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Chapter 9 Alternatives to the Proposed Action

The proposed action is the NRC issuance of an early site permit to Exelon for approval of the VCS site for one or more nuclear power facilities, separate from the filing of an application for a combined license (COL) for such a facility. The goal in preparing the ESP application environmental report is to obtain NRC approval of the site and to minimize the amount of additional environmental review needed for a COL application.

Chapter 9 describes the alternatives to construction and operation of new nuclear units at the VCS, as well as alternative plant and transmission systems. The descriptions provide sufficient detail to assess the impacts of the alternative generation options or plant and transmission systems relative to those of the proposed action. The chapter includes four sections:

- No-Action Alternative (Section 9.1)
- Energy Alternatives (Section 9.2)
- Alternative Sites (Section 9.3)
- Alternative Plant and Transmission Systems (Section 9.4)

The site is located in the Electric Reliability Council of Texas (ERCOT) region.ERCOT is the reliability coordinator, balance authority, and transmission operator for 75 percent of the geographical area and 85 percent of the load in the state of Texas (ERCOT May 2009). The ERCOT grid is essentially separated electrically from the rest of North America and has only two DC ties to the Southwest Power Pool and three to Mexico with a total capacity of approximately 1100 MW (ERCOT Jun 2009). Because the ERCOT grid is isolated from the rest of North America, Exelon defines the region of interest as the area served by ERCOT.

9.0.1 References

ERCOT Jun 2009. Electric Reliability Council of Texas, Inc., *ERCOT DC-Tie Operations: NERC Tagging, Interchange Scheduling, Normal and Emergency Operations, and Inadvertent Accounting,* Version 3.0*, Revision 4*, June 2, 2009.

ERCOT May 2009. Electric Reliability Council of Texas, Inc., *ERCOT Quick Facts*, May 2009.

9.1 No-Action Alternative

The no-action alternative for a proposed early site permit (ESP) is non-issuance of that permit (i.e., NRC denies the application for an early site permit for the proposed site). In this context, no-action would accomplish none of the benefits intended by the ESP process, which would include:

- The early resolution of siting issues prior to large investments of financial capital and human resources in new plant design and construction
- The early resolution of issues on the environmental impacts of construction and operation of reactors that fall within the site parameters
- The ability to confirm the suitability of sites on which nuclear plants may be located
- The facilitation of future decisions on whether to build new nuclear plants

Not issuing the ESP would avoid no significant environmental impacts, because no such impacts are caused by a site suitability determination. The only activities that are permissible under an ESP are limited work activities allowed by 10 CFR 50.10(e)(1), and those activities are permissible only if the final environmental impact statement concludes that the activities will not result in any significant environmental impacts that cannot be redressed. At this time, Exelon is not seeking a Limited Work Authorization.

With respect to a future proposal to construct and operate new nuclear units, the no-action alternative at that stage would constitute denial of the construction permit and operating license (eliminating nuclear units as the source of generation to meet the power needs at that time). The alternative of not licensing the construction and operation of new units would obviously avoid the environmental impacts associated with their construction and operation as outlined in Chapters 4, 5, and 7 and summarized in Chapter 10. However, depending on the need for power and impacts associated with alternative energy sources at the time when construction of the new nuclear units may be proposed, the alternative of not licensing the construction and operation of new nuclear units might result in other site and area environmental impacts, such as the impacts of constructing and operating a large base-load coal-fired plant. Consideration of the reasonableness of this or other alternatives involves evaluations of need for power and alternative energy sources, which are topics that would be addressed during the COL stage.

9.2 Energy Alternatives

Energy alternatives would be evaluated in the COL application.

9.3 Site Selection Process

This section describes the Exelon site selection process and provides an analysis of alternatives to the proposed VCS site.

9.3.1 **Introduction**

The objectives of the site selection process are:

1. Compliance with National Environmental Policy Act (NEPA) requirements regarding consideration of alternative sites
2. Satisfaction of NRC and other regulatory agency site suitability requirements
3. Conformance with Exelon's business objectives for the proposed project

Guidance for the analysis of alternatives to the proposed VCS site was taken from NUREG-1555, Section 9.3.

Subsection 9.3.2 describes the site selection process for the Exelon ESP project. A comparison of the potential environmental impacts of a new nuclear generating facility at the alternative and proposed sites is provided in Subsection 9.3.3.

9.3.2 **Overview of Site Selection Process**

Site selection was conducted in general accordance with the process outlined in the EPRI Siting Guide: *Site Selection and Evaluation Criteria for an Early Site Permit Application*, dated March 2002.

The site selection consisted of the following steps:

- Defining the region of interest (ROI)
- Screening the ROI to identify candidate areas
- Identifying potential sites in the candidate areas
- Screening the potential sites to identify candidate sites
- Selecting the proposed site and the alternative sites

The process for the Exelon site selection study is shown on Figure 9.3-1. Evaluations supporting the identification and screening of candidate areas and potential sites were based on publicly available data sources. Evaluations of the candidate sites also included onsite investigations and reconnaissance. It should be noted that for the purposes of comparison, the site selection analysis assumed that two units within a 330-acre power block area would be sited at the candidate sites. Although it is plausible for some technologies to site more than two units within these defined limits, the analyzed case remains representative.

9.3.2.1 **Region of Interest**

Exelon operates electrical generation facilities in the midwest, northeast, mid-Atlantic regions and the Electric Reliability Council of Texas (ERCOT) region of Texas. Exelon desires to expand its base load portfolio in the Texas ERCOT market because this market has favorable load projections and conditions. Exelon has defined the ROI based on a geographic boundary limited to the state of Texas and the ERCOT North American Electric Reliability Corporation (NERC) region. Figure 9.3-2 is a map that shows the major load centers and their supporting transmission infrastructure, major water bodies, and population densities for counties in the ROI.

The ERCOT region lies entirely within the state of Texas but does not include the entire state of Texas. The region excludes most of the Panhandle, the extreme west, and parts of the east. The ERCOT region encompasses 75 percent of the state of Texas and serves 85 percent of the Texas load (ERCOT May 2009). The ERCOT region is almost entirely isolated from other transmission networks, so the power provided to the ERCOT region loads must be generated within ERCOT. The power generated by the proposed new construction would be used in the ERCOT region.

9.3.2.2 **Process for Identifying Candidate Areas**

As defined in NUREG-1555, the candidate areas are “a subset of the ROI, after unsuitable areas in the ROI are removed from consideration.” Based on water availability, transmission access, and electrical load, Exelon broadly identified a sub-region in the eastern portion of the ERCOT region to initiate the potential site search. Figure 9.3-3 shows the environmentally-diverse sub-region consisting of approximately 67 counties which includes coastal and inland areas.

The next step in the Exelon site selection process was to further refine the sub-region to eliminate those areas that were unsuitable as candidate areas. Exelon performed this refinement by applying the following criteria:

- The primary load centers within the ROI are Dallas-Fort Worth, Houston, and San Antonio/ Austin. The transmission systems are most robust in these areas. Consideration shall be given to identifying areas that are within reasonable proximity to these load centers and their supporting infrastructure.
- The availability of a sufficient source of water for the generating facility is a key determining factor in deciding candidate areas in Texas. Consideration should be given to identifying areas where the Gulf of Mexico (using salt water cooling) is accessible or where there is

reasonable proximity to large freshwater reservoirs or rivers with sufficient excess capacity. There is greater precipitation and therefore greater availability of water in the south and eastern portions of ERCOT.

- Proximity to large population centers shall be considered when determining the candidate areas. The areas should not generally be within 50 miles of a large population center from an emergency planning perspective, but also not so far from a population center that some meaningful community infrastructure and proximity to a workforce does not exist.

Application of the above exclusionary criteria yielded two candidate areas viewed to be favorable for the ESP project as shown in Figure 9.3-2.

9.3.2.3 **Identification and Screening of Potential Sites**

Exelon used four sources for identifying potential sites. These sources included:

- Texas Office of Economic Development and Tourism
- County economic development agencies
- Real estate brokers
- Contact with individual property owners

Exelon used the Texas Office of Economic Development and Tourism web-based solicitation system. This system allows parties considering economic development in the state of Texas to solicit interest using a central web-based system. While the solicitation was issued by the Texas Office of Economic Development (TOED) to over 300 participating county economic development corporations or entities (i.e., all participating parties in its statewide system), Exelon identified in its request that it was focusing its search on a sub-region consisting of approximately 67 counties (Figure 9.3-3). Exelon's specification in the TOED solicitation consisted of the following:

- Transportation — Adjacent barge or heavy rail access.
- Land — Approximately 850 acres if the cooling water source is a river; additional land necessary if cooling source is a lake/reservoir or other.
- Water — Approximately 75,000 gpm flow rate for continuous consumptive use.
- Transmission Infrastructure — Readily accessible to two or more major, high voltage substations capable of handling input voltages of 345 kV or 500 kV.

Exelon requested that interested parties meeting the above specification submit the following information:

- Cover letter detailing how the community site meets the preliminary site selection criteria.
- Site plot, including documentation addressing water source (river, lake/reservoir, or other) and substation locations.
- Location of rail/barge access.
- Incentives available.
- Community profile.

Nine responses to the web-based solicitation were received: one brownfield site and eight greenfield sites. The acceptability of these sites was evaluated by Exelon's site selection team (the “Team”) comprised of individuals with an assortment of expertise, including environmental, water resource and site suitability experts, environmental and real property legal counsel, and individuals with land acquisition expertise such as real estate brokerage (also referred to as “Landmen”), GIS mapping, land and mineral title searches, valuation of target properties, and site surveying.

Following receipt of the responses to the solicitation issued through the governor's web-based economic-development system, The Landmen, at the Team's direction, began to engage parties or landowners who had subsequently offered their property to Exelon, collecting relevant information about the property and bringing this information to the Team for evaluation. Further, the Landmen canvassed the candidate areas searching for other properties that were for sale and that met the following three criteria:

- Contained within one of the designated candidate areas.
- Near an existing or proposed reservoir or near (i.e., approximately 10 miles) a major river such as the Guadalupe, Colorado, Brazos, Trinity, Neches, or San Antonio rivers.
- Individual or multiple parcels that total at least 5000 acres if the source of cooling water is fresh water. If the source is salt water from the Gulf of Mexico, the size of the property should be approximately 1000 acres.

The Landmen used real estate listings, discussions with other brokers, newspapers and other publications, and driving tours of the area to identify potential sites. Eleven sites were identified through the other sources listed above.

Due to the advantages to be gained by locating a new nuclear power plant at an existing commercial nuclear site rather than at a non-nuclear site, including environmental, constructability, and cost benefits, as well as a higher level of knowledge of site conditions, Exelon also considered existing commercial nuclear sites within the ROI. There are two commercial nuclear sites within the ROI: the two-unit South Texas Project and the two-unit Comanche Peak Plant. However, neither is controlled by Exelon, and the operators at both facilities announced plans for COL applications for new units at these sites. Accordingly, it was determined that obtaining control of sites at these locations would not be feasible and therefore, both were eliminated as potential sites.

Ultimately, 22 potential sites were examined for initial suitability. Table 9.3-1 lists the 22 potential sites considered. Figure 9.3-3 presents the location of the 20 remaining potential sites, after the elimination of two existing nuclear sites.

The potential sites represent a reasonable number of alternatives reflecting the spectrum of siting trade-offs within the ROI.

9.3.2.4 **Screening Process to Identify Candidate Sites**

The 20 remaining potential sites were first evaluated against the following exclusionary criteria:

- Minimum consumptive water flow rate of 42,000 gpm and minimum water availability of 68,000 acre-feet per year based on average water use.
- Minimum acreage
  - Cooling pond not required — 850 acres (subsequently revised to 1000 acres).
  - If cooling pond needed, sufficient acreage to impound adequate volume of water.

The initial exclusionary water requirement of 75,000 gpm (addressed in Subsection 9.3.2.3) was based on the maximum consumptive water use plant parameter envelope value for two ESBWRs with natural draft cooling towers used in the development of the Clinton Early Site Permit. Specifically, according to information provided by General Electric during the preparation of the ESP application and used to develop bounding cooling water requirements, the maximum make-up flow rate for natural draft cooling towers is 39,000 gpm and 78,000 gpm for a single and dual unit ESBWR, respectively. The latter was rounded down to 75,000 gpm. However, during the course of early discussions with Texas water authorities, it became apparent that Texas water authorities were not willing to negotiate water agreements based on a bounding use figure and a more realistic water use figure was requested. Detailed analyses were performed to determine actual water consumption, resulting in the revised flow rate criterion of 42,000 gpm. In addition, the initial minimum acreage requirement of 850 acres, if no cooling pond is required, was the minimum needed for the exclusion area boundary when the power block is located at the center of the site. The minimum acreage requirement was increased to 1000 acres to allow a larger margin on the exclusion area radius. The inclusion of ABWR, AP1000, APWR, and mPower in the ESP as potential technologies for the VCS site had a negligible impact on water consumption and did not affect the outcome of the siting evaluation.

Based on evaluation of the potential sites against these criteria, six sites were summarily eliminated, as follows:

- Moss Lake (Cooke County) — This 850-acre inland site on the shore of Moss Lake was eliminated because the response to the TOED solicitation indicated that it does not meet the minimum water requirement and it does not meet the acreage requirement to support development of a cooling pond.
- Red River (Cooke County) — This 1000-acre inland site on the southern bank of the Red River was eliminated because the response to the TOED solicitation indicated that it does not meet the minimum water requirement and it does not meet the acreage requirement to support development of a cooling pond.
- McGregor Industrial Park (McLennan County) — This 1000-acre site is part of a 9700-acre former naval weapons facility that has undergone extensive groundwater and surface water remediation. The site was eliminated due to its close proximity to other industrial facilities including an active rocket testing facility. Additionally, the site contains hundreds of underground rocket bunkers. The McGregor Industrial Park was the single brownfield site considered.
- Hughes Farm (Williamson County) — This 484-acre site was eliminated because the response to the TOED solicitation indicated that it does not meet the minimum water and acreage requirements.
- Munson site (Grayson County) — The 850-acre site is on the Red River in the northeast corner of Grayson County. This site was eliminated because it has insufficient acreage to allow for the creation of a cooling pond. In addition, there are no existing 345-kV substations in Grayson County, and the only 345-kV line in the area is the Anna-Valley line that goes through the southwest corner of the county. The site would require a new 345-kV substation and routing of a transmission corridor a significant distance to interconnect. Development of this transmission infrastructure would have impacts on land use and ecological resources and would require a substantial investment.

- Rusk County (Rusk County) — This 600-acre inland site is near the eastern edge of ERCOT, approximately 140 miles east of Dallas. While interconnection to ERCOT via an existing 345-kV transmission line is possible, development of the site would require extensive transmission system upgrades, including construction of an additional 95-mile 345-kV line. Also, the site is not in close proximity to port or barge facilities and extensive rails spurs would need to be built to support construction activities. Development of the transmission and rail lines would have impacts on land use and ecological resources. In addition, the site has a marginal cooling water supply and it does not have sufficient acreage for development of a cooling pond.

The Sam Rayburn Reservoir Area site was also found not to meet the minimum acreage requirement. It was not summarily eliminated but was included in the next selection step because there was potential for additional land parcels to be offered to increase the size of the final property.

Exelon next applied the below screening criteria (based on “avoidance” and “suitability” outlined in the EPRI Siting Guide) to further evaluate the 14 remaining potential sites. The intent of this evaluation was to eliminate those sites that did not satisfy one or more of the following criteria and to identify the five best sites of the total population. The criteria included:

- No environmentally sensitive areas in location of footprint.
- No known historic or archaeological sites in location of footprint.
- No land use restrictions (e.g., zoned for residential only).
- Generally low population density in the area immediately surrounding the exclusion area boundary.
- Minimal significant flooding potential (preferably not in a 100-year floodplain). No known or obvious impacts to water quality or aquatic species.
- No known significant geologic, seismic, or subsidence hazards.
- No known significant man-made hazard at the exclusion area boundary (e.g., site adjacent to liquefied natural gas terminal or ship channel, next to a large airport, pipelines running through property and near footprint that cannot be moved, etc.); each hazard to be examined on a case-by-case basis.
- Transmission access — Readily accessible to at least two existing, ERCOT-controlled, major, high-voltage substations capable of handling input voltages of 345 kV or 500 kV.

- Reasonably flat topography.
- Reasonable certainty of obtaining site access and acquiring surface and mineral rights.

Exelon performed reconnaissance surveys and onsite studies to obtain additional information on each of the 14 sites, and then reevaluated the sites using the above criteria. Based on the more in-depth screening, 9 of the remaining potential sites were eliminated. A summary of the general basis for their elimination is presented as follows:

- Occidental-Hardy (Matagorda County) — The 2659-acre inland site is bordered by the Colorado River Flood Control Levee along its entire western boundary and most of its southern boundary. This site was eliminated because the site acreage would not support development of a cooling pond. Also, the property behind the levee is a flood plain, so nearly all of the soils on the property have poor structural qualities. Extensive fill would be required due to geotechnical issues and the potential for flooding on the Colorado River. In addition, approximately 200 acres of wetlands exist throughout the site. Further, multiple parcels would need to be acquired, causing uncertainty regarding the ability to obtain approval to acquire the site.
- Douglas-Runnels (Matagorda County) — The 7212-acre inland site is just north of the South Texas Project nuclear power plant and is bordered by the Colorado River to the east. The property is divided by a creek that runs north-south. The eastern half of the site is in the Colorado River flood plain and the soils in this area have poor structural qualities. This site was eliminated due to geotechnical issues and the potential for flooding on the Colorado River that would require extensive fill and the construction of flood protection structures. In addition, approximately 1000 acres of wetlands are located throughout the site, and a large petro-chemical processing facility is located near the northeastern boundary of the site. Further, the unavailability of information regarding the landowner's desire to sell the property to Exelon caused uncertainty regarding the ability to obtain approval to acquire the site.
- Franzen (Matagorda County) — The 2643-acre site is located on the shore of Tres Placios Bay. This site was eliminated because the site is subject to flooding during storm surges due to its low elevation (5 to 10 feet NAVD88) and nearly all of the soils have poor structural qualities. Extensive excavation and imported fill would be required to elevate the site and improve the soil structure. In addition, approximately 300 acres of freshwater wetlands and 100 acres of saltwater wetlands are located throughout the property.

- O'Connor Tract (Victoria County) — The site's shape (long and narrow) rather than acreage (1634 acres) presented exclusion area boundary control issues, and the site has insufficient acreage for development of a cooling pond. Further, shortly after the site was reviewed by Exelon, it was purchased by another party and was no longer available for Exelon's project.

- Placedo (Victoria County) — The presence of 30-inch and 36-inch diameter natural gas transmission pipelines adjacent to the site, as well as a 6-inch natural gas pipeline and several highly volatile liquid pipelines within the site boundary, would pose hazard and relocation issues. The site is also at a low elevation above sea level, posing site suitability issues, and is bisected by Placedo Creek. Finally, the site had over 20 landowners in interest at the time of site selection, causing uncertainty regarding the ability to obtain approval to acquire the site.

- Navarro County (Navarro County) — The site is located on the shore of the Richland-Chambers Reservoir, which was built to provide water for Fort Worth. The Reservoir is a popular recreation area and its shoreline has been approved for extensive residential development. This site was eliminated because a new 3000-unit single-family housing development is underway, which caused the city commissioners to withdraw their proposal of this site.

- Powderhorn Ranch (Calhoun County) — The 3707-acre site is bounded by Powderhorn Lake to the north, Matagorda Bay to the east, and the Gulf Intracoastal Waterway (GIWW) to the south. The site is surrounded by the Aransas National Wildlife Refuge, which is known for its exceptional variety of nearly 400 resident and transient bird species. The site is on salt marshes and lowlands with elevations ranging from 5 to 15 feet NAVD88. Approximately 2000 acres of freshwater wetlands and 300 acres of saltwater wetlands are located within the property boundary. The site also has potential external hazard issues due to potential for liquefied natural gas ship traffic in the shipping channel. Further, acquisition of this site would not be possible because the landowner was neither interested in selling nor entering into discussions with Exelon.

- Womack (Victoria County) — The 3293-acre site is located between McFaddin and Tivoli in southwestern Victoria County. Two 4-inch diameter natural gas pipelines cross the site where the power block would be located, and a 6-inch natural gas pipeline is located within the exclusion area boundary. These pipelines would require relocation. Several high volatility liquid pipelines are within 4500 feet of the site boundary and would also require relocation. In addition, 23 wells are located within the exclusion area boundary. Further, the acquisition of this site would not be possible because the landowner was not interested in entering into discussions with Exelon.

- Sam Rayburn Reservoir Area (Nacogdoches County) — The 860-acre inland site is bounded on the west and south by the Angelina River and on the east by Attoyac Bayou. The anticipated cooling water source would be the Sam Rayburn Reservoir, which is used extensively for recreational and sport fishing. Development of the site would require construction of a 20-mile pipeline to an intake structure on the reservoir, which would cross several bayous. There is minimal 345-kV transmission in Nacogdoches County, and development of the transmission infrastructure would have impacts on land use and ecological resources. In addition, the site comprises 12 parcels with multiple owners, causing uncertainty regarding the ability to obtain approval to acquire the site.

Applying the avoidance and suitability criteria to these sites resulted in identifying five candidate sites. These candidate sites received detailed analysis. The sites included the Buckeye and Green sites in Matagorda County, the McCan site in Victoria County, the Alpha site in Austin County, and the Bravo site in Henderson County (Figure 9.3-3).

9.3.2.5 Candidate Site Evaluation and Conclusion

The process for candidate site evaluation was comprised of the following two elements:

- Develop criterion ratings for each candidate site
- Develop composite site suitability ratings

Criterion Ratings — Each candidate site was assigned a rating of 1 to 5 (1 = least suitable, 5 = most suitable) for each of the following criterion sets:

- Health and Safety
- Environmental
- Socioeconomic
- Engineering
- Transmission and Market Analysis
- Communications (Public Support)
- Local Government and Political Support
- Economic Development Incentives

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

The result of the initial candidate site selection process is shown on Figure 9.3-4. All candidate sites were considered viable sites. The Matagorda County site was ranked as the primary site with all evaluation criteria, and the Buckeye and Victoria County sites as secondary sites, with scoring too close to differentiate one site over the other.

Exelon's project plan was to initiate long lead data collection at the primary and secondary sites. However, additional analysis was needed to differentiate between Buckeye and Victoria County sites. The result of the secondary site selection analysis concluded that the Victoria County site was preferred over the Buckeye site. While the valuation of deep mineral rights at the Victoria County site had the potential for significant financial risk, the risks associated with acquiring the needed surface rights at the Buckeye site were higher.

Following selection of the Matagorda County site as the primary site, field work began to characterize subsurface conditions at both the primary and secondary (Victoria County) sites. The sites were reevaluated using original criteria but with updated and additional data collected. This resulted in the Victoria County site scoring better than the Matagorda County sitein the following areas:

- Geology/seismology
- Flooding
- Groundwater radionuclide pathway
- Transportation safety
- Dewatering effects on adjacent wetlands
- Dredging/disposal effects
- Engineering cost differential

In addition, updated transmission and market analysis showed preference to western load centers (San Antonio, Corpus Christi, and Austin). Based on the foregoing environmental considerations, site suitability issues, and geotechnical data, the Victoria site received a higher composite rating in the re-analysis than the Matagorda County site (Figure 9.3-5). Accordingly, this re-evaluation resulted in the Victoria County site being designated as the proposed site and the Matagorda County site as the secondary site.

The Victoria County site ranked higher than the four alternative sites based on the environmental criteria ratings (health and safety, environmental, and socioeconomic). Comparison of projected construction and operational impacts at the proposed and alternative sites, as set forth in Subsection 9.3.3 below, demonstrates that there is no significant difference in environmental impact among the five candidate sites. For these reasons, there is no alternative site that is “environmentally preferable” to the Victoria County site.

9.3.3 **Alternative Site Review**

The proposed VCS site is reviewed at length throughout the environmental report. This subsection reviews the other four alternative candidate sites using the selection criteria suggested in NUREG-1555.

Regulatory Guide 4.2, *Preparation of Environmental Reports for Nuclear Power Stations* (U.S. NRC Jul 1976) notes: “The applicant is not expected to conduct detailed environmental studies at alternative sites; only preliminary reconnaissance-type investigations need be conducted.” The alternatives described here are compared based on recent information about existing facilities, the surrounding area, and existing environmental studies.

In accordance with 10 CFR 51, potential impacts from construction and operation of the proposed nuclear power plant at candidate sites other than the proposed site are analyzed, and a single significance level of potential impact (i.e., SMALL, MODERATE, or LARGE) is assigned to each analysis consistent with the criteria that the NRC established in 10 CFR 51, Appendix B, Table B-1, Footnote 3 as follows:

SMALL	Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
MODERATE	Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource.
LARGE	Environmental effects are clearly noticeable and are sufficient to destabilize any important attributes of the resource.

For some analyses, Exelon determined the criteria used by the NRC in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (USNRC May 1996), were appropriate for the analyses presented here and reviewed those criteria to assign a significance level to impacts.

Impact initiators for the alternative sites are the same as those described in Chapter 4 for construction and Chapter 5 for operation of VCS.

9.3.3.1 Evaluation of the Matagorda County Site

The Matagorda County site is a 1480-acre, undeveloped property in the western part of Matagorda County, Texas. It is situated approximately 90 miles southwest of Houston, 25 miles southwest of Bay City, and 4 miles southeast of the towns of Palacios and Collegeport. The site is approximately 3.5 miles north of the Gulf Intracoastal Waterway (GIWW), 4 miles north of Matagorda Bay, 2 miles east of Tres Palacios Bay, and 2.5 miles north of Oyster Lake (Figure 9.3-6). The site is also 11.5 miles southwest of South Texas Project (STP) Electric Generating Station.

The cooling system would consist of onsite cooling towers with an intake line from the GIWW and a discharge line to Tres Palacios Bay. A transmission system consisting of new ROW would be required to connect the site to the surrounding grid. To analyze the effects of building a new nuclear plant, Exelon has assumed that the construction and operation practices described in ER Chapters 4 and 5 would generally be applied to the Matagorda site; thereby, allowing for a consistent description of the impacts.

9.3.3.1.1 Land Use Including Site and Transmission Line Rights-of-Way

The Matagorda County site is comprised of fairly flat, agricultural land used on a rotating basis for rice production and cattle grazing. Wetlands encompass much of the southeastern portion of the site (USFWS 2008). Construction of a power plant and transmission lines would alter land use at the site from agricultural to industrial. However, Matagorda County does not have any land use plans or zoning restrictions. The footprint of a new plant would be approximately 655 acres including switchyard, parking lots, temporary facilities, cooling towers, laydown yards, and spoil storage. Because the site is undeveloped, additional acreage would be required for roads and railroad spurs. The entire 1480 acres would be excluded from future agricultural and recreational use for the estimated 60-year life of the plant.

County Road 3221 (Oyster Lake Road) passes along the western side of the Matagorda County site and County Road 3220 (Letulle Lane) runs along its northern side. These roads would require improvement (increased elevation, widening, and paving) so that sufficient access could be provided for operations and deliveries. In addition, a 0.4-mile-long paved road would be needed on the west side of the site from Oyster Lake Road to provide vehicle access. Assuming a 100-foot ROW, development of this access road would require approximately 4.8 acres.

A heavy haul road would be constructed to provide construction materials to the site during construction. This road would span approximately 4.1 miles southeast from the plant to a barge slip that would be constructed on the GIWW. The road would follow an existing private, gravel road providing access to the Oyster Lake Stabilization Facility and would be widened, paved, and have its turn radii increased. Development of the heavy haul road would require approximately 50 acres.

The nearest operating railroad is approximately 16 miles north of the site near Blessing, Texas. A 9-mile rail spur, currently not in use, runs south from this railroad to service the STP nuclear plant and is expected to be reconstructed in the next few years for use by STP (STPNOC Sep 2007). While no railroads currently traverse the Matagorda County site, a spur rail line would be constructed directly from the rail line mentioned above or from the reconstructed STP rail spur to serve the Matagorda County site. Assuming a 100-foot ROW, this would impact 150 to 200 acres of land.

Intake and discharge piping for the plant's circulating water system would necessarily extend off the plant property. A makeup water intake line, approximately 4.5 miles long, would be constructed from the site southeast to the GIWW near the Oyster Lake Stabilization Facility. A discharge line would be routed approximately 2.7 miles southwest to Tres Palacios Bay. Assuming a 400-foot ROW, construction of the water system would temporarily disturb approximately 344 acres.

Operations impacts to site land use would include permanent disturbance of 655 acres for the power plant facility, 4.8 acres for the access road, and 150 to 200 acres for the rail spur.

Land-use impacts associated with site-preparation and construction of the proposed nuclear power plant at the Matagorda County site would be SMALL. Site land-use impacts associated with operations of the proposed nuclear power plant would be SMALL.

Exelon estimates that four additional 345 kV transmission lines would be needed for the proposed nuclear power plant. A single new transmission ROW approximately 400 feet wide containing all four lines would run from the Matagorda County site switchyard to the STP nuclear plant approximately 11.5 miles to the northeast. Assuming a 400 foot ROW, routing these new transmission lines would require approximately 560 acres of land. Similar to Matagorda County site area, the land use where this corridor would extend is primarily agricultural land and rangeland. Although, in general, the most direct route would be used between terminations, consideration would also be given to avoiding possible conflicts with natural or man-made areas where important environmental resources are located. Route selection would also avoid populated areas and residences to the extent possible. Lands that are currently forested would be altered. Trees would be replaced by grasses and other low-growing types of ground cover. Although Exelon would not be responsible for final routing and construction, the transmission service provider is expected to comply with all applicable laws, regulations, permit requirements, and use best construction management practices. Construction impacts to offsite land use would be SMALL.

The new transmission corridor would not be expected to permanently affect agricultural areas, but it would have the potential to affect residents along the ROW. Corridor vegetation management and line maintenance procedures would be established by the transmission service provider. Given the rural setting and low population density along the transmission corridors, operational impacts to land use along the ROW would be SMALL.

From STP, the four transmission lines would continue 20 miles northwest along an existing transmission corridor to the Hillje Substation in Wharton County. Two of the lines would terminate at Hillje, while the other two lines would continue 50 miles northeast along an existing transmission corridor to the W.A. Parrish Substation in Fort Bend County. The Exelon transmission lines would most likely occupy approximately half of the 400-foot-wide STP corridors. This would lead to approximately 1700 acres of established ROW being used.

The region surrounding the Matagorda County site is in the Texas Coastal Zone, and all construction and operation activities would comply with the Texas Coastal Management Program and would require a federal consistency review.

9.3.3.1.2 **Air Quality**

The Matagorda County site is in the Metropolitan Houston-Galveston Intrastate Air Quality Control Region (40 CFR 81.38), consisting of areas designated as being in non-attainment of the National Ambient Air Quality Standards (NAAQS) (40 CFR 81.344). Matagorda County is designated as being unclassified or in attainment of the NAAQS. The nearest non-attainment areas are Brazoria and Fort Bend Counties (the Houston metropolitan area) and are so classified due to exceedance of the 8-hour ozone standard (40 CFR 81.344).

Air emissions from construction and operation of the proposed nuclear power plant at the Matagorda County site would be similar to those at the VCS site as described in Subsections 4.4.1.3 and 5.8.1.2, respectively. Construction impacts would be temporary and similar to any large-scale construction project. Particulate emissions in the form of dust from disturbed land, roads, and construction activities would be generated. Mitigation measures similar to those described in Subsection 4.4.1.3 would be taken. Air pollutants would be emitted from the exhaust systems of construction vehicles and equipment and from vehicles used by construction workers to commute to the site. The amount of pollutants emitted in this way would be small compared to total vehicular emissions in the region. It is not expected that construction-related emissions would result in any violation of the NAAQS.

During station operation, auxiliary equipment such as diesel generators, combustion turbines, and boilers may be used. Emissions from those sources are described in Subsection 3.6.3. It is expected that this equipment would see limited use and, when used, would operate for short time periods. Therefore, air emissions from this auxiliary equipment are expected to be minimal.

The closest area to the Matagorda County site designated as a mandatory Class I Federal area, in which visibility is an important value, is Big Bend National Park in western Texas (40 CFR 81.429). Because there are no mandatory Class I Federal areas within 50 miles of the site, any potential visibility impacts from the proposed nuclear power facilities on Class I areas would be negligible.

The air quality impacts from construction and operation of the proposed nuclear power plant at the Matagorda County site would be SMALL.

9.3.3.1.3 **Hydrology, Water Use, and Water Quality**

The Matagorda County site lies over the central portion of the Gulf Coast Aquifer System. The Gulf Coast Aquifer is a major aquifer that parallels the Gulf of Mexico coastline from the Louisiana border to the Mexican border. This aquifer covers 54 counties and consists of several aquifers, including the Jasper, Evangeline, and Chicot aquifers, which are composed of discontinuous sand, silt, clay, and gravel beds. The area of the aquifer is approximately 41,879 square miles. Seventy-three percent of the aquifer, including the area in the region of the Matagorda County site, is covered under a groundwater control district. (TWDB Nov 2006)

As described in Subsection 2.3.2, a local issue is the significant regional decreases in water levels in the Gulf Coast Aquifer during the 1970s and 1980s that prompted concern regarding the allocation of groundwater and forced a number of users, including municipalities, to revert to surface water as their primary source of water. New development, recent droughts, and the potential for saltwater intrusion have also heightened concerns about long-term groundwater availability in the Gulf Coast Aquifer.

Matagorda County is part of the Lower Colorado Regional Water Planning Group, which is required to plan for future water needs under drought conditions. According to the 2006 Lower Colorado Regional Water Plan, the projected groundwater supply available in the Lower Colorado Region from the Gulf Coast Aquifer during drought of record conditions is 198,425 acre-feet per year throughout the 2010 through 2060 projection period. Groundwater allocations from the Gulf Coast Aquifer are projected to decline by 50.1 percent from 848,782 acre-feet per year to 423,328 acre-feet per year over the same period. (LCRWPG Jan 2006)

Exelon would use groundwater during construction for the potable water system, concrete production and curing, backfill operations, dust control, cleaning and lubrication, and hydro testing and flushing. Peak well water demand during construction is estimated to be approximately 580 gpm (Section 4.2.1.2). For station operations, Exelon estimates that a maximum of 1200 gpm is anticipated. Compared with the Lower Colorado Region projected groundwater use from the Gulf Coast Aquifer, groundwater use for construction and operations of nuclear units at the Matagorda County site would represent a very small percentage of total use (less than 1 percent). Therefore, construction and operations impacts to groundwater would be SMALL.

To ensure that wetlands and streams are not harmed by petroleum products or other industrial chemicals, Exelon would restrict certain activities (e.g., transfer and filling operations) that involve the use of petroleum products and solvents to designated areas, such as lay-down, fabrication, and shop areas. In addition, construction activities would be guided by a Stormwater Pollution Prevention Plan and a construction-phase Spill Prevention, Control, and Countermeasures Plan similar to those proposed for VCS as described in Subsection 4.2.3. Therefore, any impacts to surface water during plant construction would be SMALL and would not warrant mitigation beyond best management practices required by the permits.

The Matagorda Bay complex is the second largest bay in Texas (after Galveston Bay) and provides valuable habitat for resident and migratory birds and habitat for a number of important aquatic species. The complex is home to the largest shrimp fleet on the coast and is popular for recreational and commercial fishing. Typically, that portion of the Matagorda Bay complex west of the Colorado River is referred to simply as “Matagorda Bay,” as distinguished from East Matagorda Bay, which lies east of the river (LCRA Apr 2007). Matagorda Bay is approximately 4.4 miles south of the Matagorda County site, and Tres Palacios Bay, which is an eastern embayment of the Matagorda Bay complex, is 2.4 miles west of the site.

The GIWW is a navigable inland waterway located 3.5 miles south of the site and extending 1200 miles from Carrabelle, Florida to Brownsville, Texas. The GIWW passes through Texas barrier islands mostly via channels that must be dredged to remain open (TSHA Jan 2008a). The GIWW provides a channel with a controlling depth of 12 feet designed primarily for barge transportation, but the waterway also provides habitat for resident and migratory birds and habitat for a number of important aquatic species.

The normal consumptive use of surface water during operations by the cooling towers would be 57,800 gpm (Table 9.4-3). The source of water for the proposed nuclear generating units at the Matagorda County site would be saltwater from the Gulf of Mexico or GIWW. Impacts to surface water use would be SMALL because of the saltwater source.

During operations, the cooling water system would withdraw from the GIWW and discharge into Tres Palacios Bay. The Matagorda County site would operate under a National Pollutant Discharge Elimination System (NPDES) permit issued by the Texas Commission on Environmental Quality (TCEQ). As authorized by the Clean Water Act, the NPDES permit program controls water pollution by regulating discharges into waters of the United States. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. The permit contains limits on what can be discharged, monitoring and reporting requirements, and other provisions to ensure that the discharge does not degrade water quality or human health. Any releases to Tres Palacios Bay, the GIWW, or onsite streams as result of construction or operation of the proposed nuclear power plant at the Matagorda County site would be regulated by the TCEQ through the NPDES permit process to ensure that water quality is protected. The impacts of discharges to surface water would be minimized by the same mitigation measures as those addressed for the proposed site in Section 4.2 and Subsection 5.2.2. Therefore, impacts to water quality would be SMALL.

9.3.3.1.4 **Terrestrial Resources Including Protected Species**

The Matagorda County site is approximately 25 miles southwest of Bay City and 4 miles southeast of the towns of Palacios and Collegeport. The site encompasses approximately 1480 acres and is situated in western Matagorda County. Construction of the proposed nuclear power plant at the Matagorda County site would require at least a facility footprint of 655 acres. Additionally, a 0.4-mile entrance road from the west, 4.1 mile heavy haul road to the southeast, between 12 and 16 miles of railroad to the north, and the intake and discharge water system would all have to be constructed, requiring between 620 and 670 acres.

As mentioned in Subsection 9.3.3.1.1, Exelon estimates that four additional 345 kV transmission lines would be needed to connect the proposed nuclear power plant to the state's transmission system. The new lines would most likely run from the Matagorda County site switchyard to the STP nuclear plant, approximately 11.5 miles to the northeast, and then continue 20 miles northwest to Hillje substation along an existing transmission corridor. Two of the lines would terminate at Hillje, while the other two lines would continue along an existing transmission corridor 50 miles northeast to the W.A. Parrish Substation. Routing these transmission lines would require approximately 560 acres of virgin land disturbed in Matagorda County and approximately 1700 acres of land along established ROWs in Matagorda County, Wharton County, and Fort Bend County.

Four federally listed terrestrial species, all bird species, have the potential to occur in Matagorda County, and therefore in the vicinity of the Matagorda County site. These species include the bald eagle (*Haliaeetus leucocephalus*), the brown pelican (*Pelecamus occidentalis*), the piping plover (*Charadrius melodus*), and the whooping crane (*Grus Americana*).

The nearby Aransas National Wildlife Refuge (NWR) Complex is the wintering ground for the largest flock of whooping cranes in the United States, and specific whooping crane habitat is found in Aransas NWR (Calhoun and Refugio Counties) and in scattered locations in Matagorda County. Piping plover habitat is also scattered along the Matagorda County coastline. In Matagorda County, critical habitat for both the whooping crane and piping plover is found along county coastline, specifically on the Matagorda peninsula, in the vicinity of Matagorda/Mad Island WMA, on the Big Boggy NWR (piping plover) and San Bernard NWR (just inside Brazoria County).

In addition, Matagorda County has 14 state-protected species, including 12 bird and two mammal species.

The east coast of Texas, including Matagorda County, is at the terminus of the Central Flyway migration route, resulting in the occurrence of many different species of avifauna during the fall, winter, and spring months (TNC 2008). Thousands of migrating birds from the cooler regions of the continent visit or overwinter in the coastal zone of Texas. Other migrants traveling to or from Central and South America use this region of Texas as an important stopover point before continuing their travels.

The Matagorda County site is approximately 10 miles west of the Matagorda County-Mad Island Christmas Bird Count (CBC), a 15-mile diameter circle in which attempts are made to count all birds on one day during the winter season. The Mad Island CBC has been among the top five CBCs nationwide every year since 1993 in regards to total number of species observed (TNC 2008). In 2006, 233 bird species were observed in the 15-mile diameter circle near the Matagorda County site. Since 2000, the total number of species observed has ranged from 231–250 avian species.

Prior to clearing or construction activities at the site or along associated transmission or pipeline corridors, field surveys would be conducted for federally listed and state-protected species as part of the permitting process. Land clearing would be conducted according to federal and state regulations, permit conditions, existing Exelon procedures, good construction practices, and established best management practices (e.g., directed drainage ditches, silt fencing). With this in mind, Exelon concludes that impacts to terrestrial resources, including endangered and threatened species, from construction and operation of the proposed nuclear power plant at the Matagorda County site would be SMALL.

Although the most direct route would generally be used between transmission corridor terminations, consideration would also be given to avoiding possible conflicts with natural areas where important environmental resources are located. Given the short length of the new transmission corridor needed between the Matagorda County site and STP and the possibility of using existing transmission corridors and substations, impacts to terrestrial resources from construction and operation of transmission lines would also be SMALL.

9.3.3.1.5 **Aquatic Resources Including Protected Species**

The Matagorda County site is approximately 3.5 miles north of the GIWW, 4 miles north of Matagorda Bay, 9 miles north of the Gulf of Mexico, 2 miles east of Tres Palacios Bay, and 2.5 miles north of Oyster Lake. The surface water bodies that could potentially be affected by construction and operation of new units at the Matagorda County site are (1) nearby drainage ditches, irrigation canals, and surface streams; (2) the GIWW; and (3) Tres Palacios Bay, a secondary bay of Matagorda Bay.

Five federally listed aquatic species are found in Matagorda County. These species, all sea turtles, are found within the county boundaries, but not in the vicinity of the Matagorda County site. The species include green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), and hawksbill sea turtle (*Eretmochelys imbricate*). The green sea turtle and the loggerhead sea turtle are classified as threatened in Texas, while the remaining species are endangered. Three species are known to nest on Texas beaches (TSTNR 2007), and all five could possibly feed or occur in Matagorda Bay.

Water from the GIWW would be used to cool the proposed nuclear power plant constructed at the Matagorda County site. Although recreational sport fish and other aquatic species would be temporarily displaced during construction, they would be expected to re-colonize the area after construction is complete. Exelon is not aware of any federally listed aquatic species onsite. Field surveys would be conducted for federally listed and state-protected aquatic species as part of the permitting process before any clearing or construction activities at the site or along associated transmission corridors. Because of this fact and because construction-related land-clearing would be conducted according to federal and state regulations, permit conditions, existing Exelon procedures, good construction practices, and established best management practices as described in detail Subsection 4.3.2, impacts to aquatic resources, including endangered and threatened species from construction of nuclear power facilities at the Matagorda County site would be SMALL.

The most likely aquatic impact from nuclear operations at the Matagorda County site would be entrainment and impingement of aquatic organisms from the GIWW. Because the plant's intake structure would be designed to reduce the effects of entrainment and impingement, the potential for environmental impacts to aquatic resources, including endangered and threatened species, from nuclear power facility operations at the Matagorda County site would be SMALL.

9.3.3.1.6 **Socioeconomics**

This subsection evaluates the social and economic impacts to the surrounding region as a result of constructing and operating the proposed nuclear power plant at the Matagorda County site. The evaluation assesses impacts of construction, station operation, and demands placed by the construction and operation workforce on the surrounding region.

9.3.3.1.6.1 Physical Impacts

Construction activities can cause temporary and localized physical impacts such as noise, odor, vehicle exhaust, vibration, and dust. Vibration and shock impacts would not be expected because of the strict control over construction activities. The use of public roadways and railways would be necessary to transport construction materials and equipment. Most of construction activities would occur in the boundaries of the Matagorda County site. However, a heavy haul access road, a connecting rail spur, and makeup water system would be constructed on lands adjacent to the site. These would be routed to avoid residences and populated areas. Offsite areas that would support construction activities (for example, borrow pits, quarries, and disposal sites) are expected to be already permitted, or will be permitted prior to operation. Impacts on those facilities from construction of the proposed nuclear power plant would be small incremental impacts associated with their normal operation.

Potential impacts from station operation include noise, exhausts, thermal emissions, and visual effects. The proposed nuclear power plant would produce noise from the operation of pumps, fans, transformers, turbines, generators, and switchyard equipment. Vehicular traffic would also be a source of noise. However, noise attenuates quickly so that ambient noise levels would be minimal at the site boundary. Also, the Matagorda County site is in a rural area surrounded by pastures and agricultural land with few residents in the area. Commuter traffic would be controlled by speed limits, which could reduce the dust and noise level generated by the workforce commuting to the site.

The proposed nuclear power plant would have standby diesel generators and auxiliary power systems. This equipment would be operated infrequently, for short durations.

In summary, construction activities would be temporary and would occur mainly within the boundaries of the Matagorda County site. Offsite impacts would represent small incremental changes to offsite services supporting the construction activities. During station operations, ambient noise levels would be minimal at the site boundary. Diesel generators and auxiliary power systems would be operated infrequently for short durations. Therefore, the physical impacts of construction and operation of the proposed nuclear power plant at the Matagorda County site would be SMALL.

9.3.3.1.6.2 Demography

The population distribution near the site is low with typical rural characteristics.

As addressed in Subsection 4.4.2, Exelon anticipates that approximately 6300 construction workers would be employed during the peak construction period (Table 3.10-2). Exelon anticipates that approximately 5985 construction workers would relocate to the area. As described in Subsection 4.4.2, operations would overlap with peak construction activity; therefore, in addition to the construction workforce, it is estimated that 197 operations workers would relocate to the area during the peak construction period.

Based on the residential distribution of the current workforce at STP (an existing two-unit nuclear facility approximately 5 miles south of the Matagorda County site), Exelon has assumed that the new units' construction and operational workforces would reside in either Matagorda or Brazoria Counties.

Of the existing STP workforce, approximately 83 percent reside in Matagorda and Brazoria counties; therefore, these counties comprise the ROI and are the focus of this analysis. It is assumed that approximately 60.7 percent would settle in Matagorda County and 22.4 percent in Brazoria County (STPNOC Sep 2007).

The total Year 2000 population of Matagorda and Brazoria counties was 279,724 people, with 241,767 residing in Brazoria County and 37,957 residing in Matagorda County (USCB 2000a). The population within 50 miles of the site was 175,059 people (40.1 people per square mile), and the population within 20 miles of the site was 14,377 people (21.3 people per square mile). The nearest population center, as defined in 10 CFR 100, is Bay City Census County Division with a 2000 population of 24,238 (USCB 2000b), north-northeast of the Matagorda County site. Based on the sparseness and proximity matrix in NUREG-1437, the Matagorda County site is in a low population area.

As presented in Subsection 4.4.2, approximately 70 percent of the in-migrating construction workforce and 100 percent of the operations workforce are likely to bring families. Therefore, 4387 workers would bring families into the 50-mile region during peak construction. Assuming an average family household size of 3.25 people, construction would increase the population within the 50-mile region by 16,053 people, which is approximately 9.2 percent of the region's population in 2000. Based on the population distribution of the existing STP workforce, Exelon assumed that approximately 83 percent of the in-migrating construction workforce and their families (approximately 13,340 people) would settle in Matagorda (60.7 percent) and Brazoria (22.4 percent) counties. These numbers constitute 25.7 percent and 1.5 percent of the 2000 Census populations of Matagorda and Brazoria Counties, respectively. The remaining construction employees relocating to the region would be distributed among other counties in the 50-mile region.

Exelon is adopting the NRC definition of impacts as small when plant-related population growth is less than 5 percent of the study area's total population and large when plant-related population growth is greater than 20 percent (U.S. NRC May 1996). Therefore, the potential increases in population during construction of the proposed nuclear power plant at the Matagorda County site would represent a MODERATE increase for the entire 50-mile region. However, small and large, but temporary, impacts would be seen in Brazoria and Matagorda Counties, respectively.

Exelon assumed the operations workforce would have the same residential distribution as the construction workforce. Exelon estimates that 800 workers (Subsection 3.10.3) would be required for the operation of a dual-unit nuclear power facility at the Matagorda County site. For the purpose of analysis, Exelon conservatively assumes that all the new employees would migrate into the region. Employees relocating to the region would most likely be scattered throughout the counties in the region, with most choosing to live in Matagorda or Brazoria counties. The 800 employees would translate into an additional 2600 people (assuming an average family household size of 3.25 people). Based on 2000 census data, the addition of the new employees and their families would increase the population in Matagorda County by 4.2 percent and Brazoria County by 0.2 percent. Overall, the potential increase in population from operation of the proposed nuclear power plant at the Matagorda County site would represent a small increase in the total population for the 50-mile region and for the two most impacted counties, representing a SMALL impact to the population.

9.3.3.1.6.3 Economy

Based on 2000 census data, in the two most affected counties near the Matagorda County site there are 129,232 people in the civilian labor force. Of the civilian labor force, 94.2 percent are employed and 5.8 percent are unemployed (USCB 2000c). The overall unemployment rate for the two-county region is lower than that of the state, which is 6.1 percent (USCB 2000e). In 2000, Matagorda County had a civilian labor force of 16,434 people and an unemployment rate of 8.4 percent. Brazoria County had a civilian labor force of 112,798 people and an unemployment rate of 5.4 percent.

As described in Subsections 4.4.2.1 and 5.8.2.1, the wages and salaries of the construction and operations workforce would have a multiplier effect that could result in an increase in business activity, particularly in the retail and service sectors. This would have a positive impact on the business community and could provide opportunities for new businesses and increased job opportunities for local residents. The economic effect on the 50-mile region would be beneficial. Exelon assumes that direct jobs would be filled by an in-migrating workforce, but most indirect jobs would be service-related, not highly specialized, and would be filled by the existing workforce in the 50-mile region.

As described in Subsection 9.3.3.1.6.2, Exelon estimates that 5985 construction workers and 197 operations workers would in-migrate to the region during peak construction of the proposed nuclear power plant at the Matagorda County site. Assuming a multiplier of 1.63 jobs (direct and indirect) or 0.63 (indirect only) for every construction job (Subsection 4.4.2.1) and a multiplier of 2.59 for every operations job (BEA 2008a), an influx of 5985 construction and 197 operations workers would create 4080 indirect jobs, for a total of 10,262 new jobs in the ROI. Expenditures made by the direct and indirect workforce would strengthen the regional economy. Exelon concludes that the impacts of construction of the proposed nuclear power plant on the economy would be beneficial and SMALL in the region, beneficial and small in Brazoria County, and beneficial and moderate in Matagorda County.

As presented in Subsection 9.3.3.1.6.2, approximately 800 workers would be required for the operation of two nuclear power facilities at the Matagorda County site. For the purpose of analysis, Exelon assumes that all the new employees would migrate into the region. Assuming a multiplier of 2.59 jobs (direct and indirect) for every operations job at the proposed nuclear power plant (BEA

2008a), an influx of 800 workers would create 1276 indirect jobs for a total of 2076 new jobs in the region. Because most indirect jobs are service-related and not highly specialized, Exelon assumes that most, if not all, indirect jobs would be filled by the existing labor force in the 50-mile region. Exelon concludes that the impacts of operation of the proposed nuclear power plant on the economy would be beneficial and SMALL everywhere in the region.

9.3.3.1.6.4 Taxes

Taxes collected as a result of constructing and operating the proposed nuclear power plant at the Matagorda County site would be of benefit to state and local taxing jurisdictions. In Texas, property tax assessments are made by the county appraisal district, which bases its appraisal on a consideration of cost, income, and market value. This appraisal is used by all taxing jurisdictions in the county, including special districts and independent school districts, which apply their individual millage rates to determine the taxes owed. Based on the analysis in Subsection 4.4.2.2.2, Exelon anticipates that additional property taxes would be paid to Matagorda County during the construction period.

In 2006, Matagorda County had property tax revenues of $9,038,864 (Combs Jan 2008). Assuming that tax payments to Matagorda County for nuclear power facilities at the Matagorda County site would be similar to those of the VCS site (Subsections 4.4.2.2.2 and 5.8.2.2.2), the tax payments would represent a large portion of the tax revenue for the county. For the operations period, Exelon estimates its total payment to all taxing entities would be approximately $24 million, annually. Table 5.8-14 estimates the county property tax for VCS at approximately $6.9 million. The benefits of taxes are considered small when new tax payments by the nuclear plant constitute less than 10 percent of total revenues for local jurisdictions and large when new tax payments represent more than 20 percent of total revenues. The projected operations-phase taxes for the nuclear power facilities represent more than 75 percent of current property tax revenues for Matagorda County. Therefore, Exelon concludes that the potential beneficial impacts of taxes collected during construction and operation of the proposed project would be large in the Matagorda County and SMALL in the remainder of the 50-mile region.

The Matagorda County site is in the Palacios Independent School District (ISD), which is categorized as a property-wealthy district (see Subsection 2.5.2.3.5). Increased tax revenues would therefore have only a small positive impact to the Palacios ISD. In-migrating construction and operation workers would result in larger enrollments in the ROI schools, which would not receive direct property tax revenues from the plant. Because the Texas school funding formula is based on weighted average daily attendance, increases in the number of students would lead to increased funding, but would also result in the additional expenses related to a larger student body. Fiscal impacts to the ISD from increased enrollment would be small to moderate, depending on their existing capacity, funding status, and fiscal condition. Subsection 9.3.3.1.6.9 discusses capacity and enrollment issues for the Matagorda County site ROI in detail.

9.3.3.1.6.5 Transportation

The regional and local road system is shown on Figure 9.3-6. There are no interstate highways in the 50-mile radius; however, there are two U.S. highways: U.S. 59 and U.S. 87. U.S. 59 runs northeast-southwest through Fort Bend, Wharton, Jackson, and Victoria counties and connects the cities of Victoria and Houston; U.S. 87 runs northwest-southeast and through Victoria and Calhoun counties (Figure 9.3-6). A number of county roads (CR) and farm-to-market (FM) roads intersect these highways providing access to towns in these counties and conversely providing outlying areas access to the state and U.S. highway system. CR 3221 (Oyster Lake Road) and CR 3220 (Letulle Lane) border the Matagorda County site along the west and north sides, respectively, and would provide access to the Matagorda site. Currently they are dirt roads and would be paved, elevated, and widened, providing site access for deliveries and employees.

Workers and deliveries traveling to the Matagorda County site from the north would travel to U.S. Highway 59, then south on TX 71, then east on TX 35 for 3 miles, then south on FM 1095, CR 3225, and CR 3221 to the site. Workers and deliveries originating from the east would travel to Bay City and take TX 35 from the instruction above. A small amount of traffic is expected from south and west of the site.

The average annual traffic count near the site is approximately 125 vehicles per day along FM 1095 and likely lower on CR 3221 (TXDOT 2006). In keeping with the analysis in Subsection 4.4.2.2.4, the maximum number of vehicles on FM 1095 in a single hour is estimated to be 10 percent of the daily average. Therefore, Exelon estimates the maximum number of cars on FM 1095 in a single hour to be 13. The largest impact on traffic would be during the construction period day/back shift change, with up to 6182 vehicles entering or leaving the site. FM 1095 has a threshold capacity of 2300 passenger cars per hour.

Transportation impacts are considered to be small when increases in traffic do not result in delays or other operational problems; impacts are moderate when increases in traffic begin to cause delays or other operational problems.

Assuming construction shifts as described in Subsection 4.4.2.2.4, the additional traffic that could be on the road during shift changes could cause potential congestion. Also, the traffic of hauling construction materials (100 trucks per day) to the site could bring additional congestion during certain times of the day. Shift changes for the proposed nuclear power plant at the Matagorda County site could be staggered to mitigate the impact on traffic. Impacts of construction on transportation would be MODERATE to LARGE on the surrounding roads and some mitigating actions, such as those described in Subsection 4.4.2.2.4 would be needed.

With respect to the facility operations, the addition of 800 cars (assuming a single occupant per car) to the existing traffic on FM 1095 could congest the surrounding roadways. Shift changes for the proposed nuclear power plant at the Matagorda County site would be staggered resulting in a limited traffic increase that would not cause congestion. Impacts of the operations workforce on transportation would be SMALL to MODERATE and some mitigating actions, such as those described in Subsection 4.4.2.2.4, could be warranted.

9.3.3.1.6.6 Aesthetics and Recreation

The Matagorda County site is approximately 4 miles north of Matagorda Bay, 2.5 miles north of Oyster Lake, and 9 miles due north of the Gulf of Mexico. Landscapes with water as a major element are generally considered aesthetically pleasing, and this is the case along the southern coast and barrier islands as well as the numerous parks along Matagorda Bay. The marshes, lakes, bays, and other natural amenities found in the project area have historically attracted residents and tourists to the Matagorda Bay System.

The Matagorda County site is in the coastal prairie ecosystem of east Texas, the southernmost tip of the tallgrass prairie system prevalent in the Midwest (USGS Jun 2000). This area is typified by low elevation with native, open prairie, grasses interspersed with post oak savannahs or live oak groves. The larger drainages often have bottomland forests. Much of the original coastal prairie in Matagorda County has been converted to croplands or is now in pasture (USGS Jun 2000). Throughout the general area, the landscape consists of agricultural fields, including inundated rice fields, fallow fields/pasture, and irrigation ditches, with the margins of these features being lined with small trees and shrubs and herbaceous vegetation common to disturbed soils.

CR 3221, or Oyster Lake Road, is the closest major roadway from which the public can see the site (within 1 mile). In addition, FM 1095 is approximately 4 miles from the site, and FM 521 is within 9 miles. Because the topography surrounding the construction site is relatively flat with sparse trees, there is little to no screen for the reactors from area roadways. The above ground facilities would be located along rural farm roads primarily traveled by local farmers or rural residents. No sensitive visual resources, such as schools, residential subdivisions, or public lands were identified in the project area or in the vicinity of the Matagorda County site.

The Matagorda Island Wildlife Management Area (WMA), an offshore barrier island and bay side marsh, is jointly owned by the Texas General Land Office and the U.S. Fish and Wildlife Service (USFWS). A portion of the island is operated as a park for year-round recreational activities. Approximately 26 miles of Matagorda Island is within 50 miles of the site (TPWD Sep 2007).

The Mad Island WMA is fresh-to-brackish marsh with sparse brush and flat coastal prairie. It is approximately 9 miles east of Collegeport in Matagorda County and approximately 6 miles from the Matagorda County site (TPWD Sep 2007).

The Peach Point/Justin Hurst WMA is west of Freeport near Jones Creek in Brazoria County, approximately 46 miles from the Matagorda County site. It is part of the Central Coast Wetlands Ecosystem Project. Their mission is to provide for sound biological conservation of all wildlife resources in the central coast of Texas for the public's common benefit (TPWD Sep 2007).

The D.R. Wintermann WMA is in Wharton County near Egypt, approximately 47 miles from the Matagorda County site with 246 acres. A former rice farm, a section of the WMA was used to develop a wetlands area with water from the Colorado River. The land is a flat, coastal prairie and is used as a laboratory for students and land owners to observe wetlands management. This environment attracts winter migratory waterfowl including bald eagles, sandhill cranes, a variety of geese, teal, doves, ducks, and a variety of ibis, Neotropical migrants, and many other birds (TPWD Sep 2007).

The Nannie M. Stringfellow WMA has approximately 3664 acres in Brazoria County, approximately 37 miles from the Matagorda County site. This WMA primarily consists of coastal, bottomland, hardwood forest in the San Bernard River floodplain. It is part of the Coastal Bottomlands Mitigation Bank, established to increase wetland functions by preserving, enhancing, restoring, creating, and properly managing threatened, functioning biologically diverse ecosystems of waters of the United States, including special aquatic sites and associated uplands (TPWD Sep 2007).

The Guadalupe Delta WMA consists of freshwater marshes in the delta of the Guadalupe River. It is in Victoria, Refugio, and Calhoun Counties northeast of Tivoli, approximately 43 miles from the Matagorda County site. Lands in the Guadalupe Delta WMA have traditionally provided important habitat for wetland dependent wildlife, especially migratory waterfowl. Public hunting is permitted for waterfowl and migratory shore birds, alligators, and other wetland wildlife (TPWD Sep 2007).

The Welder Flats WMA is southwest of Seadrift in San Antonio Bay, which is in Calhoun County, approximately 45 miles from the Matagorda County site. It has 1480 acres of submerged coastal wetlands used to stock the bay with red drum and spotted sea trout (TPWD Sep 2007).

The Mad Island Marsh Preserve is southeast of Collegeport in Matagorda County. The preserve's upland prairies represent a portion of the remaining 2 percent of the original tallgrass coastal prairies once found across Texas. The Nature Conservancy forged a partnership with Ducks Unlimited in 1990 to restore the wetlands and tallgrass coastal prairies through four habitat management programs. (TNC 2008)

The Big Boggy NWR is near Wadsworth in Brazoria County, bordering Matagorda Bay. Approximately 21 miles from the Matagorda County site, it consists of flat, coastal prairies, salt marshes, and two large saltwater lakes. Established to provide habitat for migratory waterfowl and other bird species, this NWR is generally closed to visitors; however, waterfowl hunting is allowed in season. (USFWS 2007)

The San Bernard NWR is in Matagorda and Brazoria Counties, approximately 12 miles west of Freeport and 35 miles from the Matagorda County site. The refuge is a stop on the Great Texas Coastal Birding Trail and includes trails for hikers and auto tour loops. San Bernard NWR also allows fishing and waterfowl hunting. (USFWS 2007)

The Aransas NWR is near Fulton in Refugio County. Approximately 45 miles from the Matagorda County site, Aransas NWR consists of more than 115,000 acres including the Blackjack Peninsula (Aransas proper), Matagorda Island, Myrtle Foester Whitmire, Tatton, and Lamar units. These areas provide vital resting, feeding, wintering, and nesting grounds for migratory birds and native Texas wildlife. The refuge is world-renowned for hosting the largest wild flock of endangered whooping cranes each winter. (USFWS 2007)

Birding is a major tourist activity in the areas surrounding the Matagorda County site. The Coastal Birding Trail is a 500-mile trail that is jointly sponsored by the Texas Parks and Wildlife Department (TPWD) and the Texas Department of Transportation, stretching along the Texas Gulf Coast from north of Beaumont to the Rio Grande Valley. The trail establishes viewing areas at feeding, roosting, and nesting points, thereby encouraging the preservation of woods and wetlands for both migrating and endemic bird species. Launched in October 1994, the Central Texas Coast section of the trail encompasses 95 of the total 308 distinct wildlife-viewing sites throughout communities on the Central Texas Gulf Coast. The Great Texas Coastal Birding Trail goes through many areas within 50 miles of the Matagorda County site. Approximately 40 state-recognized sites are located in the 50 mile vicinity, nine of which are in and around the immediate Palacios area (TPWD Feb 2007a).

The impacts to recreational facilities within 50 miles of the Matagorda County site would be minimal. During construction of the plant, they would be affected by increased traffic on area roads during peak travel periods. During the operating period, it is expected that some employees and their families would use the recreational facilities in the region. However, the increase attributable to plant operations would be small compared to overall use of these facilities. The construction and operation of the proposed nuclear power plant on the Matagorda County site would exclude the entire 1480 acres from private recreational use for the life of the plant. The attractiveness of the Tres Palacios Bay and GIWW for sport fishing and other recreational uses could be impacted during construction of intake and discharge structures. Impacts on tourism and recreation are considered small if current facilities are adequate to handle local levels of demand. Therefore, impacts of facility construction and operation on tourism and recreation would be SMALL.

The construction and operation of the proposed nuclear power plant at the Matagorda County site would have minimal impacts on aesthetic and scenic resources. The developed areas at the site would be located near the center of the property. The intake structure would be located on the north bank of the GIWW, approximately 4 miles south of the Matagorda County site. The outfall would be located on the east side of Tres Palacios Bay approximately 3 miles southwest of the site. From the GIWW, Tres Palacios Bay, and Matagorda WMA, the plant (including the intake and outfall) would potentially be visible from certain angles. The upper portions of facility structures would potentially be visible from areas near the site. There would be occasional visible plumes associated with the cooling towers. The visibility of the plumes would be dependent upon the weather and wind patterns and the location of the viewer in the general topography of the area.

Impacts on aesthetic resources are considered to be moderate if there are some complaints about diminution in the enjoyment of the physical environment and measurable impacts that do not alter the continued functioning of socioeconomic institutions and processes. Construction and operation of an industrial facility on a previously undeveloped site would likely result in some complaints from the affected public regarding diminution in the enjoyment of the physical environment. Therefore, impacts of construction and operation of the proposed nuclear power plant on aesthetics would be MODERATE and could warrant mitigation.

9.3.3.1.6.7 Housing

Impacts on housing from the construction labor force depend on the number of workers already residing in the 50-mile region and the number that would relocate and require housing.

As described in Subsection 9.3.3.1.6.2, Exelon estimates that approximately 5985 construction and 197 operations workers would in-migrate to the region during construction of the proposed nuclear power plant at the Matagorda County site. Of these, approximately 3752 (60.7 percent) would settle in Matagorda County and 1385 (22.4 percent) would settle in Brazoria County.

Based on 2000 census data, a total of 13,384 vacant housing units were available for sale or rent in Matagorda and Brazoria Counties. Exelon estimates that, in absolute numbers, the available housing would be sufficient to house the workforce. However, there may not be enough housing of the type desired by the movers in each county, especially in Matagorda County. The median price of housing in Matagorda County in 2000 was $61,500. The median price of housing in Brazoria County was $88,500 for the same year (USCB 2000d). If pricing is too high, workers would relocate to other areas in the 50-mile region, have new homes constructed, bring their own housing, or live in hotels and motels. Given this increased demand for housing, prices of existing housing could rise to some degree. Matagorda and Brazoria Counties (and other counties to a lesser extent) would benefit from increased property values and the addition of new houses to the tax rolls. Increasing the demand for homes could increase rental rates and housing prices. It is unlikely, but possible, that some low-income populations could be priced out of their rental housing due to upward pressure on rents. However, the construction workforce would increase over time. The gradual influx of new residents would give the housing market time to adjust to the additional demands.

In summary, Matagorda and Brazoria counties, where most of the construction workforce would seek housing, have adequate housing resources for the entire workforce. Impacts on housing are considered to be small when a small and not easily discernable change in housing availability occurs, and impacts are considered to be moderate when there is a discernable but short-lived reduction in the availability of housing units. Exelon concludes that the potential impacts of construction on housing could be moderate to large in Matagorda and Brazoria Counties and would be SMALL in the remainder of the 50-mile region. Mitigation would not be warranted where the impacts were small. Mitigation of the moderate to large impacts would most likely be market-driven, but may take some time. Additional mitigation measures similar to those described in Subsection 4.4.2 could also be implemented.

For the purposes of this analysis, Exelon estimates that approximately 800 workers would be needed for operation of two nuclear power facilities at the Matagorda County site. Exelon conservatively assumes that all the new employees would migrate into the region. Employees relocating to the region would most likely be scattered throughout the counties in the region, with most choosing to live in Matagorda and Brazoria counties. If all 800 employees and their families were to come from outside the region, it is likely that adequate housing would be available in the region, especially in the larger metropolitan areas. In the two most affected counties, the average income of the new workforce would be expected to be higher than the median or average income in the county; therefore, the new workforce could exhaust the high-end housing market and some new construction could result.

Exelon concludes that the potential impacts of operations on housing in Matagorda and Brazoria Counties would be small to moderate and SMALL elsewhere in the 50-mile region. Market forces could result in more housing being built in the two-county region, eventually mitigating any housing shortages. Additional mitigation would not be warranted.

9.3.3.1.6.8 Public Services

Public services include water supply and wastewater treatment facilities; police, fire, and medical facilities; and social services. As presented in Subsection 9.3.3.1.6.2, construction of the proposed nuclear power plant at the Matagorda County site would increase the population in the 50-mile region by 16,053 people (9.2 percent of the population in the region). Approximately 83 percent of the in-migrating construction workforce and their families would settle in Matagorda and Brazoria counties. The new construction employees and their families would increase the total population in Matagorda County by 25.7 percent and in Brazoria County by 1.5 percent. Operation of the proposed nuclear power plant at the Matagorda County site would increase the population in the 50-mile region by 2600 (1.5 percent of the population in the region). The new operations employees and their families would increase the total population in Matagorda County by 4.2 percent and Brazoria County by 0.2 percent.

New construction or operations employees relocating from outside the region would most likely live in residentially developed areas where adequate water supply and wastewater treatment facilities already exist. Small increases in the regional population would not materially impact the availability of medical services. The total number of in-migrating workers and their families would only increase the 50-mile regional population by 9.2 percent for construction and 1.5 percent for operations.

The proposed nuclear power plant and the associated population influx would likely economically benefit the disadvantaged population. The additional direct jobs would increase indirect jobs that could be filled by currently unemployed workers, thus removing them from social services client lists.

In 2002, Matagorda and Brazoria counties' persons per law enforcement officer ratios were 380:1 and 418:1, respectively (USCB Sep 2004). The persons per officer ratio for Texas was 490:1 (USCB Sep 2004). The 2002 persons per firefighter ratios in Matagorda and Brazoria counties were 234:1 and 447:1, respectively (USFA Dec 2007). The persons per firefighter ratio for Texas is 342:1 (USFA Dec 2007). Ratios are in part, dependent on population density. Fewer public safety officers are necessary for the same population if the population resides in a smaller area. The population increase in the four counties from construction or operations employees relocating from outside the region could result in the need to hire additional emergency personnel. This is most likely to happen in Matagorda County. However, increased tax revenues would be adequate to pay the salaries of any additional emergency personnel hired.

As addressed above, it is not expected that public services would be materially impacted by new construction or operations employees relocating from outside the region. Impacts on public services are considered to be small if there is little or no need for changes in the level of service provided to the community. Therefore, impacts of construction and operation of the proposed nuclear power plant at the Matagorda County site on public services would be SMALL and mitigation would not be warranted.

9.3.3.1.6.9 Education

As described in Subsection 9.3.3.1.6.2, Exelon anticipates that most of in-migrating workers in the construction and operation workforces would settle in Matagorda and Brazoria counties. Therefore, this analysis is restricted to the two counties that would be most affected by the new workforce.

Based on data for the 2005-2006 school year, Matagorda County had 25 pre-kindergarten through 12 (PK-12) schools with a total enrollment of 7686 students. Brazoria County had 91 PK-12 schools with a total enrollment of 54,578 students (NCES 2007).

As presented in Subsection 9.3.3.1.6.2, Exelon assumed that 70 percent of the 5985 in-migrating nuclear plant construction workers were likely to bring families: 4190 would bring families and 1795 would not. However, Exelon assumed that 100 percent of the overlapping operations workforce (197 people) would bring families. As in Subsection 4.4.2.2.8, Exelon assumes that the average number of school-aged children per worker who relocated his or her family was 0.8 (BMI Apr 1981). This would increase the school-aged population in the ROI by approximately 3510 students. The student populations in Matagorda and Brazoria counties would increase by 27.7 percent and 1.4 percent, respectively. Small impacts are generally associated with project-related enrollment increases of up to 3 percent, and large impacts on local school systems are generally associated with project-related enrollment increases greater than 8 percent. Therefore, projected increases in the student population of Brazoria County would have a small impact on the education system and mitigation would not be warranted. In Matagorda County, the projected increase in the student population would constitute a large impact. Mitigation measures similar to those described in Subsection 4.4.2 could be implemented if the proposed nuclear power plant were constructed at the Matagorda County site. The quickest mitigation would be to hire additional teachers and move modular classrooms to existing schools. Increased property tax revenues as a result of the increased population would fund additional teachers and facilities. No additional mitigation would be warranted.

Most of the operations workforce is assumed to come from outside the ROI. As such, the school system in the ROI could potentially experience an influx of students from operation of the proposed nuclear power plant at the Matagorda County site. If all 800 employees and their families were to come from outside the region, the school-aged population in the ROI of the Matagorda County site would increase by approximately 640 students. The student populations in Matagorda and Brazoria counties would increase by 5.1 percent and 0.3 percent, respectively. These increases in student population would constitute a small impact on the education system in Brazoria County and mitigation would not be warranted. Impacts would be moderate in Matagorda County. As with construction, the quickest mitigation would be to hire additional teachers.

9.3.3.1.7 Historic and Cultural Resources

Exelon conducted historical and archaeological record searches on the National Park Service National Register of Historic Places (NRHP). A search of the NRHP identified 53 sites in the six counties surrounding the Matagorda County site including four sites in Matagorda County and 10 in Brazoria County (NPS 2008a). None are within 10 miles of the Matagorda County site.

Building the proposed nuclear power plant at the Matagorda County site would require a formal cultural resources survey to be conducted before construction. Mitigation measures would be coordinated with the Texas Historical Commission (THC) so that any impacts to cultural resources from construction or operation of the proposed nuclear power plant at the Matagorda County site would be SMALL.

9.3.3.1.8 Environmental Justice

Environmental justice refers to a federal policy under which each federal agency identifies and addresses, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. The NRC has a policy on the treatment of environmental justice matters in licensing actions (69 FR 52040) and guidance (USNRC May 2004). Subsection 2.5.4.1 describes the methodology Exelon used to establish locations of minority and low-income populations.

The 2000 Census block groups were used for ascertaining minority and low-income in the area. There are 170 block groups within 50 miles of the Matagorda County site. The Census Bureau data for Texas characterizes 11.5 percent of the population as black races, 0.6 percent as American Indian or Alaskan Native, 2.7 percent as Asian, 0.07 percent as native Hawaiian or other Pacific Islander, 11.7 percent as all other single minorities, 2.5 percent as multi-racial, 29.0 percent as an aggregate of minority races, and 32.0 percent as Hispanic ethnicity. If any block group percentage exceeded its corresponding state percentage by more than 20 percent or was greater than 50 percent, then the block group was identified as having a significant minority population. Black minority populations exist in 15 block groups, Asian minority populations exist in one block group, “aggregate of minority races” populations exist in 18 block groups, “Hispanic ethnicity” populations exist in 30 block groups, and populations of other races exist in eight blocks. The locations of the minority populations within the 50-mile radius are shown in Figure 9.3-7.

The Census Bureau data characterizes 14.0 percent of Texas households as low-income. Based on the “more than 20 percent” criterion, five block groups out of a possible 170 contain a low-income population. The locations of the low-income populations within 50 miles of the Matagorda County site are shown in Figure 9.3-8.

Construction activities (noise, fugitive dust, air emissions, traffic) would not impact minority populations, because of their distance from the Matagorda County site. In fact, minority and low-income populations would most likely benefit from construction activities through an increase in construction-related jobs. Operation of the proposed nuclear power plant at the Matagorda County site is unlikely to have a disproportionate impact on minority or low-income populations.

9.3.3.2 Evaluation of the Buckeye Site

The Buckeye site is a 5000-acre undeveloped site in Matagorda County, approximately 9 miles southwest of Bay City and 5 miles north of STP along the Colorado River. Houston is approximately 60 miles northeast of the site, and Matagorda Bay is approximately 16 miles south of the site (Figure 9.3-9).

The cooling system would consist of an onsite cooling pond with an intake line from the Colorado River. A transmission system consisting of new ROW would be required to connect the site to the surrounding grid. To analyze the effects of building a new nuclear plant, Exelon has assumed that the construction and operation practices described in ER Chapters 4 and 5 would generally be applied to the Buckeye site thereby allowing for a consistent description of the impacts.

9.3.3.2.1 Land Use Including Site and Transmission Line Rights-of-Way

The Buckeye site is comprised of flat, agricultural land along the Colorado River. Construction of a power plant and transmission lines would alter land use at the site from agricultural to industrial. However, Matagorda County does not have any land use plans or zoning restrictions. The site contains freshwater emergent wetlands on the eastern side of Wilson Creek and freshwater forested/shrub wetlands in the southeastern portion of the site (USFWS 2008). The footprint of the new plant would require approximately 5000 acres, including a switchyard, parking lots, temporary facilities, cooling pond, laydown areas, and spoil storage. Because the site is undeveloped, additional acreage would be required for roads and railroad spurs. The entire 5000 acres would be excluded from future agricultural and recreational use for the estimated 60-year life of the plant, with most of the property being used for a cooling pond. Wetlands near Wilson Creek would be impacted by construction of the cooling pond.

Local road FM 1468 is approximately 0.8 mile east of the Buckeye site. Construction of local road access would be minimal (less than 2 miles in length and 24 acres), but some local area roads may require upgrades (increased elevation, widening, paving) so proper access could be provided for operations and deliveries.

The site is approximately 3.1 miles west of the Port of Bay City. The Port of Bay City is accessed via the Colorado River Channel, which is approximately 200 feet wide and 12 feet deep. Rail connectivity is immediately accessible at the port. The nearest rail line is approximately 1.4 miles north of the site and operated by Union Pacific Railroad; however, Burlington Northern Santa Fe has track usage rights. Construction of rail access from the Union Pacific line to the site would necessitate crossing small canals/levees located in the area, and would require approximately 17 acres (assuming a 100-foot ROW.

A makeup water intake line, approximately 5 miles long, would be constructed from the site east to the Colorado River. Construction of the pipeline would temporarily disturb approximately 30 acres, assuming a 50-foot ROW. As mentioned, the Buckeye site would necessitate construction of a cooling pond on the site property (included in the 5000-acre footprint.

Operations impacts to site land use would include permanent disturbance of most of the 5000-acre site, plus local road (24 acres) and rail (17 acres) access.

Land use impacts associated with site preparation and construction of the proposed nuclear power plant at the Buckeye site would be SMALL. Site land use impacts associated with operations would be SMALL.

The proposed site is in the South Zone of ERCOT in the proximity of strong transmission infrastructure and would utilize a similar interconnection arrangement to the Matagorda County site. Four new 345 kV transmission lines would be required; two would be routed to STP (10 miles), and two would be routed to Hillje (10 miles). From Hillje, the two lines would continue to WA Parrish (50 miles). A total of 70 miles of new ROW would be required. No residential areas or major obstacles lie in the path of a ROW for new transmission lines. Assuming a 200-foot-wide transmission corridor, the new transmission lines would require approximately 1700 acres. The new transmission corridor would not be expected to permanently affect agricultural areas, but it would have the potential to affect residents along the ROW. Although Exelon would not be responsible for final routing and construction, the transmission service provider is expected to comply with all applicable laws, regulations, permit requirements, and use best construction management practices. Construction impacts to offsite land use would be SMALL.

The new transmission corridor would not be expected to permanently affect agricultural areas, but it would have the potential to affect residents along the ROW. Corridor vegetation management and line maintenance procedures would be established by the transmission service provider. Given the rural setting and low population density along the transmission corridors, operational impacts to land use along the ROW would be SMALL.

Most of the Buckeye site is not in the Texas Coastal Zone, and the route for the new transmission lines would not pass through the Texas Coastal Zone. However, the Colorado River lies east of the plant. This portion of the Colorado River, along with a 1-mile buffer area, is contained in the Coastal

Zone. Portions of the plant infrastructure (cooling pond) may fall in the Coastal Zone. The intake line would be constructed through the portion of the Texas Coastal Zone surrounding the Colorado River. Therefore, all construction and operation activities at the Buckeye site would comply with the Texas Coastal Management Program, and the Buckeye site would require a federal consistency review.

9.3.3.2.2 **Air Quality**

The Buckeye site is in the Metropolitan Houston-Galveston Intrastate Air Quality Control Region (40 CFR 81.38), which consists of NAAQS (40 CFR 81.344) non-attainment areas. Matagorda County is designated as unclassified or in attainment of all NAAQS. The nearest non-attainment areas are Brazoria and Fort Bend Counties (the Houston metropolitan area) and are so classified due to their exceedance of the 8-hour ozone standard (40 CFR 81.344). These counties are approximately 20 miles east and 30 miles northeast of the Buckeye site, respectively.

Air emissions from construction and operation of the proposed nuclear power plant at the Buckeye site would be similar to those at the proposed site as described in Subsections 4.4.1.3 and 5.8.1.2, respectively. Construction impacts would be temporary and similar to any large-scale construction project. Particulate emissions in the form of dust from disturbed land, roads, and construction activities would be generated. Mitigation measures similar to those described in Subsection 4.4.1.3 would be taken. Air pollutants would be emitted from the exhaust systems of construction vehicles and equipment and from vehicles used by construction workers to commute to the site. The amount of pollutants emitted in this way would be small compared to total vehicular emissions in the region. It is not expected that construction-related emissions would result in any violation of the NAAQS.

The proposed nuclear power plant would have auxiliary equipment such as diesel generators, combustion turbines and boilers. Emissions from those sources are described in Subsection 3.6.3. It is expected that this equipment would see limited use and, when used, would operate for short time periods. Therefore, air emissions from this auxiliary equipment are expected to be minimal and would not result in any violation of TCEQ standards.

The closest area to the Buckeye site designated as a mandatory Class I Federal area, in which visibility is an important value, is Big Bend National Park in western Texas (40 CFR 81.429). Because there are no mandatory Class I Federal areas within 50 miles of the site, any potential visibility impacts from the proposed nuclear power facilities on Class I areas would be negligible.

The air quality impacts from construction and operation of the proposed nuclear power plant at the Buckeye site would be SMALL.

9.3.3.2.3 **Hydrology, Water Use, and Water Quality**

The Buckeye site lies over the central portion of the Gulf Coast Aquifer System. The Gulf Coast Aquifer is a major aquifer that parallels the Gulf of Mexico coastline from the Louisiana border to the Mexican border. This aquifer covers 54 counties and consists of several aquifers, including the Jasper, Evangeline, and Chicot aquifers, which are composed of discontinuous sand, silt, clay, and gravel beds. The area of the aquifer is approximately 41,879 square miles. Seventy-three percent of the aquifer, including the area in the region of the Buckeye site, is covered under a groundwater control district. (TWDB Nov 2006)

As described in Subsection 2.3.2, a local issue is the significant regional decreases in water levels in the Gulf Coast Aquifer during the 1970s and 1980s that prompted concern regarding the allocation of groundwater and forced a number of users, including municipalities, to revert to surface water as their primary source of water. New development, recent droughts, and the potential for saltwater intrusion have also heightened concerns about long-term groundwater availability in the Gulf Coast Aquifer.

Matagorda County is part of the Lower Colorado Regional Water Planning Group, which is required to plan for future water needs under drought conditions. According to the 2006 Lower Colorado Regional Water Plan, the projected groundwater supply available in the Lower Colorado Region from the Gulf Coast Aquifer during drought of record conditions is 198,425 acre-feet per year throughout the 2010 through 2060 projection period. Groundwater allocations from the Gulf Coast Aquifer are projected to decline by 50.1 percent from 848,782 acre-feet per year to 423,328 acre-feet per year over the same period. (LCRWPG Jan 2006)

Exelon would use groundwater during construction for the potable water system, concrete production and curing, backfill operations, dust control, cleaning and lubrication, and hydro testing and flushing. Peak well water demand during construction is estimated to be approximately 580 gpm (Subsection 4.2.1.2). For station operations, Exelon estimates that a maximum of 1200 gpm of groundwater would be necessary. Compared with the Lower Colorado Region projected groundwater use from the Gulf Coast Aquifer, groundwater use for construction and operations of nuclear units at the Buckeye site would represent a very small percentage of total use (less than 1 percent). Therefore, construction and operations impacts to groundwater would be SMALL.

To ensure that wetlands and streams are not harmed by petroleum products or other industrial chemicals, Exelon would restrict certain activities (e.g., transfer and filling operations) that involve the use of petroleum products and solvents to designated areas, such as lay-down, fabrication, and shop areas. In addition, construction activities would be guided by a Stormwater Pollution Prevention Plan and a construction-phase Spill Prevention, Control, and Countermeasures Plan similar to those proposed for VCS as described in Subsection 4.2.3. Therefore, any impacts to surface water during plant construction would be SMALL and would not warrant mitigation beyond best management practices required by the permits.

The Gulf of Mexico is approximately 20 miles south of the Buckeye site. The GIWW is approximately 17 miles south of the site and extends 1200 miles from Carrabelle, Florida to Brownsville, Texas. The GIWW passes through Texas barrier islands mostly via channels that must be dredged to remain open (TSHA Jan 2008a). The Colorado River is approximately 2 miles east of the Buckeye site and drains into Matagorda Bay and the Gulf of Mexico. The portion of the Colorado River east of the site, along with a 1-mile buffer area, is contained in the Coastal Zone.

As described in Section 5.2.1.1, the consumptive use of surface water during operations by the cooling pond is 46,000 gpm (normal use) to 68,300 gpm (maximum use). Water for the proposed nuclear generating units at the Buckeye site would be provided by the Colorado River through a water supply contract with the LCRA. The LCRA can provide as much as 945,000 acre-feet per year (585,000 gpm). Surface water use for operations of nuclear units at the Buckeye site would represent a small percentage of total water available (less than 12 percent). Therefore, impacts to surface water use would be SMALL.

The Buckeye site would operate under a NPDES permit issued by the TCEQ. As authorized by the Clean Water Act, the NPDES permit program controls water pollution by regulating discharges into waters of the United States. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. The permit contains limits on what can be discharged, monitoring and reporting requirements, and other provisions to ensure that the discharge does not degrade water quality or human health. Any releases from the cooling pond into the Colorado River or onsite streams as result of construction or operation would be regulated by the TCEQ through the NPDES permit process to ensure that water quality is protected. The impacts of discharges to surface water would be minimized by the same mitigation measures as those addressed for the proposed site in Section 4.2 and Subsection 5.2.2. Therefore, impacts to water quality would be SMALL.

9.3.3.2.4 **Terrestrial Resources Including Protected Species**

The Buckeye site is approximately 9 miles southwest of Bay City, 6 miles south of Markham, and 8 miles east of Blessing. The site encompasses approximately 5000 acres, and is situated in western Matagorda County. Less than 2 miles of entrance road from FM 1468 east of the proposed site would be constructed, along with 1.4 miles of rail line to access the railroad to the north, and intake and discharge water pipelines to the proposed site, a distance of approximately 5 miles.

As mentioned in Subsection 9.3.3.2.1, the proposed site is in the South Zone of ERCOT in the proximity of strong transmission infrastructure. No residential areas or major obstacles lie in the path of a ROW for new transmission lines. Assuming a 200-foot-wide transmission corridor, the new transmission lines would require approximately 1700 acres of transmission corridor. The new transmission corridor would run from the Buckeye site switchyard to the Hillje, STP and WA Parrish substations.

The topography of the site consists of a relatively flat area between Wilson Creek and the Colorado River, with an elevation of 35 feet. The site is protected from Colorado River flooding by a series of levees west of the river. However, construction of flood protection structures or fill to elevate the site would likely be necessary. The planned footprint (including the 3200-acre cooling pond) would impact wetlands on the east side of Wilson Creek.

Agricultural land represents 87 percent of Matagorda County land; 41 percent is planted in crops. The predominant crops are sorghum, cotton, rice, soybeans, hay, and orchards. Other farmland is used for cattle, hogs, pigs, sheep, and poultry. Aerial imagery indicates that the agricultural crop operations in the vicinity of the Buckeye site are focused near Tres Palacios Bay and along the Colorado River.

Four federally listed terrestrial species, all bird species, have the potential to occur in Matagorda County, and therefore in the vicinity of the Buckeye site. These species include the bald eagle (Haliaeetus leucocephalus), the brown pelican (*Pelecamus occidentalis*), the piping plover (C*haradrius melodus*), and the whooping crane (*Grus Americana*). Although the bald eagle was de-listed under the Endangered Species Act, it remains protected under the Bald and Golden Eagle Protection Act (72 FR 37346-37372).

The nearby Aransas NWR Complex is the wintering ground for the largest flock of whooping cranes in the United States, and specific whooping crane habitat is found in Aransas NWR (Calhoun and Refugio Counties) and in scattered locations in Matagorda County. Piping plover habitat is also scattered along the Matagorda County coastline. In Matagorda County, critical habitat for both the whooping crane and piping plover is found along county coastline, specifically on the Matagorda peninsula, in the vicinity of Matagorda/Mad Island Wildlife Management Area (WMA), on the Big Boggy NWR (piping plover), and San Bernard NWR (just inside Brazoria County).

In addition, Matagorda County has 14 state-protected species, including 12 bird and two mammal species.

The east coast of Texas, including Matagorda County, is at the terminus of the Central Flyway migration route—one of four principal North American migratory bird routes (TNC 2008). The Buckeye site is approximately 15 miles northwest of the Matagorda County-Mad Island CBC, an early-winter bird census where volunteers follow specified routes through a designated 15-mile diameter circle, counting every bird they see or hear all day (NAS Undated). The Mad Island CBC has been among the top five CBCs nationwide every year since 1993 in regards to total number of species observed (TNC 2008). In 2007, 235 bird species were observed in the 15-mile-diameter circle near the Buckeye site (NAS 2008).

Before clearing or construction activities at the site or along associated transmission or pipeline corridors, field surveys would be conducted for federally listed and state-protected species as part of the permitting process. Land clearing would be conducted according to federal and state regulations, permit conditions, existing Exelon procedures, good construction practices, and established best management practices (e.g., directed drainage ditches, silt fencing). With this in mind, Exelon concludes that impacts to terrestrial resources from construction and operation of the proposed nuclear power plant at the Buckeye site would be MODERATE. Impacts to threatened and endangered species would be SMALL.

9.3.3.2.5 **Aquatic Resources Including Protected Species**

Five federally listed aquatic species are found in Matagorda County. These species, all sea turtles, are found in county boundaries but not in the vicinity of the Buckeye site. The species include green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), and hawksbill sea turtle (*Eretmochelys imbricate*). The green sea turtle and the loggerhead sea turtle are classified as threatened in Texas, while the remaining species are endangered. Sea turtles are not present in the Colorado River, and therefore would not be impacted by construction or operation activities at the Buckeye site.

Water from the Colorado River would be used for cooling at the Buckeye site. Although aquatic biota would be temporarily displaced during construction of new intake and discharge structures, they would be expected to re-colonize the area after construction is complete. Any disturbance to aquatic resources from construction would be localized and of relatively short duration. Construction-related land clearing would be conducted according to federal and state regulations, permit conditions, existing Exelon procedures, good construction practices, and established best management practices as described in detail in Subsection 4.3.2. Any impacts of construction on aquatic resources, including federally listed threatened and endangered species would be SMALL.

The most likely aquatic impact from nuclear operations at the Buckeye site would be entrainment and impingement of aquatic organisms at the intake in the Colorado River. Because the plant's intake structure would be designed and operated to reduce the effects of entrainment and impingement, the potential for environmental impacts to aquatic resources from nuclear power facility operations at the Buckeye site would be SMALL.

9.3.3.2.6 **Socioeconomics**

This subsection evaluates the social and economic impacts to the surrounding region as a result of constructing and operating the proposed nuclear power plant at the Buckeye site. The evaluation assesses impacts of construction, station operation, and demands placed by the construction and operation workforce on the surrounding region.

9.3.3.2.6.1 Physical Impacts

Construction activities can cause temporary and localized physical impacts such as noise, odor, vehicle exhaust, and dust. Vibration and shock impacts would not be expected due to the strict control over construction activities. It is assumed that all construction activities would occur within the existing Buckeye site boundary. The use of public roadways and railways would be necessary to transport construction materials and equipment. Commuter traffic would be controlled by speed limits that, in connection with good road conditions, would minimize the noise level and dust generated by the workforce commuting to the site. Some existing public roads would require upgrades, but no new offsite routes would be required. Offsite areas that would support construction activities (e.g., borrow pits, quarries, and disposal sites) are expected to be already permitted or will be permitted prior to operation. Impacts on those facilities from construction of the proposed nuclear power plant would be small, incremental impacts associated with their normal operation.

Potential impacts from station operation include noise, exhausts, thermal emissions, and visual intrusions. The proposed nuclear power plant would produce noise from the operation of pumps, fans, transformers, turbines, generators, and switchyard equipment. Vehicular traffic would also be a source of noise. However, noise attenuates quickly, so noise levels would be minimal at the project boundary. Commuter traffic would be controlled by speed limits, which could reduce the noise level and dust generated by the workforce commuting to the site.

The proposed nuclear power plant would have auxiliary equipment such as diesel generators, combustion turbines, and boilers. It is expected that this equipment would be operated infrequently, for short durations.

In summary, construction activities would be temporary and would occur mainly within the boundaries of the Buckeye site. Offsite impacts would represent small incremental changes to offsite services supporting the construction activities. During station operations, ambient noise levels would be minimal at the site boundary. Auxiliary equipment would be operated infrequently, for short durations. Therefore, the physical impacts of construction and operation would be SMALL.

9.3.3.2.6.2 Demography

The Buckeye site is in western Matagorda County, Texas within 10 miles of Markham, Blessing, and Bay City, and within 20 miles of Palacios and Matagorda.

As presented in Subsection 4.4.2, Exelon anticipates employing 6300 construction workers during the peak construction period (Table 3.10-2). Exelon anticipates that approximately 5985 construction workers would relocate to the area. As described in Subsection 4.4.2, operations would overlap with peak construction activity; therefore, in addition to the construction workforce, it is estimated that 197 operations workers would relocate to the area during the peak construction period.

Based on the residential distribution of the current workforce at STP (an existing 2-unit nuclear facility located approximately 5 miles south of the proposed location for the new units), Exelon has assumed that the new units' construction and operational workforces would reside in either Matagorda or Brazoria Counties. Of the existing STP workforce approximately 83 percent reside in Matagorda and Brazoria counties, therefore, these counties comprise the ROI and are the focus of this analysis. Approximately 60.7 percent would settle in Matagorda County and 22.4 percent in Brazoria County (STPNOC Sep 2007).

The 2000 population of the two most affected counties is 279,724 people. The 2000 population in the counties was 241,767 in Brazoria County and 37,957 in Matagorda County (USCB 2000a). The 2000 population within 50 miles of the site was 287,616 (53.4 people per square mile), and the population within 20 miles of the site was 36,948 people (32.1 people per square mile). The nearest population center, as defined in 10 CFR 100, is Bay City Census County Division with a 2000 population of 24,238 (USCB 2000b), northeast of the Buckeye site. Based on the sparseness and proximity matrix in NUREG-1437, the Buckeye site is in a low population area.

As addressed in Subsection 4.4.2, approximately 70 percent of the in-migrating construction workers and 100 percent of the operations workers are likely to bring families. Therefore, 4387 workers would bring families into the 50-mile region during peak construction. Assuming an average family household size of 3.25 people, construction would increase the population in the 50-mile region by 16,053 people, which is approximately 5.6 percent of the 50-mile radius population in 2000. Exelon assumed that approximately 83 percent of the in-migrating construction workforce and their families (13,340 people) would settle in Matagorda (60.7 percent) and Brazoria (22.4 percent) counties. The remaining construction employees relocating to the region would be distributed among other counties in the 50-mile region. Based on 2000 census data, the addition of the new employees and their families would increase the population in Matagorda County by 25.7 percent and in Brazoria County by 1.5 percent. Exelon is adopting the NRC definition of impacts as small if plant-related population growth is less than 5 percent of the study area's total population and large if plant-related population growth is more than 20 percent of the study area's total population. Therefore, the potential increases in population during construction of the proposed nuclear power plant at the Buckeye site would represent a MODERATE increase for the entire 50-mile region. However, small and large, but temporary, impacts would be seen in Brazoria and Matagorda Counties, respectively.

Exelon estimates that 800 workers would be required for the operation of nuclear power facilities at the Buckeye site (Subsection 3.10.3). For the purpose of analysis, Exelon conservatively assumes that all the new employees would migrate into the region. Employees relocating would most likely be scattered throughout other counties in the region, with most choosing to live in Matagorda or Brazoria counties. However, if all 800 employees and their families were to come from outside the region, the potential increase in population in the most affected counties would not be substantial. For example, the 800 employees would translate into an additional 2600 people (assuming an average household size of 3.25 people). Based on 2000 census data, the addition of the new employees and their families would increase the population in Matagorda County by 4.2 percent and in Brazoria County by 0.2 percent. Overall, the potential increase in population from operation of the proposed nuclear power plant at the Buckeye site would represent a small increase in the total population for the 50-mile region and for Matagorda and Brazoria counties, representing a SMALL impact to the population.

9.3.3.2.6.3 Economy

Based on 2000 census data, in the two most affected counties near the Buckeye site there are 129,232 people in the civilian labor force. Of the civilian labor force, 94.2 percent are employed and 5.8 percent are unemployed. The overall unemployment rate for the two-county region is lower than that of the state, which is 6.1 percent (USCB 2000e).In 2000, Matagorda County had a civilian labor force of 16,434 people and an unemployment rate of 8.4 percent. Brazoria County had a civilian labor force of 112,798 people and an unemployment rate of 5.4 percent.

As described in Subsections 4.4.2.1 and 5.8.2.1, the wages and salaries of the construction and operations workforce would have a multiplier effect that could result in an increase in business activity, particularly in the retail and service sectors. This would have a positive impact on the business community and could provide opportunities for new businesses, and increased job opportunities for local residents. The economic effect on the 50-mile region would be beneficial. Exelon assumes that direct jobs would be filled by an in-migrating workforce, but most indirect jobs would be service-related, not highly specialized, and would be filled by the existing workforce in the 50-mile region.

As presented in Subsection 9.3.3.2.6.2, Exelon estimates that 5985 construction and 197 operations workers would in-migrate to the region during the peak employment of construction. Assuming a multiplier of 1.63 jobs (direct and indirect) or 0.63 (for indirect only) for every construction job and a multiplier of 2.59 for every operations job (BEA 2008a), an influx of 5985 construction workers and

197 operations workers would create 4,080 indirect jobs, for a total of 10,262 new jobs in the region of influence. Expenditures made by the direct and indirect workforce would strengthen the regional economy. Exelon concludes that the impacts of construction of the proposed nuclear power plant on the economy would be beneficial and SMALL in the region, and beneficial and moderate in Matagorda County.

As described in Subsection 9.3.3.2.6.2, approximately 800 workers would be required for the operation of the two assumed nuclear power facilities at the Buckeye site. For the purpose of analysis, Exelon assumes that all the new employees would migrate into the region. Assuming a multiplier of 2.59 jobs (direct and indirect) for every operations job at the proposed nuclear power plant (BEA 2008a), an influx of 800 workers would create 1276 indirect jobs for a total of 2076 new jobs in the region. Because most indirect jobs are service-related and not highly specialized, Exelon assumes that most, if not all, indirect jobs would be filled by the existing labor force in the 50-mile region. Exelon concludes that the impacts of operation of the proposed nuclear power plant on the economy would be beneficial and SMALL everywhere in the region.

9.3.3.2.6.4 Taxes

Taxes collected as a result of constructing and operating the proposed nuclear power plant at the Buckeye site would be of benefit to state and local taxing jurisdictions. In Texas, property tax assessments are made by the county appraisal district, which bases its appraisal on a consideration of cost, income, and market value. This appraisal is used by all taxing jurisdictions in the county, including special districts and independent school districts, which apply their individual millage rates to determine the taxes owed. Based on the analysis in Subsection 4.4.2.2.2, Exelon anticipates that additional property taxes would be paid to Matagorda County during the construction period.

In 2006, Matagorda County had property tax revenues of $9,038,864 (Combs Jan 2008). Assuming that tax payments to Matagorda County for nuclear power facilities at the Buckeye site would be similar to those of the VCS site (Subsections 4.4.2.2.2 and 5.8.2.2.2), the tax payments would represent a large portion of the tax revenue for the county. For the operations period, Exelon estimates its total payment to all taxing entities would be approximately $24 million, annually. Table 5.8-14 estimates the county property tax for VCS at approximately $6.9 million. The benefits of taxes are considered small when new tax payments by the nuclear plant constitute less than 10 percent of total revenues for local jurisdictions and large when new tax payments represent more than 20 percent of total revenues. The projected operations-phase taxes for the nuclear power facilities represent more than 75 percent of current property tax revenues for Matagorda County. Therefore, Exelon concludes that the potential beneficial impacts of taxes collected during construction and operation of the proposed project would be large in Matagorda County and SMALL in the remainder of the 50-mile region.

The Buckeye site is in the Tidehaven ISD, which is categorized as a property-wealthy district (see Subsection 2.5.2.3.5). Increased tax revenues would therefore have only a small positive impact to the Tidehaven ISD. In-migrating construction and operation workers would result in larger enrollments in the ROI schools, which would not receive direct property tax revenues from the plant. Because the Texas school funding formula is based on weighted average daily attendance, increases in the number of students would lead to increased funding, but would also result in the additional expenses related to a larger student body. Fiscal impacts to the ISD from increased enrollment would be small to moderate, depending on their existing capacity, funding status, and fiscal condition. Subsection 9.3.3.2.6.9 discusses capacity and enrollment issues for the Buckeye site ROI in detail.

9.3.3.2.6.5 Transportation

The regional and local road system is shown on Figure 9.3-9. Highway access to the Buckeye site is provided by FM 1468, a two-lane paved road. There are no interstate highways in the 50-mile radius; however, there are two U.S. highways: U.S, Highway 59 and U.S. Highway 87. U.S. Highway 59 runs northeast-southwest through Fort Bend, Wharton, Jackson, and Victoria counties and connects the cities of Victoria and Houston; U.S. Highway 87 runs northwest-southeast through Victoria and Calhoun counties. A number of county roads and farm-to-market roads intersect these highways, providing access to towns in these counties and conversely providing outlying areas access to the state and U.S. highway system.

Workers and deliveries traveling to the Buckeye site from the north would travel to U.S. Highway 59, then south on TX 60 to Bay City, then east on TX 35 for 6.5 miles, and then south on FM 1468 to the site. Workers and deliveries originating from the east or west would travel to TX 35 and take FM 1468 south to the site. A small amount of traffic is expected from south of the site.

The average annual traffic count near the site is approximately 750 vehicles per day along FM 1468 and approximately 6700 along TX 35 (TXDOT 2006). In keeping with the analysis in Subsection 4.4.2.2.4, the maximum number of vehicles on a highway in a single hour is estimated to be 10 percent of the daily average. Therefore, Exelon estimates the maximum number of cars on FM 1468 and TX 35 in a single hour to be 75 and 670, respectively. The largest impact on traffic would be during the construction period day/back shift change, with up to 6182 vehicles entering or leaving the site. FM 1468 and TX 31, respectively, have threshold capacities of 2300 and 4200 passenger cars per hour.

Transportation impacts are considered small when increases in traffic do not result in delays or other operational problems and moderate when increases in traffic begin to cause delays or other operational problems.

Assuming construction shifts as described in Subsection 4.4.2.2.4, additional traffic that could be on the road during construction shift changes could cause potential congestion. Also, the traffic of hauling construction materials (100 trucks per day) to the site could bring additional congestion during certain times of the day. Shift changes for the proposed nuclear power plant at the Buckeye site could be staggered to mitigate the impact on traffic. Impacts of construction on transportation would be MODERATE to LARGE on the surrounding roads and some mitigating actions such as those described in Subsection 4.4.2.2.4 would be needed.

With respect to the facility operations, the addition of 800 cars (assuming a single occupant per car) the existing traffic on FM 1468 and TX 31 would not materially congest the roadways. Shift changes for the proposed nuclear power plant at the Buckeye site would be staggered, resulting in a limited traffic increase that would not cause congestion. Impacts of the operations workforce on transportation would be SMALL and mitigation would not be warranted.

9.3.3.2.6.6 Aesthetics and Recreation

The Buckeye site is in Matagorda County, which is adjacent to the Gulf of Mexico. Landscapes with water as a major element are generally considered aesthetically pleasing, and this is the case along the southern coast and barrier islands as well as the numerous parks along Matagorda Bay. The marshes, lakes, bays, and other natural amenities found in the project area have historically attracted residents and tourists to the Matagorda Bay System.

Multiple recreational facilities are within 50 miles of the Buckeye site. The Matagorda Island WMA, an offshore barrier island and bayside marsh, is jointly owned by the Texas General Land Office and the USFWS. The TPWD manages the area for public use, and the USFWS has the main responsibility for managing the wildlife and habitat on the island (TPWD Sep 2007).

The Peach Point/Justin Hurst WMA is west of Freeport near Jones Creek in Brazoria County. It is part of the Central Coast Wetlands Ecosystem Project. Their mission is to provide for sound biological conservation of all wildlife resources in the central coast of Texas for the public's common benefit (TPWD Sep 2007).

The D.R. Wintermann WMA is in Wharton County near Egypt, encompassing 246 acres. A former rice farm, a section of this WMA was used to develop a wetlands area with water from the Colorado River. The land is a flat, coastal prairie and is used as a laboratory for students and land owners to observe wetlands management. This environment attracts winter migratory waterfowl including bald eagles, sandhill cranes, a variety of geese, teal, doves, ducks, and a variety of ibis, Neotropical migrants, and many other birds (TPWD Sep 2007).

The Nannie M. Stringfellow WMA has approximately 3664 acres in Brazoria County. This WMA consists primarily of coastal bottomland hardwood forest which lies in the San Bernard River floodplain. It is part of the Coastal Bottomlands Mitigation Bank, which was set up to increase wetland functions by preserving, enhancing, restoring, creating, and properly managing threatened, functioning, biologically diverse ecosystems of waters of the United States, including special aquatic sites, and associated uplands (TPWD Sep 2007).

The Guadalupe Delta WMA consists of freshwater marshes in the delta of the Guadalupe River. It is in Victoria, Refugio, and Calhoun Counties along the Texas Coast between Houston and Corpus Christi. Lands in the Guadalupe Delta WMA have traditionally provided important habitat for wetland dependent wildlife, especially migratory waterfowl. Public hunting is permitted for waterfowl and migratory shore birds, alligators, and other wetland wildlife (TPWD Sep 2007).

The Welder Flats WMA is in the San Antonio Bay area in Calhoun County. It has 1480 acres of submerged coastal wetlands used to stock the bay with red drum and spotted sea trout (TPWD Sep 2007).

The Mad Island Marsh Preserve is southeast of Collegeport in Matagorda County. The preserve's upland prairies represent a portion of the remaining 2 percent of the original tallgrass coastal prairies once found across Texas. The Nature Conservancy forged a partnership with Ducks Unlimited in 1990 to restore the wetlands and tallgrass coastal prairies through four habitat management programs. (TNC 2008).

The Big Boggy NWR is near Wadsworth in Brazoria County, bordering Matagorda Bay. Big Boggy NWR consists of flat coastal prairies, salt marshes, and two large saltwater lakes. Established to provide habitat for migratory waterfowl and other bird species, this NWR is generally closed to visitors; however, waterfowl hunting is allowed in season (USFWS 2007).

The San Bernard NWR is in Matagorda and Brazoria Counties, approximately 12 miles west of Freeport. The refuge is a stop on the Great Texas Coastal Birding Trail and includes trails for hikers and auto tour loops. San Bernard NWR also allows fishing and waterfowl hunting (USFWS 2007)

The Aransas NWR is near Fulton in Refugio County. Aransas NWR consists of more than 115,000 acres including the Blackjack Peninsula (Aransas proper), Matagorda Island, Myrtle Foester Whitmire, Tatton, and Lamar units. These areas provide vital resting, feeding, wintering, and nesting grounds for migratory birds and native Texas wildlife. The refuge is world-renowned for hosting the largest wild flock of endangered whooping cranes each winter (USFWS 2007).

Birding is a major tourist activity in Matagorda County. The Great Texas Coastal Birding Trail stretches along the Texas Gulf Coast from the Louisiana Border, encompassing the southern tip of

Texas along the border with Mexico, and extending west towards Laredo. The trail has 308 established viewing areas at feeding, roosting, and nesting points, thereby encouraging the preservation of woods and wetlands for both migrating and endemic bird species. The Great Texas Coastal Birding Trail goes through many areas within 50 miles of the Buckeye site, with several sites in the immediate vicinity of Bay City and Palacios (TPWD Feb 2007a).

The impacts on recreational facilities within 50 miles of the Buckeye site would be minimal. During construction of the plant, some may be affected by increased traffic on area roads during peak travel periods. During the operating period, it is expected that some employees and their families would use the recreational facilities in the region. However, the increase attributable to plant operations would be small compared to overall use of these facilities. The construction and operation of the proposed nuclear power plant on the Buckeye site would exclude the entire 5000 acres from recreational use for the life of the plant. The attractiveness of the Colorado River for sport fishing and other recreational uses could be impacted during construction of intake and discharge structures. Impacts on tourism and recreation are considered small if current facilities are adequate to handle local levels of demand. Therefore, impacts of facility construction and operation on tourism and recreation would be SMALL.

The construction and operation of the proposed nuclear power plant at the Buckeye site would have minimal impacts on aesthetic and scenic resources. The developed areas at the site would be located near the center of the property. The intake structure would be located on the west bank of the Colorado, approximately 5 miles east of the Buckeye site. There would be occasional visible plumes associated with the cooling towers. The visibility of the plumes would be dependent upon the weather and wind patterns and the location of the viewer in the general topography of the area.

Impacts on aesthetic resources are considered to be moderate if there are some complaints about diminution in the enjoyment of the physical environment and measurable impacts that do not alter the continued functioning of socioeconomic institutions and processes. Construction and operation of an industrial facility on a previously undeveloped site would likely result in some complaints from the affected public regarding diminution in the enjoyment of the physical environment. Therefore, impacts of construction and operation of the proposed nuclear power plant on aesthetics would be MODERATE and could warrant mitigation.

9.3.3.2.6.7 Housing

Impacts on housing from the construction labor force depend on the number of workers already residing in the 50-mile region and the number that would relocate and require housing.

As described in Subsection 9.3.3.2.6.2, Exelon estimates that approximately 5985 construction and 197 operations workers would in-migrate to the region during construction of the proposed nuclear power plant at the Buckeye site. Of these, approximately 3752 (60.7 percent) would settle in Matagorda County and 1385 (22.4 percent) would settle in Brazoria County.

Based on 2000 census data, a total of 13,384 vacant housing units were available for sale or rent in Matagorda and Brazoria Counties. Exelon estimates that, in absolute numbers, the available housing would be sufficient to house the workforce. However, there may not be enough housing of the type desired by the movers in each county, especially in Matagorda County. The median price of housing in Matagorda County in 2000 was $61,500. The median price of housing in Brazoria County was $88,500 for the same year (USCB 2000d). If pricing is too high, workers would relocate to other areas in the 50-mile region, have new homes constructed, bring their own housing, or live in hotels and motels. Given this increased demand for housing, prices of existing housing could rise to some degree. Matagorda and Brazoria Counties (and other counties to a lesser extent) would benefit from increased property values and the addition of new houses to the tax rolls. Increasing the demand for homes could increase rental rates and housing prices. It is unlikely, but possible, that some low-income populations could be priced out of their rental housing due to upward pressure on rents. However, the construction workforce would increase over time. The gradual influx of new residents would give the housing market time to adjust to the additional demands.

In summary, Matagorda and Brazoria counties, where most of the construction workforce would seek housing, have adequate housing resources for the entire workforce. Impacts on housing are considered to be small when a small and not easily discernable change in housing availability occurs, and impacts are considered to be moderate when there is a discernable but short-lived reduction in the availability of housing units. Exelon concludes that the potential impacts of construction on housing could be moderate to large in Matagorda and Brazoria Counties and would be SMALL in the remainder of the 50-mile region. Mitigation would not be warranted where the impacts were small. Mitigation of the moderate-to-large impacts would most likely be market-driven, but may take some time. Additional mitigation measures similar to those presented in Subsection 4.4.2 could also be implemented.

Exelon estimates that approximately 800 workers would be needed for the operation of the assumed two-unit nuclear power facility at the Buckeye site. For the purpose of analysis, Exelon conservatively assumes that all the new employees would migrate into the region. Employees relocating to the region would most likely be scattered throughout the counties in the region, with most choosing to live in Matagorda and Brazoria counties. If all 800 employees and their families were to come from outside the region, it is likely that adequate housing would be available in the region, especially in the larger metropolitan areas. In the two most affected counties, the average income of the new workforce would be expected to be higher than the median or average income in the county; therefore, the new workforce could exhaust the high-end housing market and some new construction could result.

Exelon concludes that the potential impacts of operations on housing in Matagorda and Brazoria Counties would be small to moderate and SMALL elsewhere in the 50-mile region. Market forces could result in more housing being built in the two-county region, eventually mitigating any housing shortages. Additional mitigation would not be warranted.

9.3.3.2.6.8 Public Services

Public services include water supply and wastewater treatment facilities; police, fire, and medical facilities; and social services. As described in Subsection 9.3.3.2.6.2, construction of the proposed nuclear power plant at the Buckeye site would increase the population in the 50-mile region by 16,053 people (5.6 percent of the population in the region). Approximately 83 percent of the in-migrating construction workforce and their families would settle in Matagorda and Brazoria counties. The new construction employees and their families would increase the total population in Matagorda County by 25.7 percent and in Brazoria County by 1.5 percent. Operation of the proposed nuclear power plant at the Buckeye site would increase the population in the 50-mile region by 2600 (0.9 percent of the population in the region). The new operations employees and their families would increase the total population in Matagorda County by 4.2 percent and Brazoria County by 0.2 percent.

New construction or operations employees relocating from outside the region would most likely live in residentially developed areas where adequate water supply and waste treatment facilities already exist. Small increases in the regional population would not materially impact the availability of medical services.

The proposed nuclear power plant and the associated population influx would likely economically benefit the disadvantaged population. The additional direct jobs would increase indirect jobs that could be filled by currently unemployed workers, thus removing them from social services client lists.

In 2002, Matagorda and Brazoria persons per law enforcement officer ratios were 380:1 and 418:1, respectively (USCB Sep 2004). The persons per officer ratio for Texas was 490:1 (USCB Sep 2004). The 2002 persons per firefighter ratios in Matagorda and Brazoria counties were 234:1 and 447:1, respectively (USFA Dec 2007). The persons per firefighter ratio for Texas is 342:1 (USFA Dec 2007). Ratios are partly dependent on population density. Fewer public safety officers are necessary for the same population if the population resides in a smaller area. The population increase in the two counties from construction or operations employees relocating from outside the region could result in the need to hire additional emergency personnel. This is most likely to happen in Matagorda County. However, increased tax revenues would be adequate to pay the salaries of any additional emergency personnel hired.

As described above, it is not expected that public services would be materially impacted by new construction or operations employees relocating from outside the region. Impacts on public services are considered to be small if there is little or no need for changes in the level of service provided to the community. Therefore, impacts of construction and operation of the proposed nuclear power plant on public services would be SMALL and mitigation would not be warranted.

9.3.3.2.6.9 Education

As addressed in Subsection 9.3.3.2.6.2, Exelon anticipates that most of in-migrating workers in the construction and operation workforces would settle in Matagorda and Brazoria counties. Therefore, this analysis is restricted to the two counties that would be most affected by the new workforce.

Based on data for the 2005-2006 school year, Matagorda County has 25 pre-kindergarten through 12 (PK-12) schools with a total enrollment of 7686 students; Brazoria County has 91 PK-12 schools with a total enrollment of 54,578 students (NCES 2007).

As presented in Subsection 9.3.3.2.6.2, Exelon assumed that 70 percent of the 5985 in-migrating nuclear plant construction workers were likely to bring families: 4190 would bring families and 1795 would not. However, Exelon assumed that 100 percent of the overlapping operations workforce (197 people) would bring families. As in Subsection 4.4.2.2.8, Exelon assumes that the average number of school age children per worker who relocated his or her family was 0.8 (BMI Apr 1981). This would increase the school-aged population in the ROI by approximately 3510 students. The student populations in Matagorda and Brazoria counties would increase by 27.7 percent and 1.4 percent, respectively. Small impacts are generally associated with project-related enrollment increases of up to 3 percent, and moderate impacts on local school systems are generally associated with project-related enrollment increases of 3 percent to 8 percent. Therefore, projected increases in the student population of Brazoria would have a small impact on the education system and mitigation would not be warranted. In Matagorda County, the projected increase in the student population would constitute a large impact. Mitigation measures similar to those addressed in Subsection 4.4.2 could be implemented if the proposed nuclear power plant were constructed at the Buckeye site. The quickest mitigation would be to hire additional teachers and move modular classrooms to existing schools. Increased property tax revenues as a result of the increased population would fund additional teachers and facilities. No additional mitigation would be warranted.

Most of the operations workforce would be expected to come from outside the ROI. As such, the school system in the ROI could potentially experience an influx of students from operation of the proposed nuclear power plant at the Buckeye site. If all 800 employees and their families were to come from outside the region, the school-aged population in the ROI of the Buckeye site would increase by approximately 640 students. The student populations in Matagorda and Brazoria counties would increase by 5.1 percent and 0.3 percent, respectively. These increases in student population would constitute a small impact on the education system in Brazoria County and mitigation would not be warranted. Impacts would be moderate in Matagorda County. As with construction, the quickest mitigation would be to hire additional teachers.

9.3.3.2.7 Historic and Cultural Resources

Exelon conducted historical and archaeological record searches on the National Park Service NRHP. A search of the NRHP identified 53 sites in the six counties surrounding the Buckeye site including four sites in Matagorda County and 10 in Brazoria County. (NPS 2008a). None are within 10 miles of the Buckeye site.

Building the proposed nuclear power plant at the Buckeye site would require a formal cultural resources survey to be conducted prior to construction. Mitigation measures would be coordinated with the THC so that any impacts to cultural resources from construction or operation of the proposed nuclear power plant at the Buckeye site would be SMALL.

9.3.3.2.8 Environmental Justice

Environmental justice refers to a federal policy under which each federal agency identifies and addresses, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. The NRC has a policy on the treatment of environmental justice matters in licensing actions (69 FR 52040) and guidance (U.S. NRC May 2004). Subsection 2.5.4.1 describes the methodology Exelon used to establish locations of minority and low-income populations.

The 2000 Census block groups were used for ascertaining minority and low-income in the area. There are 255 block groups within 50 miles of the Buckeye site. The Census Bureau data for Texas characterizes 11.5 percent of the population as black races, 0.6 percent as American Indian or Alaskan native, 2.7 percent as Asian, 0.1 percent as native Hawaiian or other Pacific Islander, 11.7 percent as all other single minorities, 2.5 percent as multi-racial, 29.0 percent as an aggregate of minority races, and 32.0 percent as Hispanic ethnicity. If any block group percentage exceeded its corresponding state percentage by more than 20 percent or was greater than 50 percent, then the block group was identified as having a significant minority population. Black minority populations exist in 19 block groups, Asian minority populations exist in one block group, “aggregate of minority races” populations exist in 25 block groups, “Hispanic ethnicity” populations exist in 38 block groups, and populations of other races exist in 10 block groups. The locations of the minority populations in the ROI are shown in Figure 9.3-10.

The Census Bureau data characterizes 14.0 percent of Texas households as low-income. Based on the “more than 20 percent” criterion, six block groups out of a possible 255 contain a significant low-income population. The locations of the low-income populations within 50 miles of the Buckeye site are shown in Figure 9.3-11.

Construction activities (noise, fugitive dust, air emissions, traffic) would not impact minority populations, because of their distance from the Buckeye site. In fact, minority and low-income populations would most likely benefit from construction activities through an increase in construction-related jobs. Operation of the proposed nuclear power plant at the Buckeye site is unlikely to have a disproportionate impact on minority or low-income populations.

9.3.3.3 **Evaluation of the Alpha Site**

The Alpha site is located in southwestern Austin County, just west of the Brazos River and approximately 45 miles west of Houston, approximately 4 miles northwest of Wallis, and 7 miles south-southeast of Sealy, between TX 36 and the Brazos River floodplain. The counties conterminous with Austin County include Colorado County to the west, Wharton County to the south, Fort Bend County to the southeast, and Waller County to the east (Figure 9.3-12). The terrain rolls gently with elevations that range from 98 to 146 feet NAVD88 (HL&P 1973). Farms currently occupy approximately 367,497 of 417,278 acres in Austin County (88 percent).

The cooling system would consist of onsite cooling towers with intake and discharge lines to the yet to be built Allen's Creek Reservoir. A transmission system consisting of new ROW would be required to connect the site to the surrounding grid. To analyze the effects of building a new nuclear plant, Exelon has assumed that the construction and operation practices described in ER Chapters 4 and 5 would generally be applied to the Alpha site; thereby allowing for a consistent description of the impacts.

9.3.3.3.1 **Land Use Including Site and Transmission Line Rights-of-Way**

The 2000-acre Alpha site is comprised of mostly flat agricultural land used to farm row crops. Uncleared and partially cleared land is used to graze cattle (HL&P 1973). A proposed reservoir would be located near the Alpha site, and would provide a 145,500 acre-feet off-channel surface water storage to hold peak flows diverted from the Brazos River. The reservoir would provide an annual volume of 99,650 acre-feet of water to meet demand in Austin County and five other counties in the region and would also be the primary source of cooling water for the proposed nuclear power plant.

Construction of the power plant would alter land use at the site from agricultural to industrial use. However, Austin County does not have any land use plans or zoning restrictions. It is expected that the footprint of the new units at the Alpha site would be approximately 300 acres. A paved road, less than 2 miles long (100-foot ROW), would be constructed to provide vehicle access from State

Highway 36 to the Alpha site. Development of the access road would require approximately 24 acres. Rail access would also need to be constructed, requiring approximately 0.8 miles of new railroad.

Operations impacts to site land use would include permanent disturbance of the 300-acre power block area, plus local road (24 acres) and rail (10 acres) access.

Because most of the site has been previously cleared and is now used for farm activities, land-use impacts associated with site-preparation and construction of the proposed nuclear power plant at the Alpha site would be SMALL. Site land use impacts from operation of the proposed nuclear power plant at the Alpha Site would be SMALL.

Four new 345 kV transmission lines, divided between two ROWs, would be required to connect the proposed nuclear power plant to ERCOT transmission system, and both ROWs would be 200-feet wide. Two transmission lines would connect to the O'Brien Substation, approximately 24 miles from the site, and the other two would connect to the Fayette Substation, approximately 32 miles from the site. New ROWs would be required. Based on 56 total miles of corridor and a 200-foot ROW, installation of these transmission lines would impact approximately 1360 acres. Although the most direct route would, in general, be used between terminations, efforts would be applied to avoid conflicts with any natural or man-made areas where important environmental resources are located. Route selection would also seek to avoid populated areas and residences to the extent possible. The use of lands that are currently used for forests or timber production would be altered. Trees would be replaced by grasses and other low-growth ground cover. Although Exelon would not be responsible for final routing and construction, the transmission service provider is expected to comply with all applicable laws, regulations, permit requirements, and use best construction management practices. Construction impacts to offsite land use would be SMALL.

The new transmission corridor would not be expected to permanently affect agricultural areas, but it would have the potential to affect residents along the ROW. Corridor vegetation management and line maintenance procedures would be established by the transmission service provider. Given the rural setting and low population density along the transmission corridors, operational impacts to land use along the ROWs would be SMALL.

9.3.3.3.2 **Air Quality**

The Alpha site is in the Metropolitan Houston-Galveston Intrastate Air Quality Control Region (AQCR) (40 CFR 81.38). The Austin County portion of this AQCR is either designated as attainment or unclassifiable with respect to the NAAQS (40 CFR 81.344). The nearest non-attainment areas are the conterminous counties of Fort Bend and Waller, also located in the Metropolitan Houston-Galveston Intrastate AQCR. Both of these counties are designated as non-attainment with respect to the 1-hour and 8-hour ozone standards (40 CFR 81.344).

Air quality impacts from construction and operation of the proposed nuclear power plant at the Alpha site would be similar to those at the VCS site. Construction impacts would be temporary and would be similar to any large-scale construction project. Construction emissions would primarily include fugitive dust from disturbed land and roads and tailpipe emissions from construction equipment. Mitigation measures similar to those described for the VCS site would be applied. During station operation, auxiliary equipment such as diesel generators, combustion turbines, and boilers would be used. It is expected that this equipment would see limited use and, when used, would operate for short time periods, and annual emission levels would be low. Air emissions from the auxiliary equipment are expected to be minimal and would not result in any violation of NAAQS.

The nearest Class I area is the Wichita Mountains Wilderness in Oklahoma, more than 300 miles from the Alpha site. Therefore, there is no potential for the project to impose visibility impacts to Class I areas. The air quality impacts from construction and operation of the proposed nuclear power plant at the Alpha site would be SMALL.

9.3.3.3.3 **Hydrology, Water Use, and Water Quality**

The Alpha site lies over the northern portion of the Gulf Coast Aquifer System. The Gulf Coast Aquifer is a major aquifer that parallels the Gulf of Mexico coastline from the Louisiana border to the Mexican border. This aquifer covers 54 counties and consists of several aquifers, including the Jasper, Evangeline, and Chicot aquifers, which are composed of discontinuous sand, silt, clay, and gravel beds. The area of the aquifer is approximately 41,879 square miles. Seventy-three percent of the aquifer, including the area in the region of the Alpha site, is covered under a groundwater control district. (TWDB Nov 2006)

As described in Subsection 2.3.2, a local issue is the significant regional decreases in water levels in the Gulf Coast Aquifer during the 1970s and 1980s that prompted concern regarding the allocation of groundwater and forced a number of users, including municipalities, to revert to surface water as their primary source of water. New development, recent droughts, and the potential for saltwater intrusion have also heightened concerns about long-term groundwater availability in the Gulf Coast Aquifer.

Austin County is part of the Region H Water Planning Group, which is required to plan for future water needs under drought conditions. According to the 2006 Region H Water Plan, the projected groundwater supply available in Region H from the Gulf Coast Aquifer would decline from 803,271 acre-feet per year to 616,648 in 2060 (RHWPG Jan 2006). In 2004, Austin County pumped approximately 11,156 acre-feet of groundwater from the Gulf Coast Aquifer (TWDB 2008).

Exelon would use groundwater during construction for the potable water system, concrete production and curing, backfill operations, dust control, cleaning and lubrication, and hydro testing and flushing.

Peak well water demand during construction is estimated to be approximately 580 gpm (Section 4.2.1.2). For station operations, Exelon estimates that a maximum of 1200 gpm of groundwater would be necessary. Compared with the Lower Colorado Region projected groundwater supply from the Gulf Coast Aquifer, groundwater use for construction and operations of nuclear units at the Alpha site would represent a very small percentage of total supply (less than 1 percent). Therefore, construction and operations impacts to groundwater would be SMALL.

To ensure that wetlands and streams are not harmed by petroleum products or other industrial chemicals, Exelon would restrict certain activities (e.g., transfer and filling operations) that involve the use of petroleum products and solvents to designated areas, such as lay-down, fabrication, and shop areas. In addition, construction activities would be guided by a Stormwater Pollution Prevention Plan and a construction-phase Spill Prevention, Control, and Countermeasures Plan similar to those proposed for VCS as described in Subsection 4.2.3. Therefore, any impacts to surface water during plant construction would be SMALL and would not warrant mitigation beyond best management practices required by the permits.

The normal consumptive use of surface water during operations by the cooling towers would be 57,800 gpm (Table 9.4-3). Water for the proposed nuclear generating units at Alpha site would be provided by future development of the Allen's Creek Reservoir. Water Rights Permit 2925 is held by the City of Houston (70 percent of 69,750 acre-feet per year), the Brazos River Authority (30 percent of 29,900 acre-feet per year), and the Texas Water Development Board to allow diversion of water from Allen's Creek and the Brazos River into this new reservoir.

The reservoir would be constructed in the southern portion of Austin County. It would be bounded by U.S. Interstate 10 to the north, Highway 1458 to the east, Highway 1093 to the south, and State Highway 36 to the west. The reservoir would cover approximately 9500 acres of land, have a capacity of 145,500 acre-feet, and would yield nearly 100,000 acre-feet of water availability per year (61,700 gpm) (BRA Undated). Surface water use for operations of nuclear units at the Alpha site would represent most of the total water available. Currently, the water is designated to meet future municipal, industrial, and irrigation needs within Austin County and five other counties in the region; however, no contracts for this yield have been executed by the Houston or Brazos River Authority. It is expected that the reservoir could be constructed and filled to support plant operation. However, this would require that reservoir construction be completed much sooner than would be planned. For this reason, impacts on surface water supplies would be LARGE.

An NPDES permit from the TCEQ would be required. As authorized by the Clean Water Act, the NPDES permit program controls water pollution by regulating water discharges. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. The permit contains limits on what can be discharged, monitoring and reporting requirements, and other provisions to ensure that the discharge does not degrade water quality or human health. Any releases of contaminants to the Brazos River, Allen's Creek, or other Texas waters as result of construction or operation of the proposed nuclear power plant at the Alpha site would be regulated by the TCEQ through the NPDES permit process to ensure that water quality is protected. The impacts of discharges to surface water would be minimized by the same mitigation measures as those addressed for the proposed site in Section 4.2 and Subsection 5.2.2. Therefore, impacts to water quality would be SMALL.

9.3.3.3.4 **Terrestrial Resources Including Protected Species**

Two federally listed terrestrial species are found in Austin County and have the potential to occur in the vicinity of the Alpha site. These include the Attwater's greater prairie chicken (*Tympanuchus cupido attwateri*) and the Houston toad (*Bufo houstonensis*). The Attwater's greater prairie chicken was once widely distributed but has declined dramatically from historic population levels. The endangered species is now found only in two counties, including Austin County. The Attwater Prairie Chicken NWR has been established largely for the purpose of preserving prairie habitat that supports this prairie chicken. The refuge is approximately 8 miles west of the Alpha site. Other suitable habitat may be scattered throughout the county.

The Houston toad is an endangered species that is found in nine counties in Texas. The toad lives primarily on land and requires loose, deep sands supporting woodland savannah and still or slow-flowing waters that persist for at least 30 days for breeding.

Austin County also has 13 state-listed species, including one amphibian, nine birds, two mammals, and one reptile.

As mentioned in Subsection 9.3.3.3.1, it is assumed that four new 345 kV transmission lines requiring two 200-foot wide transmission corridors would be needed to connect the proposed nuclear power plant to the ERCOT transmission system. The new lines would connect to the Fayette and O'Brien substations. Routing the new transmission lines would require approximately 1360 acres of transmission corridor. Land clearing associated with construction of plant facilities and transmission lines would be conducted according to federal and state regulations, permit conditions, existing procedures, good construction practices, and established best management practices (e.g., directed drainage ditches, silt fencing). With this in mind, impacts to terrestrial resources, including endangered and threatened species, from construction and operation of a plant at the Alpha site would be SMALL. Given the relatively short length of the transmission corridor needed to the substations and the low number of sensitive species in Austin County, impacts to terrestrial resources would be SMALL. Impacts would be MODERATE when construction of the Allen’s Creek reservoir is considered.

9.3.3.3.5 **Aquatic Resources Including Endangered Species**

Allen's Creek originates southeast of Sealy, Texas (Austin County) and flows south for approximately 10 miles before making a strong turn to the east, emptying into the Brazos River after another 3.7 miles. As presented in Subsection 9.3.3.3.3, water for the proposed nuclear generating units at Alpha site would be provided by future development of the Allen's Creek Reservoir. The reservoir would be constructed along Allen's Creek. As planned, the Allen's Creek Reservoir would be a 145,500 acre-feet off-channel reservoir. The reservoir site would be located 2 miles north of the town of Wallis, Texas. The project would impound water available from the Allen's Creek watershed, as well as water diverted and pumped from the Brazos River during periods of flow in excess of downstream needs. The location for the proposed reservoir lies directly above the confluence of Allen's Creek and the Brazos River. A spillway from the reservoir would continue the flow from Allen's Creek into the Brazos River.

One federally listed aquatic species is found in Austin County and has the potential to occur in the vicinity of the Alpha site: the sharpnose shiner (*Notropis oxygrhynchus*). The sharpnose shiner is endemic to the Brazos River Basin. The species is an obligate riverine fish that typically occurs in fairly shallow water. This shiner is found in waters that have a relatively high current velocity and high turbidity. Reservoir construction on the Brazos River appears to have had a substantial impact on the distribution of the shiner, with apparent population declines in many parts of the river system. Impacts on this protected species from construction of the Allen’s Creek Reservoir could be LARGE and could require mitigation.

The aquatic environment would be impacted during the construction of the reservoir. However, impacts to the aquatic environment during construction and operation of the plant would be minimal. The construction of a cooling water intake structure would be necessary if a nuclear power plant were built at the Alpha site. The plant's intake structure would be designed and operated to reduce the effects of entrainment and impingement to sensitive species.

Based on a review of the available information, impacts to the aquatic environment during construction of the Allen's Creek Reservoir would be MODERATE to LARGE. Impacts to the aquatic environment during construction of the power plant would be SMALL. Impacts during operation at the Alpha site would be SMALL to both Allen's Creek and the Brazos River.

9.3.3.3.6 **Socioeconomics**

This section evaluates the social and economic impacts to the surrounding region as a result of constructing and operating the proposed nuclear power plant at the Alpha site. The evaluation assesses impacts of construction, station operation, and demands placed by the construction and operation workforce on the surrounding region.

9.3.3.3.6.1 Physical Impacts

Construction activities can cause temporary and localized physical impacts such as noise, odor, vehicle exhaust, and dust. Vibration and shock impacts would not be expected due to the strict control over construction activities. The use of public roadways and railways would be necessary to transport construction materials and equipment. Most construction activities would occur within the boundaries of the Alpha site. However, an access road and a connecting rail spur (requiring approximately 34 acres) would be constructed on lands adjacent to the site. These new transportation rights-of-way would be routed to avoid residences and populated areas. Offsite areas that would support construction activities (for example, borrow pits, quarries, and disposal sites) are expected to be already permitted or would be permitted prior to operation. Impacts on those facilities from construction of the proposed nuclear power plant would be small incremental impacts associated with their normal operation.

Potential impacts from station operation include noise, odors, exhausts, thermal emissions, and visual intrusions. The proposed nuclear power plant would produce noise from the operation of pumps, fans, transformers, turbines, generators, and switchyard equipment, and traffic at the site would also be a source of noise. However, noise attenuates quickly, so ambient noise levels would be minimal at the site boundary. Also, the Alpha site is in a rural area surrounded by agricultural land with few residents in the area. Commuter traffic would be controlled by speed limits, which could reduce the dust and noise level generated by the workforce commuting to the site.

The proposed nuclear power plant would have standby diesel generators and auxiliary power systems. This equipment would be operated infrequently, for short durations.

In summary, construction activities would be temporary and would occur mainly in the boundaries of the Alpha site. Offsite impacts would represent small incremental changes to offsite services supporting the construction activities. During station operations, ambient noise levels would be minimal at the site boundary. Auxiliary power equipment such as diesel generators, combustion turbines, and boilers would be operated infrequently, for short durations. Therefore, the physical impacts of construction and operation of the proposed nuclear power plant at the Alpha site would be SMALL.

9.3.3.3.6.2 Demography

The Alpha site is in Austin County, Texas. The population distribution near the site is low with typical rural characteristics.

As addressed in Subsection 4.4.2, Exelon anticipates employing 6300 construction workers during the peak construction period (Table 3.10-2). Exelon anticipates that approximately 5985 construction workers would relocate to the area. As described in Subsection 4.4.2, operations would overlap with peak construction activity; therefore, in addition to the construction workforce, it is estimated that 197 operations workers during the peak construction period.

Exelon estimates that most of construction workers would locate in Austin, Fort Bend, and Waller counties, based on the counties' distance from the Alpha site. Approximately 60 percent would settle in Austin County, primarily in the town of Sealy; 10 percent would settle in Fort Bend County, primarily along County Highway 1093; and 30 percent would settle in Waller County, primarily along the Interstate-10 corridor. In reality, some workers could locate to one of the other counties within 50 miles of the site.

Based on the 2000 Census, the total population of the three most affected counties is 410,705 people. The 2000 population was 23,590 in Austin County, 354,452 in Fort Bend County, and 32,663 in Waller County (USCB 2000a). In 2000, the population within 50 miles of the site was 3,169,740 people (403.8 people per square mile), and the population within 20 miles of the site was 67,654 people (53.9 people per square mile). The nearest population center, as defined in 10 CFR 100 is Houston, Texas (population 4,669,571), approximately 45 miles east of the Alpha site (USCB 2000b). Based on the sparseness and proximity matrix in NUREG-1437, the Alpha site is in a high population area.

As described in Subsection 4.4.2, approximately 70 percent of the in-migrating construction workers and 100 percent of the operations workers are likely to bring families. Therefore, 4387 workers would bring families into the 50-mile region during peak construction. Assuming an average family household size of 3.25 people, construction would increase the population in the 50-mile region by 16,053 people, which is approximately 0.5 percent of the 50-mile radius population in 2000. Based on the counties' distance to the Alpha site, Exelon assumed that the workers would relocate in one of three counties: approximately 9632 (60 percent) people would locate to Austin County, 1605 (10 percent) people would locate to Fort Bend County, and 4816 (30 percent) people would locate to Waller County. These numbers constitute 40.8 percent, 0.5 percent, and 14.7 percent of the 2000 Census populations of Austin, Fort Bend, and Waller Counties, respectively.

Exelon is adopting the NRC definition of impacts as small if plant-related population growth is less than 5 percent of the study area's total population and large if plant-related population growth is greater than 20 percent. Therefore, the potential increases in population during construction of the proposed nuclear power plant at the Alpha site would represent a large impact to the population in Austin County, a moderate impact to the population in Waller County, and a SMALL impact to the total population elsewhere in the 50-mile region. Mitigation methods would be similar to those described in Subsection 4.4.2.

Exelon assumed the operations workforce would have the same residential distribution as the construction workforce. Exelon estimates that 800 workers (Subsection 3.10.3) would be required for the operation of two nuclear power facilities at the Alpha site. For the purpose of analysis, Exelon conservatively assumes that all the new employees would migrate into the region. Employees relocating to the region would most likely choose to live in Austin, Fort Bend, or Waller counties. The 800 employees would translate into an additional 2600 people (assuming an average family household size of 3.25 people). Based on the counties' distance to the Alpha site, Exelon assumed that the workers would relocate in one of three counties: approximately 1560 (60 percent) people would locate to Austin County, 260 (10 percent) people would locate to Fort Bend County, and 780 (30 percent) people would locate to Waller County. These numbers constitute 6.6 percent, 0.1 percent, and 2.4 percent of the 2000 Census populations of Austin, Fort Bend, and Waller Counties, respectively. Overall, the potential increase in population from operation of the proposed nuclear power plant at the Alpha site would represent a SMALL impact to the total population throughout the 50-mile region, except Austin County, where the impact could be moderate and mitigation would be warranted. Mitigation methods would be similar to those described in Subsection 4.4.2.

9.3.3.3.6.3 Economy

Based on 2000 census data, in the three most affected counties near the Alpha site, there are 201,806 people in the civilian labor force. Of the civilian labor force, 94.5 percent are employed and 5.5 percent are unemployed. In 2000, Austin County had a civilian labor force of 11,265 people and an unemployment rate of 4.4 percent. Fort Bend County had a civilian labor force of 174,654 people and an unemployment rate of 4.9 percent. Waller County had a civilian labor force of 15,887 people and an unemployment rate of 13.8 percent. (USCB 2000c)

As presented in Subsections 4.4.2.1 and 5.8.2.1, the wages and salaries of the construction and operations workforce would have a multiplier effect that could result in increases in business activity, particularly in the retail and service sectors. This would have a positive impact on the business community and could provide opportunities for new businesses and increased job opportunities for local residents. The economic effect on the 50-mile region would be beneficial. For the purpose of analysis, Exelon assumes that direct jobs would be filled by an in-migrating workforce, but most indirect jobs would be service-related, not highly specialized, and would be filled by the existing workforce in the 50-mile region. Expenditures made by the direct and indirect workforce would strengthen the regional economy. This would be considered a positive impact.

As described in Subsection 9.3.3.3.6.2, Exelon estimates that 5985 construction workers and 197 operations workers would in-migrate to the region during construction of the proposed nuclear power plant at the Alpha site. Assuming a multiplier of 1.68 jobs (direct and indirect) for every construction job and a multiplier of 2.62 for every operations job (BEA 2008b), an influx of 6182 workers would create 4360 indirect jobs, permanent or temporary, for a total of 10,542 new jobs in the 50-mile region. The number of new jobs would represent approximately 56.1 percent of the employment in Austin County, 0.6 percent of the employment in Fort Bend County, and 19.9 percent of the employment in Waller County.

Exelon is adopting the NRC definition of impacts as small if plant-related employment is less than 5 percent of the study area's total employment and large if plant-related employment is greater than 10 percent. Exelon concludes that the impacts of construction on the economy would be beneficial and SMALL everywhere in the region except Austin and Waller counties, where the impacts could be large.

As described in Subsection 9.3.3.3.6.2, approximately 800 workers would be required for the operation of two nuclear power facilities at the Alpha site, and Exelon assumes that all the new employees would migrate into the region. Assuming a multiplier of 2.62 jobs (direct and indirect) for every operations job at the new units (BEA 2008b), an influx of 800 workers would create 1294 indirect jobs for a total of approximately 2094 new jobs in the region. The number of new jobs would represent approximately 11.2 percent of the employment in Austin County, 0.1 percent of the employment in Fort Bend County, and 4.0 percent of the employment in Waller County. Because most indirect jobs are service-related and not highly specialized, Exelon assumes that most, if not all, indirect jobs would be filled by the existing labor force in the 50-mile region. Exelon concludes that the impacts of operation of the two assumed nuclear power facilities on the economy would be beneficial and SMALL everywhere in the region except Austin County, where the impact could be beneficial and moderate.

9.3.3.3.6.4 Taxes

Taxes collected as a result of constructing and operating the proposed nuclear power plant at the Alpha site would benefit state and local taxing jurisdictions. In Texas, property tax assessments are made by the county appraisal district, which bases its appraisal on a consideration of cost, income, and market value. This appraisal is used by all taxing jurisdictions in the county, including special districts and independent school districts, which apply their individual millage rates to determine the taxes owed. Based on the analysis in Subsection 4.4.2.2.2, Exelon anticipates that additional property taxes would be paid to Austin County during the construction period.

In 2006, Austin County had property tax revenues of $8,604,832 (Combs Jan 2008). Assuming that tax payments to Austin County for nuclear power facilities at the Alpha site would be similar to those of the VCS site (Subsections 4.4.2.2.2 and 5.8.2.2.2), the tax payment would represent a large portion of the tax revenue for the county. For the operations phase, Exelon estimates its total payment to all taxing entities would be approximately $24 million, annually. Table 5.8-14 estimates the county property tax for VCS at approximately $6.9 million. The benefits of taxes are considered small when new tax payments by the nuclear plant constitute less than 10 percent of total revenues for local jurisdictions and large when new tax payments represent more than 20 percent of total revenues. The projected operations-phase property taxes for the nuclear power facilities represent almost 80 percent of current property tax revenues for Austin County. Therefore, Exelon concludes that the potential beneficial impacts of taxes collected during construction and operation of the proposed project would be large in Austin County and SMALL elsewhere in the 50-mile region.

The Alpha site is located in the Brazos ISD, which is categorized as a property-poor district (see Subsection 2.5.2.3.5). The substantially increased tax revenues from the plant would likely change the district's status to property-wealthy. In that case, more of the district's funding would come from local taxpayers, with less funding from the state. Overall revenues would not change very much unless there was a large increase in enrollment from the in-migrating families, and there would be a small positive impact to the Brazos ISD. In-migrating construction and operation workers could lead to larger enrollments in other ROI schools that would not receive direct property tax revenues from the plant. Because the Texas school funding formula is based on weighted average daily attendance, increases in the number of students would lead to increased funding, but would also result in the additional expenses related to a larger student body. Fiscal impacts to the ISD from increased enrollment would be small to moderate, depending on their existing capacity, funding status, and fiscal condition. Subsection 9.3.3.3.6.9 discusses capacity and enrollment issues for the Alpha site ROI in detail.

9.3.3.3.6.5 Transportation

The regional and local road system is shown on Figure 9.3-12. Highway access to the Alpha site is provided by State Highway 36, a two-lane road that connects Wallis and Sealy, the only two communities with more than 1000 residents within 10 miles of the site. TX 36 passes the site just west of the restricted area, and the Santa Fe Railway crosses Interstate 10 north of the Alpha site. South of the site in Wallis, TX 36 intersects with TX 60, which further south of Wallis intersects with U.S. 90. U.S. 90 runs east-west connecting many smaller communities to Houston. The road is a two-lane road at its intersection with TX 60 but becomes a four-lane road closer to Houston.

Workers and deliveries traveling to the Alpha site from the north would travel to TX 36 and then travel south to the site. Those originating from the south would travel to TX 60 to Wallis and then north on TX 36 to the site. Workers and deliveries originating from the east or west (Houston area) would travel to Interstate 10 and take Exit 720, the TX 36 exit, and then travel south to the site. Alternately, the workers or deliveries could travel to U.S. 90 and take TX 60 north to Wallis to intersect with TX 36 and then go north to the site.

The average annual traffic count near the site along TX 36 is 14,000 vehicles per day north of the site near Sealy and Interstate 10 and 6300 vehicles per day south of the site near Wallis (TXDOT 2006). In keeping with the analysis in Subsection 4.4.2.2.4, the maximum number of vehicles on TX 36 in a single hour is estimated to be 10 percent of the daily average. Therefore, Exelon estimates the maximum number of cars on TX 36 in a single hour to be 1400. The largest impact on traffic would be during the construction period day/back shift change, with up to 6182 vehicles entering or leaving the site. TX 36 has a threshold capacity of 5200 passenger cars per hour.

Transportation impacts are considered to be small when increases in traffic do not result in delays or other operational problems; impacts are moderate when increases in traffic begin to cause delays or other operational problems.

Assuming construction shifts as described in Subsection 4.4.2.2.4, the additional traffic that could be on the road during shift changes could cause potential congestion. Also, the traffic of hauling construction materials (100 trucks per day) to the site could bring additional congestion during certain times of the day. Shift changes for the proposed nuclear power plant at the Alpha site could be staggered so that the traffic increase would not cause congestion. Impacts of construction on transportation would be small to moderate on two-lane roads in Austin County, particularly on TX 36 near the site, and some mitigating actions such as those described in Subsection 4.4.2.2.4 would be needed.

With respect to facility operations, the addition of 800 cars (assuming a single occupant per car) to the existing traffic on TX 36 would not materially congest the roadways. Shift changes for the proposed nuclear power plant at the Alpha site would be staggered resulting in a limited traffic increase that would not cause congestion. Impacts of the operations workforce on transportation would be SMALL and mitigation would not be warranted.

9.3.3.3.6.6 Aesthetics and Recreation

The Alpha site is an undeveloped property in southern Austin County and is surrounded by rural agricultural land. The plant would be located approximately 4 miles northwest of Wallis, and 7 miles south-southeast of Sealy between Highway 36 and the floodplain of the Brazos River. The site is situated approximately 5 miles east of Allen's Creek and 3 miles west of the Brazos River. Approximately 9500 acres would be dedicated for a reservoir located on a portion of the Brazos River floodplain. The attractiveness of the area for hunting, sport fishing, and other recreational uses could be increased by construction of the reservoir, and additional recreation facilities would be built to use this demand (HL&P 1973). Present recreational facilities might be affected by increased traffic on area roads during peak travel periods, but impacts would be minimal. The only nearby recreational areas are the 663-acre Stephen F. Austin State Park 10.5 miles to the north and Eagle Lake 15 miles southwest (TPWD Feb 2007b). During the operating period, it is expected that some employees and their families would use the recreational facilities in the region. However, the increase attributable to plant operations would be small compared to overall use of these facilities. Impacts on tourism and recreation are considered small if current facilities are adequate to handle local levels of demand. Therefore, impacts of facility construction and operation on tourism and recreation would be SMALL.

The construction and operation of the proposed nuclear power plant at the Alpha site would have small impacts on aesthetic and scenic resources. The developed areas at the Alpha site would be located near the center of the property, with the area immediately adjacent to the Alpha site mostly undeveloped. The remainder of the site would consist of open fields. Due to the flat nature of the land, facility structures would be visible from roadways near the site. There would be occasional visible plumes associated with the cooling towers. The visibility of the plumes would be dependent upon the weather and wind patterns and the location of the viewer in the general topography of the area. Impacts on aesthetic resources are considered to be moderate if there are some complaints about diminution in the enjoyment of the physical environment and measurable impacts that do not alter the continued functioning of socioeconomic institutions and processes. Construction and operation of an industrial facility on a previously undeveloped site would likely result in some complaints from the affected public regarding diminution in the enjoyment of the physical environment. Therefore, impacts of construction and operation of the proposed nuclear power plant on aesthetics would be MODERATE and could warrant mitigation.

9.3.3.3.6.7 Housing

Impacts on housing from the construction labor force depend on the number of workers already residing in the 50-mile region and the number that would relocate and require housing.

As described in Subsection 9.3.3.2.6.2, Exelon estimates that 5985 construction and 197 operations workers would in-migrate to the region during construction of the proposed nuclear power plant at the Alpha site. Of these, approximately 3709 (60 percent) would settle in Austin County, 618 (10 percent) would settle in Fort Bend County, and 1855 (30 percent) would settle in Waller County.

In 2000, a total of 7932 vacant housing units were available for sale or rent in Austin, Fort Bend, and Waller Counties. Exelon estimates that, in absolute numbers, the available housing would be sufficient to house the in-migrating workforce. However, there may not be enough housing of the type desired by the workers in each of the three counties, especially in Austin and Waller Counties. The median price of housing in Austin County in 2000 was $85,000. The median price of housing in Fort Bend and Waller Counties was $115,100 and $84,700, respectively, for the same year (USCB 2000d). In this event, workers would relocate to other areas in the 50-mile region, have new homes constructed, bring their own housing, or live in hotels and motels. Given this increased demand for housing, prices of existing housing could rise to some degree.

Austin and Waller Counties (and other counties to a lesser extent) would benefit from increased property values and the addition of new houses to the tax rolls. Increasing the demand for homes could increase rental rates and housing prices. It is unlikely, but possible, that some low-income populations could be priced out of their rental housing due to upward pressure on rents. However, the construction workforce would increase over time and any actual housing shortage is unlikely to be as severe as a comparison of maximum workforce to available housing would indicate. The gradual influx of new residents would give the housing market time to adjust to the additional demands.

In summary, the three counties where most of the construction workforce would seek housing have adequate housing resources for the entire workforce. Impacts on housing are considered to be small when a small and not easily discernable change in housing availability occurs, and impacts are considered to be moderate when there is a discernable but short-lived reduction in the availability of housing units. Exelon concludes that the potential impacts of construction on housing could be moderate to large in Austin and Waller Counties and would be SMALL in the remainder of the 50-mile region. Mitigation would not be warranted where the impacts were small. Mitigation of the moderate to large impacts would most likely be market-driven but may take some time. Additional mitigation measures similar to those addressed in Subsection 4.4.2 could also be implemented.

Exelon estimates that approximately 800 workers would be needed for operations at the Alpha site. For the purpose of analysis, Exelon conservatively assumes that all the new employees would migrate into the region. Employees relocating to the region would most likely be scattered throughout the counties in the region, with most choosing to live in Austin, Fort Bend, or Waller counties. If all 800 employees and their families were to come from outside the region, it is likely that adequate housing would be available in the region, especially in the larger metropolitan areas.

Exelon concludes that the potential impacts of operations on housing in Austin and Waller counties would be moderate and SMALL elsewhere in the 50-mile region. Market forces could result in more housing being built in the three-county region, eventually mitigating any housing shortages. Additional mitigation would not be warranted.

9.3.3.3.6.8 Public Services

Public services include water supply and wastewater treatment facilities; police, fire, and medical facilities; and social services. As described in Subsection 9.3.3.3.6.2, construction of the proposed nuclear power plant at the Alpha site would increase the population in the 50-mile region by 16,053 people (0.5 percent of the population in the region). The new construction employees and their families would increase the total population in Austin County by 40.8 percent, Fort Bend County by 0.5 percent, and Waller County by 14.7 percent. Operation of the proposed nuclear power plant at the Alpha site would increase the population in the 50-mile region by 2600 people (0.1 percent of the population in the region). The new operations employees and their families would increase the total population in Austin County by 6.6 percent, Fort Bend County by 0.1 percent, and Waller County by 2.4 percent.

New construction or operations employees relocating from outside the region would most likely live in residentially developed areas where adequate water supply and waste treatment facilities already exist. The medical facilities in the Houston area provide medical care to much of the population in the 50-mile region, and the small increases in the regional population would not materially impact the availability of medical services.

The proposed nuclear power plant and the associated population influx would likely economically benefit the disadvantaged population served by the Texas Department of Human Resources. The additional direct jobs would increase indirect jobs that could be filled by currently unemployed workers, thus removing them from social services client lists.

In 2002, Austin, Fort Bend, and Waller Counties' persons per law enforcement officer ratios were 347:1, 512:1, and 311:1, respectively (USCB Sep 2004). The persons per officer ratio for Texas was 490:1 (USCB Sep 2004). The 2002 persons per firefighter ratios in Austin, Fort Bend, and Waller counties were 167:1, 748:1, and 268:1, respectively (USFA Dec 2007). The persons per firefighter ratio for Texas was 342:1 (USFA Dec 2007). Ratios are partly dependent on population density. Fewer public safety officers are necessary for the same population if the population resides in a smaller area. The population increase in the three most affected counties from construction or operations employees relocating from outside the region could result in the need to hire additional emergency personnel. This is most likely to happen in Austin and Waller Counties. However, increased tax revenues would be adequate to pay the salaries of any additional emergency personnel hired.

As described above, it is not expected that public services would be materially impacted by new construction or operations employees relocating from outside the region. Impacts on public services are considered to be small if there is little or no need for changes in the level of service provided to the community. Therefore, impacts of construction and operation of the proposed nuclear power plant on public services would be SMALL and mitigation would not be warranted.

9.3.3.3.6.9 Education

As presented in Subsection 9.3.3.3.6.2, Exelon anticipates that most of the in-migrating workers in the construction and operation workforce would settle in Austin, Fort Bend, and Waller counties. Therefore, this analysis is restricted to the three counties that would be most affected by the new workforce.

Based on data for the 2005-2006 school year, Austin County has 13 pre-kindergarten through 12 (PK-12) schools with a total enrollment of 5620 students; Fort Bend County has 113 PK-12 schools with a total enrollment of 91,559 students; and Waller County has 17 PK-12 schools with a total enrollment of 8210 students (NCES 2007).

As addressed in Subsection 9.3.3.3.6.2, Exelon assumed that 70 percent of the 5985 in-migrating nuclear plant construction workers were likely to bring families: 4190 would bring families and 1795 would not. However, Exelon assumed that 100 percent of the overlapping operations workforce (197 people) would bring families. As in Subsection 4.4.2.2.8, Exelon assumes that the average number of school-aged children per worker who relocated his or her family was 0.8 (BMI Apr 1981). This would increase the school-aged population within 50 miles of the Alpha site by approximately 3510 students. Approximately 60 percent would settle in Austin County, 10 percent in Fort Bend County, and 30 percent in Waller County. The student populations in Austin, Fort Bend, and Waller counties would increase by 37.5 percent, 0.4 percent, and 12.8 percent, respectively. Small impacts are generally associated with project-related enrollment increases below 4 percent and large impacts on local school systems are generally associated with project-related enrollment increases above 8 percent. Therefore, the projected increase in the student population of Fort Bend County would have a small impact on the education system and mitigation would not be warranted. Projected increases in the student populations of Austin and Waller Counties would constitute large impacts. Mitigation measures similar to those addressed in Subsection 4.4.2 could be implemented if the proposed nuclear power plant were constructed at the Alpha site. The quickest mitigation would be to hire additional teachers and move modular classrooms to existing schools. Increased property tax revenues as a result of the increased population would fund additional teachers and facilities. No additional mitigation would be warranted.

For the purpose of analysis, Exelon conservatively assumes that all the operations employees would migrate to the region. If all 2600 employees and their families were to come from outside the region, the school-aged population in Austin, Fort Bend, and Waller counties would increase by approximately 640 students, or by 6.8 percent, 0.1 percent, and 2.3 percent, respectively. Therefore, the projected increase in the student populations of Fort Bend and Waller Counties would have a small impact on the education system and mitigation would not be warranted. Projected increases in the student population of Austin County would constitute a moderate impact. Mitigation measures similar to those addressed in Subsection 4.4.2 could be implemented if the proposed nuclear power plant were constructed at the Alpha site. As with construction, the quickest mitigation would be to hire additional teachers.

9.3.3.3.7 **Historic and Cultural Resources**

Exelon conducted historical and archaeological records searches on the National Park Service NRHP and reviewed information in the Allen's Creek Safety Analysis Report prepared in 1973.

A search of the NRHP identified 54 sites in the five counties surrounding the Alpha site. There are seven sites in Austin County (4 to 42 miles from the site), which encompasses the Alpha site. Two of these properties, the Allen's Creek Ossuary Site and the Church of the Guardian Angel, are in Willis, approximately 4 miles northwest of the Alpha site. There are five sites in Colorado County (27 miles from the site), 31 sites in Wharton County (25 miles from the site), five sites in Fort Bend County (17 to 22 miles from the site), and six sites in Waller County (28 miles from the site) (NPS 2008b).

Building the proposed nuclear power plant at the Alpha site would require a formal cultural resources survey to be conducted prior to construction. Mitigation measures similar to those described in Subsection 4.4.2 would be coordinated with the THC so that any impacts to cultural resources from construction or operation of the proposed nuclear power plant at the Alpha site would be SMALL.

9.3.3.3.8 **Environmental Justice**

Environmental justice refers to a federal policy under which each federal agency identifies and addresses, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. The NRC has a policy on the treatment of environmental justice matters in licensing actions (69 FR 52040) and guidance (U.S. NRC May 2004). Subsection 2.5.4.1 describes the methodology Exelon used to establish locations of minority and low-income populations.

The 2000 Census block groups were used for ascertaining minority and low-income populations in the area. There are 1816 block groups within 50 miles of the Alpha site. The Census Bureau data for Texas characterizes 11.5 percent of the population as black races, 0.6 percent as American Indian or Alaskan native, 2.7 percent as Asian, 0.1 percent as native Hawaiian or other Pacific Islander; 11.7 percent as all other races; 2.5 percent as multiracial, 29.0 percent as an aggregate of minority races, and 32.0 percent as Hispanic ethnicity. If any block group minority percentage exceeded 50 percent, then the block group was identified as containing a minority population. If any block group percentage exceeded its corresponding state percentage by more than 20 percent, then the block group was identified as having minority population. There are 388 block groups with significant black races populations, 68 block groups with significant Asian populations, 196 block groups with significant "other" race populations, 634 block groups with "aggregate of minority races," and 367 block groups with significant Hispanic populations. The locations of the minority populations within 50 miles of the Alpha site are shown in Figure 9.3-13.

The Census Bureau data characterizes 13.98 percent of Texas households as low-income. Based on the "more than 20 percent" criterion, 151 block groups contain a low-income population. The locations of the low-income populations within 50 miles of the Alpha site are shown in Figure 9.3-14.

Construction activities (noise, fugitive dust, air emissions, traffic) would not impact minority populations because of their distance from the Alpha site. In fact, minority and low-income populations would most likely benefit from construction activities through an increase in construction-related jobs. Operation of the proposed nuclear power plant at the Alpha site is unlikely to have disproportionate impacts on minority or low-income populations.

9.3.3.4 Evaluation of the Bravo Site

The 5000-acre Bravo site is on the west side of Henderson County 1 mile southwest of the town of Malakoff. State Highway 31 spans an east-west path approximately 0.5 mile north of the Bravo site; Cedar Creek defines the western boundary of the site; and the rest of the site is bordered by the former Trinity Lignite Mine site (Figure 9.3-15). Farmland occupies approximately 61 percent of the land in Henderson County.

The cooling system would consist of onsite cooling towers with an intake line to the Cedar Creek Reservoir, an onsite makeup water retention basin, and a discharge line to Walnut Creek. A transmission system consisting of new ROW would be required to connect the site to the surrounding grid. To analyze the effects of building a new nuclear plant, Exelon has assumed that the construction and operation practices described in ER Chapters 4 and 5 would generally be applied to the Bravo site; thereby, allowing for a consistent description of the impacts.

9.3.3.4.1 Land Use Including Site and Transmission Line Rights-of-Way

In the early 1980s, HL&P began construction of a coal-fired generation plant at the Bravo site; however, the project was cancelled and construction activities were discontinued. Today, based on aerial photography, about half the site is wooded and half is cleared for agricultural use. Construction of the power plant would alter land use at the site from agricultural and wooded to industrial use. However, Henderson County does not have any land use or zoning restrictions. The footprint of the plant would be approximately 3500 acres including switchyard, parking lots, temporary facilities, makeup water storage basin, cooling towers, laydown yards, and spoil storage. A paved road, less than 2 miles long (100-foot ROW), would be constructed to provide vehicle access from State Highway 31 to the Bravo Site. Development of the access road would require approximately 24 acres. Rail access is approximately 1.3 miles from the site (100-foot ROW), requiring approximately 16 acres.

A 3.8-mile water pipeline corridor would be required to transfer water south from Cedar Creek Reservoir to the site. Although the pipeline corridor would be installed underground, it is assumed that a 100-foot wide pipeline ROW would be required. This would impact approximately 46 acres of land.

Operations impacts to site land use would include permanent disturbance of the 3500-acre site area plus local road (24 acres) and rail (16 acres) access.

Because approximately half the site has been previously cleared and is now used for farm activities, land-use impacts associated with site preparation and construction of the proposed nuclear power plant at the Bravo site would be SMALL. Site land-use impacts from operations of the proposed nuclear power plant would be SMALL.

Four new transmission lines would be required to connect the proposed nuclear power plant with the Trinidad substation. Assuming a 400-foot wide ROW, the land affected would be approximately 390 acres. Two of these transmission lines would continue to the Venus substation. Sixty-five miles of power transmission would be needed to join to the 345 kV Venus substation, which serves as the primary path into Dallas and Fort Worth. New ROW would be required for some or all of the new transmission lines. For a 200-foot wide ROW and 65 miles of new transmission line, the land area affected would be around 1575 acres. The maximum land area affected would be approximately 1965 acres. Although Exelon would not be responsible for final routing and construction, the transmission service provider would be expected to comply with all applicable laws, regulations, and permit requirements, and use best management practices. Construction impacts of new transmission lines on offsite land use would be SMALL.

The new transmission line would not be expected to permanently affect agricultural areas, but it would have the potential to affect residents along the ROW. Corridor vegetation management and line maintenance procedures would be established by the transmission service provider. Operational impacts to land use along the ROWs would be SMALL.

9.3.3.4.2 **Air Quality**

The Bravo site is in western Henderson County in the Shreveport-Texarkana-Tyler Interstate AQCR (40 CFR 81.94). This AQCR is designated as unclassifiable/attainment with respect to the NAAQS (40 CFR 81.344). The nearest non-attainment area is Kaufman County which is designated as a Subpart 2 Moderate non-attainment area with respect to the 8-hour ozone standard (40 CFR 81.344). The southern boundary of Kaufman County is approximately 14 miles northwest of the Bravo site.

Air quality impacts from construction and operation of the proposed nuclear power plant at the Bravo site would be similar to those at the VCS site. Construction impacts would be temporary, and would be similar to any large-scale construction project. Construction emissions would primarily include fugitive dust from disturbed land and roads, and tailpipe emissions from construction equipment. Mitigation measures similar to those described for the VCS site would be applied. During station operation, auxiliary equipment such as diesel generators, combustion turbines, and boilers would be used. It is expected that this equipment would see limited use and, when they are used, they would operate for short time periods, and annual emission levels would be low. Air emissions from the auxiliary equipment are expected to be minimal and would not violate NAAQS.

The nearest Class I area to the Bravo site is the Wichita Mountains Wilderness Area in Oklahoma (40 CFR 81.424), more than 180 miles from the Bravo site; therefore, there is little potential for the project to impose visibility impacts to Class I areas. Overall, impacts to regional air quality would be SMALL.

9.3.3.4.3 **Hydrology, Water Use, and Water Quality**

The Bravo site lies over the Carrizo-Wilcox Aquifer. The Carrizo-Wilcox Aquifer is a major aquifer that extends across much of eastern Texas and covers 66 counties. The outcrop of the aquifer covers approximately 11,186 square miles, and the area in subsurface covers approximately 25,409 square miles. Sixty-three percent of the aquifer, including the area in the region of the Bravo site, is covered under a groundwater control district (TWDB Nov 2006).

Significant decreases in water levels have developed in the semiarid Winter Garden portion of the Carrizo-Wilcox Aquifer in south Texas because the region is heavily dependent on groundwater for irrigation. Significant water level declines resulting from extensive municipal and industrial use also have occurred in Northeast Texas around Tyler and the Lufkin-Nacogdoches area.

Henderson County is part of the Region C Water Planning Group, which is required to plan for future water needs under drought conditions. According to the 2006 Region C Water Plan, the projected groundwater supply available in Region C from the Carrizo-Wilcox Aquifer is 12,203 acre-feet per year throughout the 2010 through 2060 projection period (RCWPG Jan 2006). In 2004, Henderson County pumped approximately 5870 acre-feet of groundwater from the Carrizo-Wilcox Aquifer (TDWB 2008).

Exelon would use groundwater during construction for the potable water system, concrete production and curing, backfill operations, dust control, cleaning and lubrication, and hydro testing and flushing. Peak well water demand during construction is estimated to be approximately 580 gpm (Section 4.2.1.2). For station operations, Exelon estimates that a maximum of 1200 gpm of groundwater would be necessary. Compared with the projected groundwater supply from the Carrizo-Wilcox aquifer, groundwater use for construction and operations of nuclear units at the Bravo site would represent a very small percentage of total supply (less than 12 percent). Therefore, construction and operations impacts to groundwater would be SMALL.

To ensure that wetlands and streams are not harmed by petroleum products or other industrial chemicals, Exelon would restrict certain activities (e.g., transfer and filling operations) that involve the use of petroleum products and solvents to designated areas, such as laydown, fabrication, and shop areas. In addition, construction activities would be guided by a Stormwater Pollution Prevention Plan and a construction-phase Spill Prevention, Control, and Countermeasures Plan similar to those proposed for VCS as described in Subsection 4.2.4. Therefore, any impacts to surface water during plant construction would be SMALL and would not warrant mitigation beyond best management practices required by the permits.

The normal consumptive water use during operations by the cooling towers would be 57,800 gpm (Table 9.4-3). Water for the proposed cooling system at Bravo site could be provided by a number of available water sources.

Richland Chambers Reservoir, owned and operated by Tarrant Regional Water District (TRWD), is approximately 13.5 miles southwest of Bravo site. It was completed in 1987 with a firm yield of approximately 210,000 acre-feet per year (130,000 gpm). This yield is expected to decline from 188,000 acre-foot per year (116,000 gpm) in 2010 to 153,000 acre-foot per year (95,000 gpm) in 2060 due to sedimentation in the reservoir.

Cedar Creek Reservoir, also operated by the TRWD, is approximately 3.8 miles north of the site. Cedar Creek is estimated to have a firm yield of approximately 153,000 acre-feet per year (95,000 gpm) reducing to 139,000 acre-feet per year (86,000 gpm) in 2060 due to sedimentation.

While much of the supply in this reservoir system has been allocated to existing users, firm supplies remain. Additionally, other surface water supplies are available. For example, Lake Palestine, the Upper Neches River, and the Trinity River have both obtainable water and water potentially available under water supply contracts to support plant operation. Although ample surface water is available in the region (1.5 million acre-feet according to 2006 region C Plan), construction of the nuclear generation units at the Bravo site would require modifications to the existing long-range water management plans for the region and would therefore have a MODERATE impact on regional surface water supplies.

During operation, the cooling water system would likely withdraw water from the Cedar Creek Reservoir or Richland Chambers Reservoir and discharge water to the Trinity River via Walnut Creek. Construction of cooling towers would be required. The Bravo site would operate under a NPDES permit issued by the TCEQ. As authorized by the Clean Water Act, the NPDES permit program controls water pollution by regulating discharges into waters of the United States. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. The permit contains limits on what can be discharged, monitoring and reporting requirements, and other provisions to ensure that the discharge does not degrade water quality or human health. Any releases of contaminants to the Trinity River or other Texas waters as a result of construction or operation of the proposed nuclear power plant at the Bravo site would be regulated by the TCEQ through the NPDES permit process to ensure that water quality is protected. The impacts of discharges to surface water would be minimized by the same mitigation measures as those presented for the proposed site in Section 4.2 and Subsection 5.2.2. Therefore, impacts to water quality would be SMALL.

9.3.3.4.4 **Terrestrial Resources Including Protected Species**

The plant site is southeast of Dallas, Texas, immediately east of the Trinity River, and is situated in southwestern Henderson County. The terrain at the site is relatively flat, being in the Trinity River flood plain. Much of the site is open cropland and pasture, but some hardwood riparian areas exist along the Trinity River and Cedar Creek. The vegetation in the area surrounding this proposed site consists of mixed pine and hardwoods, including oak, elm, hackberry, and pecan. Along the Trinity River, the western border of the county, lie the bottomlands of the floodplain, where the vegetation features mixed hardwoods and a dense undergrowth of scrubs and vines typical of the East Texas mixed forests (TSHA 2008). Some land would have to be cleared for the construction of site facilities. Also, a makeup water intake line from the site to Cedar Creek Reservoir would have to be constructed. This line would be approximately 3.8 miles long and would require approximately 46 acres of corridor.

One federally listed terrestrial species has the potential to occur in Henderson County and therefore in the vicinity of the Bravo site. This species is the bald eagle (recently federally de-listed). Although de-listed under the Endangered Species Act, it remains protected under the Bald and Golden Eagle Protection Act (72 FR 37346-37372). In addition, Henderson County has 10 state-protected species, including seven birds, two mammals, and one reptile.

As mentioned in Subsection 9.3.3.4.1, it is assumed that four 345 kV transmission lines requiring a 400-foot wide ROW (8 miles long) would be needed to connect the proposed nuclear power plant to the Trinidad substation. Two new lines, requiring a 200-foot ROW, would continue to the Venus substation. Land clearing associated with construction of plant facilities and transmission lines would be conducted according to federal and state regulations, permit conditions, existing Exelon procedures, good construction practices, and established best management practices (e.g., directed drainage ditches, silt fencing). With this in mind, impacts to terrestrial resources, including endangered and threatened species, from operation of the Bravo site plant and transmission lines would probably be SMALL.

9.3.3.4.5 **Aquatic Resources Including Endangered Species**

The Bravo site is near the city of Malakoff in Henderson County. Water for the proposed plant would be withdrawn from the Cedar Creek Reservoir north of the site. The reservoir is estimated to have a firm yield of approximately 153,000 acre-feet reducing to 139,000 acre-feet in 2060 because of sedimentation. There are no known federally listed aquatic species in Henderson County.

Discharge from the facility would go to Walnut Creek. This creek is part of the Trinity River watershed. Impacts to the aquatic environment during construction of the plant would be minimal. The construction of cooling water intake and discharge structures would be necessary if a nuclear power plant were constructed at the Bravo site. The design of the intake structure would comply with the requirements of Section 316(b) of the Clean Water Act, thereby reducing the potential impacts of entrainment and impingement to sensitive species. The design of the new discharge system would comply with the requirements of the Clean Water Act thereby reducing the potential impacts of increased thermal discharge temperatures on sensitive species. The discharge to Walnut Creek would also comply with NPDES guidelines.

Based on a review of the available information construction impacts to aquatic biota would be SMALL. Impacts due to plant operations would also be SMALL.

9.3.3.4.6 **Socioeconomics**

This subsection evaluates the social and economic impacts to the surrounding region as a result of constructing and operating the proposed nuclear power plant at the Bravo site. The evaluation assesses impacts of construction, station operation, and demands placed by the construction and operation workforce on the surrounding region.

9.3.3.4.6.1 Physical Impacts

Construction activities can cause temporary and localized physical impacts such as noise, odor, vehicle exhaust, and dust. Vibration and shock impacts would not be expected due to the strict control over construction activities. The use of public roadways and railways would be necessary to transport construction materials and equipment. Most construction activities would occur in the boundaries of the Bravo site. However, an access road and a connecting rail spur (requiring approximately 30 acres) would be constructed on lands adjacent to the site. These new transportation ROW would be routed to avoid residences and populated areas. Offsite areas that would support construction activities (for example, borrow pits, quarries, and disposal sites) are expected to be already permitted or would be permitted prior to operation. Impacts on those facilities from construction of the proposed nuclear power plant would be small incremental impacts associated with their normal operation.

Potential impacts from station operation include noise, exhausts, thermal emissions, and visual intrusions. The proposed nuclear power plant would produce noise from the operation of pumps, fans, transformers, turbines, generators, and switchyard equipment, and traffic at the site would also be a source of noise. However, noise attenuates quickly so ambient noise levels would be minimal at the site boundary. Also, the Bravo site is in a rural area surrounded by forests and agricultural land, with few residents in the area. Commuter traffic would be controlled by speed limits, which could reduce the dust and noise level generated by the workforce commuting to the site.

During operation, the proposed nuclear power plant would have auxiliary equipment such as diesel generators, combustion turbines, and boilers. It is expected that this equipment would be operated infrequently, for short durations.

In summary, construction activities would be temporary and would occur mainly in the boundaries of the Bravo site. Offsite impacts would represent small incremental changes to offsite services supporting the construction activities. During station operation, ambient noise levels would be minimal at the site boundary. Therefore, the physical impacts of construction and operation of the proposed nuclear power plant at the Bravo site would be SMALL.

9.3.3.4.6.2 Demography

The Bravo site is in Henderson County, Texas. The population distribution near the site is low with typical rural characteristics.

As presented in Subsection 4.4.2, Exelon anticipates employing 6300 construction and 197 operations workers during the peak construction period (Table 3.10-2). Exelon anticipates that approximately 5985 construction and 197 operations workers would relocate to the area. Based on their proximity to the Bravo site, Exelon estimates that most of construction workers would locate in Henderson and Navarro Counties. Approximately 60 percent would settle in Henderson County, primarily in Athens and Malakoff, and 40 percent in Navarro County, primarily in Corsicana. In reality, some workers could locate to one of the other counties within 50 miles of the site.

Based on the 2000 Census, the total population of the two most affected counties is 118,401 people. The 2000 population in the counties was 73,277 in Henderson County and 45,124 in Navarro County (USCB 2000a). In 2000, the population within 50 miles of the site was 603,832 people (76.9 people per square mile), and the population within 20 miles of the site was 68,838 people (54.8 people per square mile). The nearest population center, as defined in 10 CFR 100, is Dallas, Texas (population 5,221,801); northwest of the Bravo site. The distance between the Bravo site and Dallas is approximately 60 air miles. Based on the sparseness and proximity matrix in NUREG-1437, the Bravo site is in a medium population area.

As addressed in Subsection 4.4.2, approximately 70 percent of the in-migrating construction workers and 100 percent of operations workers are likely to bring families. Therefore, of 5985 construction workers, 4190 would bring families into the 50-mile region, for a total of 4387 construction and operations workers bringing families. Assuming an average family household size of 3.25 people, construction would increase the population in the 50-mile region by 16,053 people, which is approximately 2.7 percent of the region's population in 2000. As stated previously, it is assumed that approximately 9632 (60 percent) people would locate to Henderson County and 6421 (40 percent) people would locate to Navarro County. These numbers constitute 13.1 percent and 14.2 percent of the 2000 Census populations of Henderson and Navarro Counties, respectively.

Exelon is adopting the NRC definition of impacts as small if plant-related population growth is less than 5 percent of the study area's total population and large if plant-related population growth is greater than 20 percent. Therefore, the potential increases in population during construction of the proposed nuclear power plant at the Bravo site would represent moderate impact to the population in Henderson and Navarro Counties and a SMALL impact to the total population elsewhere in the 50-mile region. Mitigation methods would be similar to those described in Subsection 4.4.2.

Exelon assumed the operations workforce would have the same residential distribution as the construction workforce. Exelon estimates that 800 workers (Subsection 3.10.3) would be required for the operation of two nuclear power facilities at the Bravo site. For the purpose of analysis, Exelon conservatively assumes that all the new employees would migrate into the region. Employees relocating to the region would most likely choose to live in Henderson or Navarro Counties. However, for the purpose of analysis, Exelon assumed that all 800 employees and their families would come from outside the region. The 800 employees would translate into an additional 2600 people (assuming an average family household size of 3.25 people). Based on the counties' proximity to the site, approximately 1560 (60 percent) people would locate to Henderson County and 1040 (40 percent) people would locate to Navarro County. These numbers constitute 2.1 percent and 2.3 percent of the 2000 Census populations of Henderson and Navarro Counties, respectively. Overall, the potential increase in population from operation of the proposed nuclear power plant at the Bravo site would represent a SMALL impact to the total population throughout the 50-mile region, and mitigation would not be warranted.

9.3.3.4.6.3 Economy

Based on 2000 census data in the two most affected counties near the Bravo site, there are 51,679 people in the civilian labor force. Of the civilian labor force, 93.0 percent are employed and 7.0 percent are unemployed. In 2000, Henderson County had a civilian labor force of 31,643 people and an unemployment rate of 6.5 percent. Navarro County had a civilian labor force of 20,036 people and an unemployment rate of 7.8 percent (USCB 2000c).

As described in Subsections 4.4.2.1 and 5.8.2.1, the wages and salaries of the construction and operations workforce would have a multiplier effect that could result in increases in business activity, particularly in the retail and service sectors. This would have a positive impact on the business community and could provide opportunities for new businesses, and increased job opportunities for local residents. The economic effect on the 50-mile region would be beneficial. For the purpose of analysis, Exelon conservatively assumes that direct jobs would be filled by an in-migrating workforce, but most indirect jobs would be service-related, not highly specialized, and would be filled by the existing workforce in the 50-mile region. Expenditures made by the direct and indirect workforce would strengthen the regional economy. This would be considered a positive impact.

As addressed in Subsection 9.3.3.4.6.2, Exelon estimates that 5985 construction and 197 operations workers would in-migrate to the region during peak construction of the proposed nuclear power plant at the Bravo site. Assuming a multiplier of 1.68 jobs (direct and indirect) for every construction job and a multiplier of 2.79 for each operations job (BEA 2008c), an influx of 5985 construction and 197 operations workers would create 4439 indirect jobs, permanent or temporary, for a total of 10,621 new jobs in the 50-mile region. The number of new jobs would represent approximately 20.1 percent of the employment in Henderson County and 21.2 percent of the employment in Navarro County.

Exelon is adopting the NRC definition of impacts as small if plant-related employment is less than 5 percent of the study area's total employment and large if plant-related employment is greater than 10 percent. Exelon concludes that the impacts of construction on the economy would be beneficial and SMALL everywhere in the region except Henderson and Navarro Counties, where the impacts could be beneficial and large.

As presented in Subsection 9.3.3.4.6.2, approximately 800 workers would be required for the operation of the two assumed nuclear power facilities at the Bravo site, and Exelon assumes that all the new employees would migrate into the region. Assuming a multiplier of 2.79 jobs (direct and indirect) for every operations job at the new units (BEA 2008c), an influx of 800 workers would create 1429 indirect jobs for a total of approximately 2229 new jobs in the region. The number of new jobs would represent approximately 4.2 percent of the employment in Henderson County and 4.5 percent of the employment in Navarro County. Because most indirect jobs are service-related and not highly specialized, Exelon assumes that most, if not all, indirect jobs would be filled by the existing labor force in the 50-mile region. Exelon concludes that the impacts of operation of two nuclear power facilities on the economy would be beneficial and SMALL everywhere in the region.

9.3.3.4.6.4 Taxes

Taxes collected as a result of constructing and operating the proposed nuclear power plant at the Bravo site would be of benefit to state and local taxing jurisdictions. In Texas, property tax assessments are made by the county appraisal district, which bases its appraisal on a consideration of cost, income, and market value. This appraisal is used by all taxing jurisdictions in the county, including special districts and independent school districts, which apply their individual millage rates to determine the taxes owed. Based on the analysis in Subsection 4.4.2.2.2, Exelon anticipates that additional property taxes would be paid to Henderson County during the construction period.

In 2006, Henderson County had property tax revenues of $21,986,101 (Combs Jan 2008). Assuming that tax payments to Henderson County for nuclear power facilities at the Bravo site would be similar to those of the VCS site (Section 4.4.2.2.2 and 5.8.2.2.2), the tax payments would represent a large portion of the tax revenue for the county. For the operations period, Exelon estimates its total payment to all taxing entities would be approximately $24 million, annually. Table 5.8-14 estimates the county property tax for VCS at approximately $6.9 million. The benefits of taxes are considered small when new tax payments by the nuclear plant constitutes less than 10 percent of total revenues for local jurisdictions and large when new tax payments represent more than 20 percent of total revenues. The projected operations-phase taxes for the nuclear power facilities represent more than 30 percent of current property tax revenues for Henderson County. Therefore, Exelon concludes that the potential beneficial impacts of taxes collected during construction of the proposed project would be moderate to large in Henderson County and SMALL in the remainder of the 50-mile region. The potential beneficial impacts of taxes collected during operations would be large in Henderson County and SMALL in the remainder of the 50-mile region.

The Bravo site is in the Malakoff ISD, which is categorized as a property-wealthy district (see Subsection 2.5.2.3.5). Increased tax revenues would therefore have only a SMALL positive impact to the Malakoff ISD. In-migrating construction and operation workers would result in larger enrollments in the ROI schools, which would not receive direct property tax revenues from the plant. Because the Texas school funding formula is based on weighted average daily attendance, increases in the number of students would lead to increased funding, but would also result in the additional expenses related to a larger student body. Fiscal impacts to the ISD from increased enrollment would be small to moderate, depending on their existing capacity, funding status, and fiscal condition. Subsection 9.3.3.4.6.9 discusses capacity and enrollment issues for the Bravo site ROI in detail.

9.3.3.4.6.5 Transportation

The regional and local road system is shown on Figure 9.3-15. Highway access to the Bravo site is provided by FM 90, a two-lane paved road. The Bravo site is approximately 60 miles southeast of Dallas. Two interstate roadways provide access to the region, Interstate 20 to the north of the site and Interstate 45 to the south. Just north of the site is State Highway 31, which has an interchange with Interstate 45 at Corsicana. TX 31 is a divided four-lane highway that stretches east-west nearly linking the two interstates. A traveler must go north on U.S. 69 in Tyler for approximately 7 miles to reach an interchange with Interstate 20.

The average annual traffic count south of Malakoff along FM 90 is 3900 vehicles per day (TXDOT 2006). In keeping with the analysis in Subsection 4.4.2.2.4, the maximum number of vehicles on a highway in a single hour is estimated to be 10 percent of the daily average. Therefore, Exelon estimates the maximum number of cars on FM 90 in a single hour to be 390. The largest impact on traffic would be during the construction period day/back shift change, with up to 6182 vehicles entering or leaving the site. FM 90 has a threshold capacity of 2300 passenger cars per hour.

Transportation impacts are considered to be small when increases in traffic do not result in delays or other operational problems; impacts are moderate when increases in traffic begin to cause delays or other operational problems.

Assuming construction shifts as described in Subsection 4.4.2.2.4, the additional traffic that could be on the road during shift changes could cause potential congestion. Also, the traffic of hauling construction materials (100 trucks per day) to the site could bring additional congestion during certain times of the day. Shift changes for the proposed nuclear power plant at the Bravo site could be staggered to mitigate the impact on traffic. Impacts of construction on transportation would be SMALL to MODERATE on the two-lane roads in Henderson County, particularly Highway 31 and FM 90, and some mitigating actions such as those described in Subsection 4.4.2.2.4 would be needed.

With respect to facility operations, the addition of 800 cars (assuming a single occupant per car) to the existing traffic on Highway 31 or FM 90 would not materially congest the roadways. Shift changes for the proposed nuclear power plant at the Bravo site would be staggered resulting in a limited traffic increase that would not cause congestion. Impacts of the operations workforce on transportation would be SMALL and mitigation would not be warranted.

9.3.3.4.6.6 Aesthetics and Recreation

The Bravo site encompasses approximately 5000 acres in the southwestern part of Henderson County. Natural and man-made features that give the landscape its character include topographic features, vegetation, and existing structures. The topography of the region consists of undulating hills with elevations ranging from 256 to 763 feet above MSL (TSHA 2008). The vegetation of the area features mixed hardwoods and a dense undergrowth of shrubs and vines (TSHA 2008). The site was originally used for lignite mining and then later considered for a coal-fired generating facility by Houston Lighting and Power. Most of the site is rural, undeveloped agricultural fields, but there are industrial facilities constructed in the northeastern corner of the property.

The property is on the outskirts of the town of Malakoff. Other nearby residential areas that could be affected by construction are Trinidad, 3 miles to the west, and Star Harbor, 2.5 miles to the north. Cedar Creek Reservoir is a 34,000 acre lake 2.5 miles to the north of the site and is the largest recreational area in the region. Additionally, Creslenn Park, Cain Civic Center Park, and Purtis Creek State Park are located 7 miles southwest, 10.5 miles east in downtown Athens, and 14 miles north, respectively.

The attractiveness of the southern part of the Cedar Creek Reservoir for sport fishing and other recreational uses could be impacted during construction of intake and discharge structures. Other recreational areas would be affected by increased traffic on area roads during peak travel periods, but impacts would be minimal. During the operating period, it is expected that some employees and their families would use the recreational facilities in the region. However, the increase attributable to plant operations would be small compared to overall use of these facilities. Impacts on tourism and recreation are considered small if current facilities are adequate to handle local levels of demand. Therefore, impacts of facility construction and operation on tourism and recreation would be SMALL.

The construction and operation of the proposed nuclear power plant at the Bravo site would have minimal impacts on aesthetic and scenic resources. The upper portions of facility structures would potentially be visible from elevated areas near the site. There would be occasional visible plumes associated with the cooling towers. The visibility of the plumes would be dependent upon the weather and wind patterns and the location of the viewer in the general topography of the area. Impacts on aesthetic resources are considered to be moderate if there are some complaints about diminution in the enjoyment of the physical environment and measurable impacts that do not alter the continued functioning of socioeconomic institutions and processes. Construction and operation of an industrial facility on a previously undeveloped site would likely result in some complaints from the affected public regarding diminution in the enjoyment of the physical environment. Therefore, impacts of construction and operation of the proposed nuclear power plant on aesthetics would be MODERATE and could warrant mitigation.

9.3.3.4.6.7 Housing

Impacts on housing from the construction labor force depend on the number of workers already residing in the 50-mile region and the number that would relocate and require housing.

As described in Subsection 9.3.3.4.6.2, approximately 5985 construction and 197 operations workers would migrate into to the 50-mile region. Of these, approximately 3709 (60 percent) would settle in Henderson County and 2473 (40 percent) would settle in Navarro County.

In 2000, a total of 9089 vacant housing units were available for sale or rent in Henderson and Navarro Counties. Exelon estimates that, in absolute numbers, the available housing would be sufficient to house the workforce. However, there may not be enough housing of the type desired by the movers in each county, especially in Navarro County. The median price of housing in Henderson County in 2000 was $75,300. The median price of housing in Navarro County was $56,700 for the same year (USCB 2000d). If pricing is too high, workers would relocate to other areas in the 50-mile region, have new homes constructed, bring their own housing, or live in hotels and motels. Given this increased demand for housing, prices of existing housing could rise to some degree. Henderson and Navarro Counties (and other counties to a lesser extent) would benefit from increased property values and the addition of new houses to the tax rolls. Increasing the demand for homes could increase rental rates and housing prices. It is unlikely, but possible, that some low-income populations could be priced out of their rental housing due to upward pressure on rents. However, the construction workforce would increase over time. The gradual influx of new residents would give the housing market time to adjust to the additional demands.

In summary, the two counties where most of the construction workforce would seek housing have adequate housing resources for the entire workforce. Impacts on housing are considered to be small when a small and not easily discernable change in housing availability occurs, and impacts are considered to be moderate when there is a discernable but short-lived reduction in the availability of housing units. Exelon concludes that the potential impacts of construction on housing could be moderate to large in Henderson and Navarro Counties and would be SMALL in the remainder of the 50-mile region. Mitigation would not be warranted where the impacts are small. Mitigation of the moderate to large impacts would most likely be market-driven but may take some time. Additional mitigation measures similar to those addressed in Subsection 4.4.2 could also be implemented.

Exelon estimates that approximately 800 workers would be needed for operation of the assumed two conventional advanced LWR nuclear power facilities at the Bravo site. For the purpose of analysis, Exelon conservatively assumes that all the new employees would migrate to the region. Employees relocating to the region would most likely be scattered throughout the counties in the region, with most choosing to live in Henderson or Navarro counties. If all 800 employees and their families were to come from outside the region, it is likely that adequate housing would be available in the region, especially in the larger metropolitan areas. In the two most affected counties, the average income of the new workforce would be expected to be higher than the median or average income in the county; therefore, the new workforce could exhaust the high-end housing market and some new construction could result.

Exelon concludes that the potential impacts of operations on housing in Henderson and Navarro Counties would be small to moderate and SMALL elsewhere in the 50-mile region. Market forces could result in more housing being built in the two-county region, eventually mitigating any housing shortages. Additional mitigation would not be warranted.

9.3.3.4.6.8 Public Services

Public services include water supply and wastewater treatment facilities; police, fire and medical facilities; and social services. As described in Subsection 9.3.3.4.6.2 construction of the proposed nuclear power plant at the Bravo site would increase the population in the 50-mile region by 16,053 people (2.7 percent of the population in the region). The new construction employees and their families would increase the total population in Henderson County by 13.1 percent, and in Navarro County by 14.2 percent. Operation of the proposed nuclear power plant at the Bravo site would increase the population in the 50-mile region by 2600 people (0.4 percent of the population in the region). The new operations employees and their families would increase the total population in Henderson County by 2.1 percent and Navarro County by 2.3 percent.

New construction or operations employees relocating from outside the region would most likely live in residentially developed areas where adequate water supply and waste treatment facilities already exist. The medical facilities in the two-county area provide medical care to much of the population in the 50-mile region, and the small increases in the regional population would not materially impact the availability of medical services.

The proposed nuclear power plant and the associated population influx would likely economically benefit the disadvantaged population served by the Texas Department of Human Resources. The additional direct jobs would increase indirect jobs that could be filled by currently unemployed workers, thus removing them from social services client lists.

In 2002, Henderson and Navarro Counties' persons per law enforcement officer ratios were 733:1 and 78:1, respectively (USCB Sep 2004). The persons per officer ratio for Texas is 490:1 (USCB Sep 2004). The 2002 persons per firefighter ratios in Henderson and Navarro Counties were 452:1 and 83:1, respectively (USFA Dec 2007). The persons per firefighter ratio for Texas is 342:1 (USFA Dec 2007). Ratios are partly dependent on population density. Fewer public safety officers are necessary for the same population if the population resides in a smaller area. The population increase in the two most affected counties from construction or operations employees relocating from outside the region could result in the need to hire additional emergency personnel. This is most likely to happen in Henderson and Navarro Counties. However, increased tax revenues would be adequate to pay the salaries of any additional emergency personnel hired.

As addressed above, it is not expected that public services would be materially impacted by new construction or operations employees relocating from outside the region. Impacts on public services are considered to be small if there is little or no need for changes in the level of service provided to the community. Therefore, impacts of construction and operation of the proposed nuclear power plant on public services would be SMALL and mitigation would not be warranted.

9.3.3.4.6.9 Education

As presented in Subsection 9.3.3.4.6.2, Exelon anticipates that most of in-migrating workers in the construction and operation workforces would settle in Henderson and Navarro counties. Therefore, this analysis is restricted to the two counties that would be most affected by the new workforce.

Based on data for the 2004-2005 school year, Henderson County has 33 pre-kindergarten through 12 (PK-12) schools with a total enrollment of 10,602 students and Navarro County has 26 PK-12 schools with a total enrollment of 9650 students (NCES 2007).

As described in Subsection 9.3.3.4.6.2, Exelon assumed that 70 percent of the 5985 in-migrating nuclear plant construction workers were likely to bring families: 4190 would bring families and 1795 would not. However, Exelon assumed that 100 percent of the overlapping operations workforce (197 people) would bring families. As in Subsection 4.4.2.2.8, Exelon assumes that the average number of school-aged children per worker who relocated his or her family was 0.8 (BMI Apr 1981). This would increase the school-aged population within 50 miles of the Bravo site by approximately 3510 students. Approximately 40 percent would settle in Navarro County and 60 percent in Henderson County. The student populations in Henderson and Navarro counties would increase by 19.9 percent and 14.5 percent, respectively. Small impacts are generally associated with project-related enrollment increases below 4 percent, and large impacts on local school systems are generally associated with project-related enrollment increases above 8 percent. Therefore, the projected increase in the student population would constitute a SMALL impact on the education system everywhere in the 50-mile region except Henderson and Navarro Counties where the projected increases in the student populations would constitute large impacts. Mitigation measures similar to those addressed in Subsection 4.4.2 could be implemented if the proposed nuclear power plant were constructed at the Bravo site. The quickest mitigation would be to hire additional teachers and move modular classrooms to existing schools. Increased property tax revenues as a result of the increased population would fund additional teachers and facilities. No additional mitigation would be warranted.

For the purpose of analysis, Exelon conservatively assumes that all the new employees would migrate into the region. If all 800 employees and their families were to come from outside the region, the school-aged population in Henderson and Navarro Counties would increase by approximately 640 students, or by 3.6 percent and 2.7 percent, respectively. These increases in student population are below 4 percent of the total student populations in these counties, hence project-related enrollment increases would constitute a SMALL impact on the education systems and mitigation would not be warranted.

9.3.3.4.7 **Historic and Cultural Resources**

Exelon conducted historical and archaeological records searches on the National Park Service's NRHP and reviewed information on historic and archaeological sites provided in documents associated with the canceled Malakoff coal-fired unit.

Several archaeological sites were identified at the Bravo site during cultural resources surveys to support the cancelled coal-fired unit. The sites were evaluated for listing in the National Register but none were eligible.

A search of the NRHP identified 34 sites in the three counties surrounding the Bravo site; including 6 sites in Navarro County (24 miles from the site), 26 sites in Anderson County (25 miles from the site), 1 site in Freestone County (40 miles from the site), and 1 site in Henderson County (12 miles from the site) (NPS 2008c). No properties are within 10 miles of the Bravo site (NPS 2008c).

Building the proposed nuclear power plant at the Bravo site would require a formal cultural resources survey to be conducted so that no archaeological or historic resources would be damaged during construction. Mitigative measures would be coordinated with the THC to prevent permanent damage and ensure that any impacts to cultural resources from construction or operation of the proposed nuclear power plant at the Bravo site would be SMALL.

9.3.3.4.8 **Environmental Justice**

Environmental justice refers to a federal policy under which each agency identifies and addresses, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. NRC has a policy on the treatment of environmental justice matters in licensing actions (69 FR 52040) and guidance (U.S. NRC May 2004). Subsection 2.5.4.1 describes the methodology Exelon used to establish locations of minority and low-income populations.

The 2000 Census block groups were used for ascertaining minority and low-income populations in the area. There are 476 block groups within 50 miles of Bravo. The Census Bureau data for Texas characterizes 11.5 percent of the population as black races, 0.6 percent as American Indian or Alaskan native, 2.7 percent as Asian, 0.1 percent as native Hawaiian or other Pacific Islander, 11.7 percent as all other races, 2.5 percent as multiracial, 29.0 percent as an aggregate of minority races, and 32.0 percent as Hispanic ethnicity. If any block group minority percentage exceeded 50 percent, then the block group was identified as containing a minority population. If any block group percentage exceeded its corresponding state percentage by more than 20 percent, then the block group was identified as having minority population. There are 69 block groups with significant black races with 50 miles of the Bravo site, there are 11 block groups with “other” minority populations, 68 block groups with significant aggregate races, and 14 block groups with significant Hispanic populations. The locations of the minority populations within 50 miles of the Bravo site are shown in Figure 9.3-16.

The Census Bureau data characterizes 14 percent of Texas households as low-income. Based on the “more than 20 percent” criterion, 25 block groups contain a low-income population. The locations of the low-income populations in the 50-mile radius of the Bravo site are shown in Figure 9.3-17.

Construction activities (noise, fugitive dust, air emissions, traffic) would not impact minority populations because of their distance from the Bravo site. In fact, minority and low-income populations would most likely benefit from construction activities through an increase in construction-related jobs. Operation of the proposed nuclear power plant at the Bravo site is unlikely to have a disproportionate impact on minority or low-income populations.

9.3.4 Summary and Conclusions

The decision to locate the nuclear power units at the VCS site was based on the implementation of a site selection process that evaluated 22 potential sites (Subsection 9.3.2) and concluded with the comparison of the five candidate sites. The Victoria County site ranked higher than the four alternative sites based on the environmental criteria ratings (health and safety, environmental, and socioeconomic). A comparison of projected construction and operational impacts at the proposed and alternative sites demonstrates that there is no significant difference in environmental impact among the five candidate sites. For these reasons, there is no alternative site that is "environmentally preferable" to the Victoria County site.

Tables 9.3-2 and 9.3-3 compare the environmental impacts of construction and operation of the proposed nuclear power plant at each of the alternative sites with impacts at the VCS site. This site-by-site comparison did not result in identification of a site environmentally preferable to the proposed VCS site. Therefore, no additional analysis is required to determine whether the candidate sites are "obviously superior" to the proposed VCS site.

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Table 9.3-1
Sites Considered by Exelon

Site Name	County
Alpha	Austin
Bravo	Henderson
Victoria County	Victoria
Buckeye	Matagorda
Matagorda County	Matagorda
Powderhorn Ranch	Calhoun
Placedo	Victoria
Franzen	Matagorda
Womack	Victoria
Sam Rayburn Reservoir Area	Nacogdoches
Rusk County	Rusk
Navarro County	Navarro
Occidental-Hardy	Matagorda
Douglas-Runnels	Matagorda
O'Connor Tract	Victoria
Munson	Grayson
Red River	Cooke
Moss Lake	Cooke
McGregor	McLennan
Hughes Farm	Williamson
South Texas Project	Matagorda
Comanche Peak	Somervell

Table 9.3-2
Characterization of Construction Impacts at the VCS Site and Alternative Sites

Category	Victoria County	Matagorda County	Buckeye	Alpha	Bravo
Land Use Impacts					
The Site and Vicinity	SMALL	SMALL	SMALL	SMALL	SMALL
Transmission rights-of-way	SMALL	SMALL	SMALL	SMALL	SMALL
Air Quality	SMALL	SMALL	SMALL	SMALL	SMALL
Water Related Impacts					
Water Use	SMALL	SMALL	SMALL	LARGE	MODERATE
Water Quality	SMALL	SMALL	SMALL	SMALL	SMALL
Ecological Impacts					
Terrestrial Ecosystems	MODERATE	SMALL	MODERATE	SMALL to MODERATE	SMALL
Aquatic Ecosystems	SMALL	SMALL	SMALL	SMALL to LARGE	SMALL
Threatened and Endangered Species	SMALL	SMALL	SMALL	LARGE	SMALL
Socioeconomic Impacts					
Physical Impacts	SMALL	SMALL	SMALL	SMALL	SMALL
Demography	MODERATE	MODERATE	MODERATE	SMALL	SMALL
Economy	SMALL to MODERATE (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)	SMALL
Taxes	SMALL to MODERATE (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)	LARGE (Beneficial)	MODERATE to LARGE (Beneficial)
Transportation	SMALL	MODERATE to LARGE	MODERATE to LARGE	SMALL to MODERATE	SMALL to MODERATE
Aesthetics	SMALL to MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Socioeconomic Impacts					
Recreation	SMALL to MODERATE	SMALL	SMALL	SMALL	SMALL
Housing	SMALL	SMALL	SMALL	SMALL	SMALL
Public and Social Services	SMALL to MODERATE	SMALL	SMALL	SMALL	SMALL
Education	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE
Historic and Cultural Resources	SMALL to LARGE[(a)]	SMALL	SMALL	SMALL	SMALL
Environmental Justice	None[(b)]	None[(b)]	None[(b)]	None[(b)]	None[(b)]

(a) Physical impacts to cultural resources would be SMALL. Visual impacts to historical properties could potentially be LARGE.
(b) Adverse and disproportionate impacts to minority and low-income populations have not been identified.

Table 9.3-3
Characterization of Operations Impacts at the Victoria County Site and Alternative Sites

Category	Victoria County	Matagorda County	Buckeye	Alpha	Bravo
Land Use Impacts					
The Site and Vicinity	SMALL	SMALL	SMALL	SMALL	SMALL
Transmission rights-of-way	SMALL	SMALL	SMALL	SMALL	SMALL
Air Quality	SMALL	SMALL	SMALL	SMALL	SMALL
Water Related Impacts					
Water Use	SMALL	SMALL	SMALL	LARGE	MODERATE to LARGE
Water Quality	SMALL	SMALL	SMALL	SMALL	SMALL
Ecological Impacts					
Terrestrial Ecosystems	SMALL	SMALL	MODERATE	SMALL	SMALL
Aquatic Ecosystems	SMALL	SMALL	SMALL	SMALL	SMALL
Threatened and Endangered Species	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomic Impacts					
Physical Impacts	SMALL	SMALL	SMALL	SMALL	SMALL
Demography	SMALL	SMALL	SMALL	SMALL	SMALL
Economy	SMALL (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)	SMALL
Taxes	SMALL to LARGE (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)
Transportation	SMALL	SMALL to MODERATE	SMALL	SMALL	SMALL
Aesthetics	SMALL to MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Recreation	SMALL to MODERATE	SMALL	SMALL	SMALL	SMALL
Housing	SMALL	SMALL	SMALL	SMALL	SMALL
Public and Social Services	SMALL	SMALL	SMALL	SMALL	SMALL
Education	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL
Historic and Cultural Resources	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	None[a]	None[a]	None[a]	None[a]	None[a]

(a) Adverse and disproportionate impacts to minority and low-income populations have not been identified.

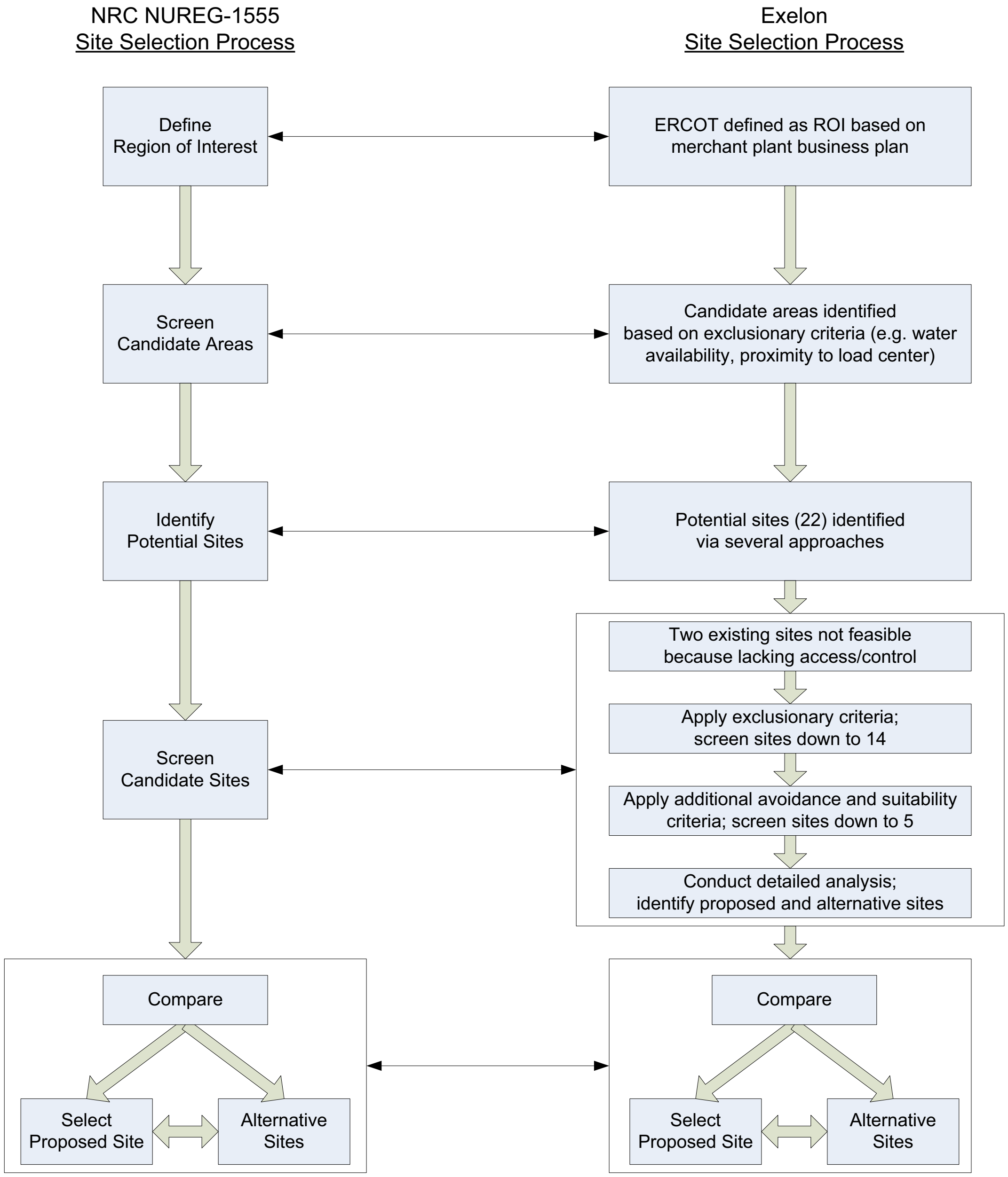

Figure 9.3-1 Comparison of Exelon Site Selection Process with NUREG-1555 Process

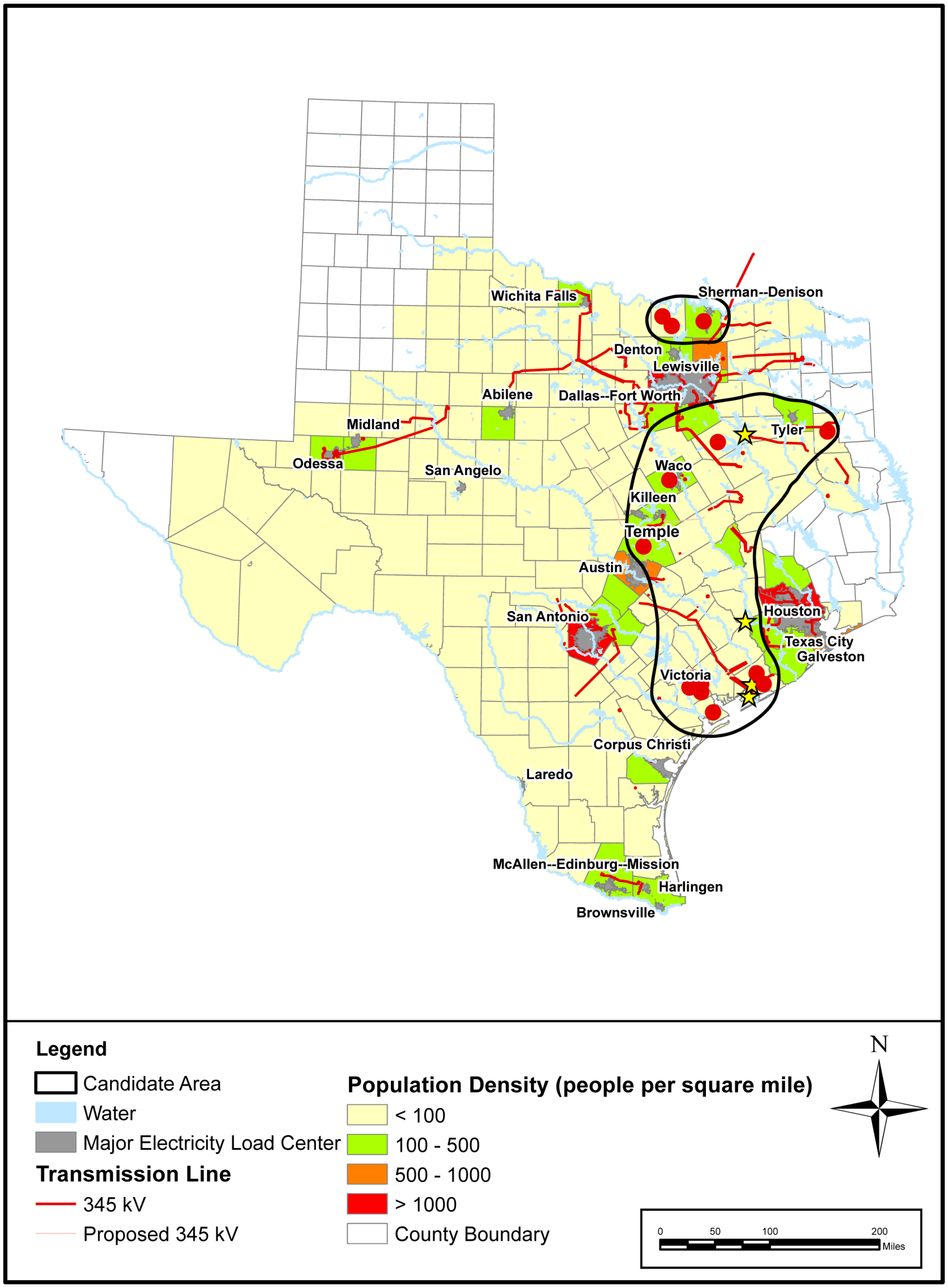

Figure 9.3-2 Composite Map of Major Load Centers, Transmission Infrastructure, Major Water Bodies, and Population Densities in the ERCOT Region

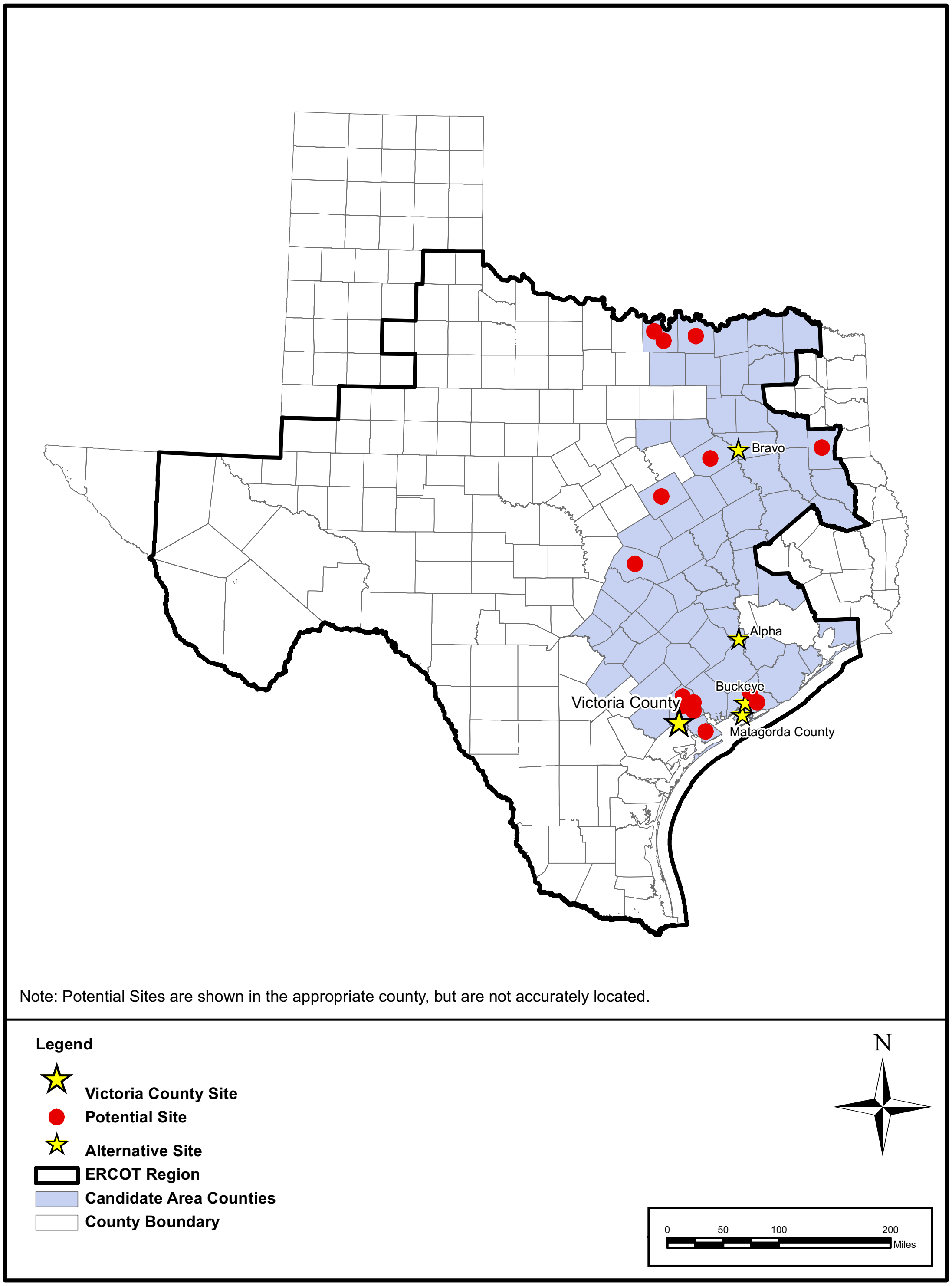

Figure 9.3-3 Candidate Areas and Potential Sites

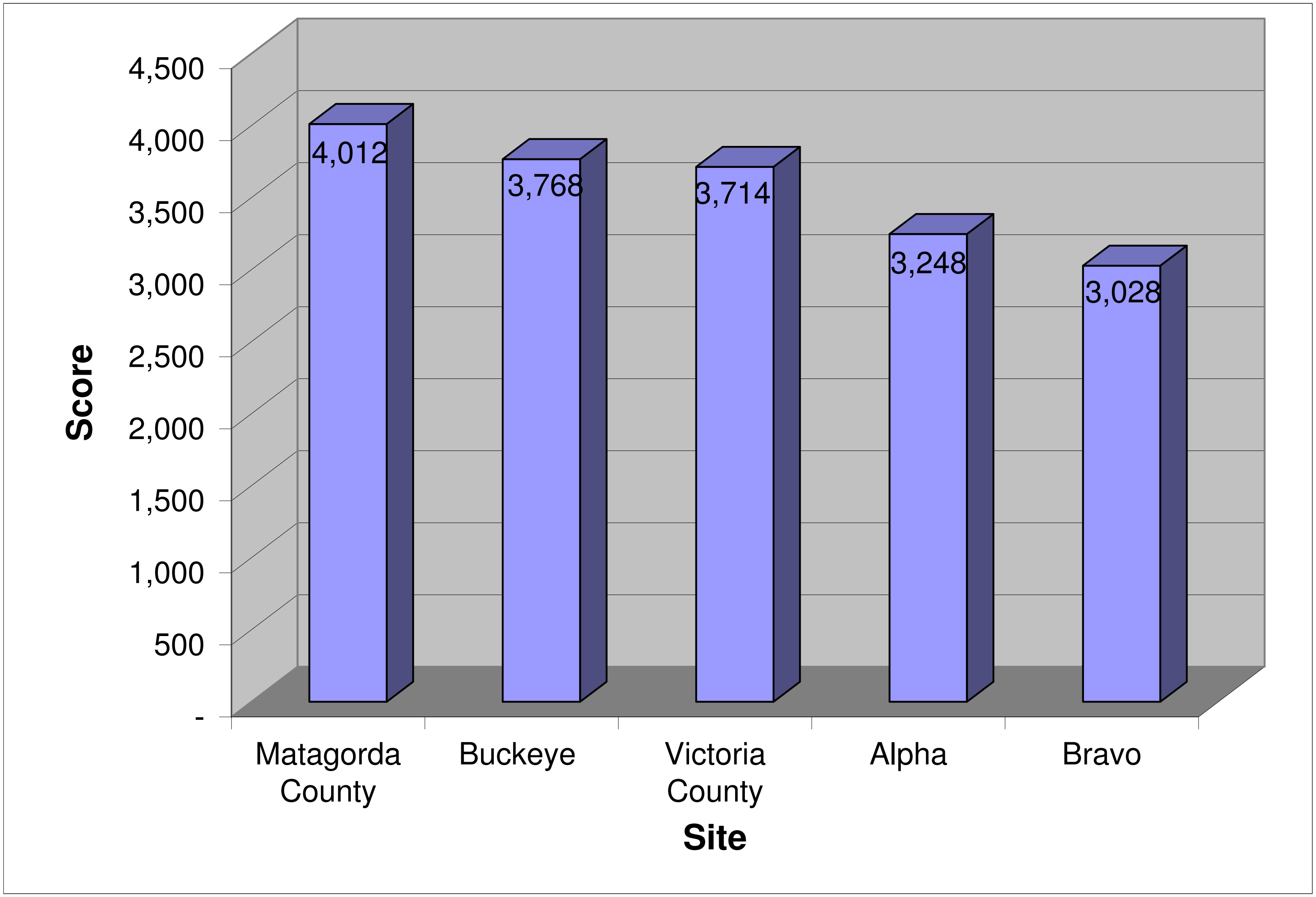

Figure 9.3-4 Initial Site Selection Scores

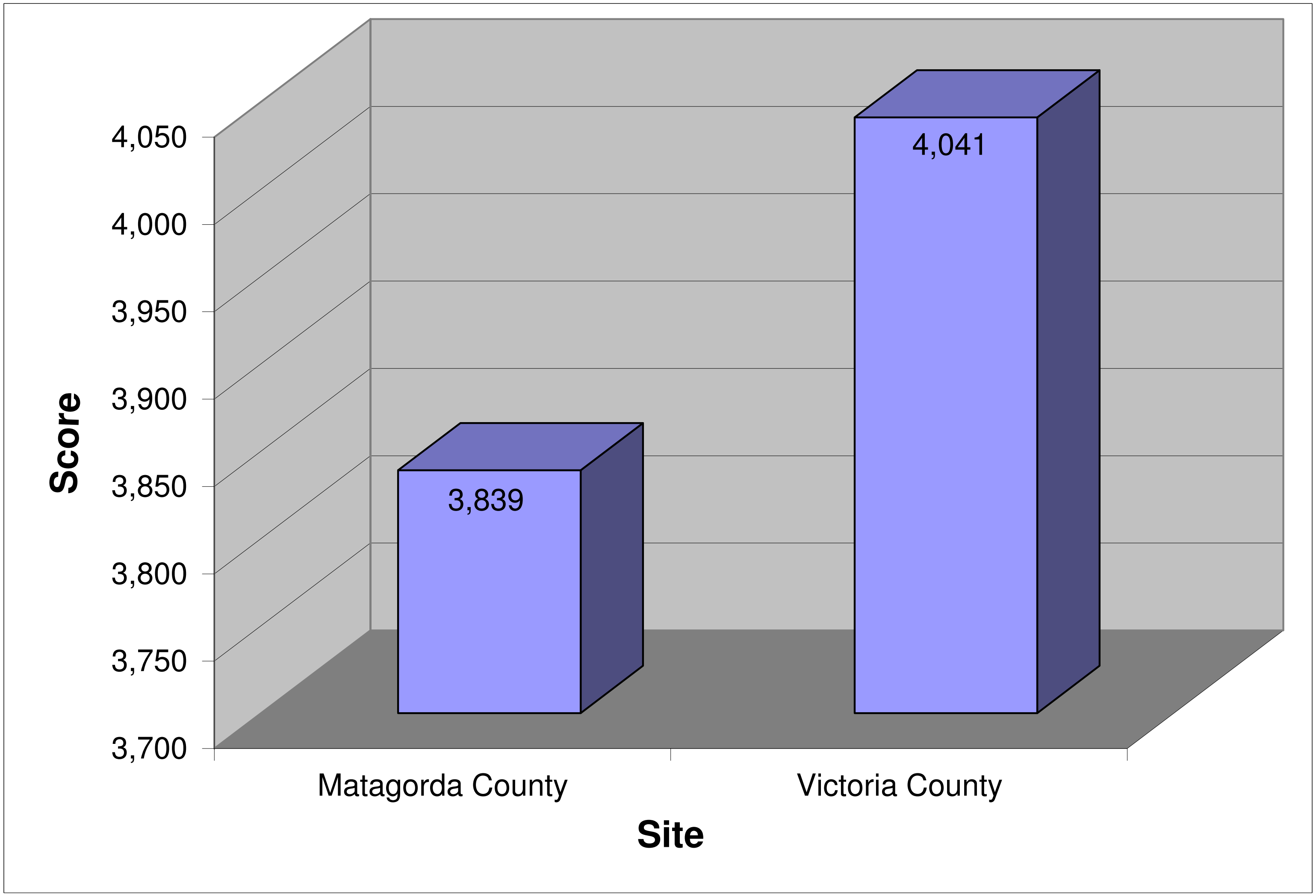

Figure 9.3-5 Updated Site Selection Scores

Figure 9.3-6 Matagorda County Site

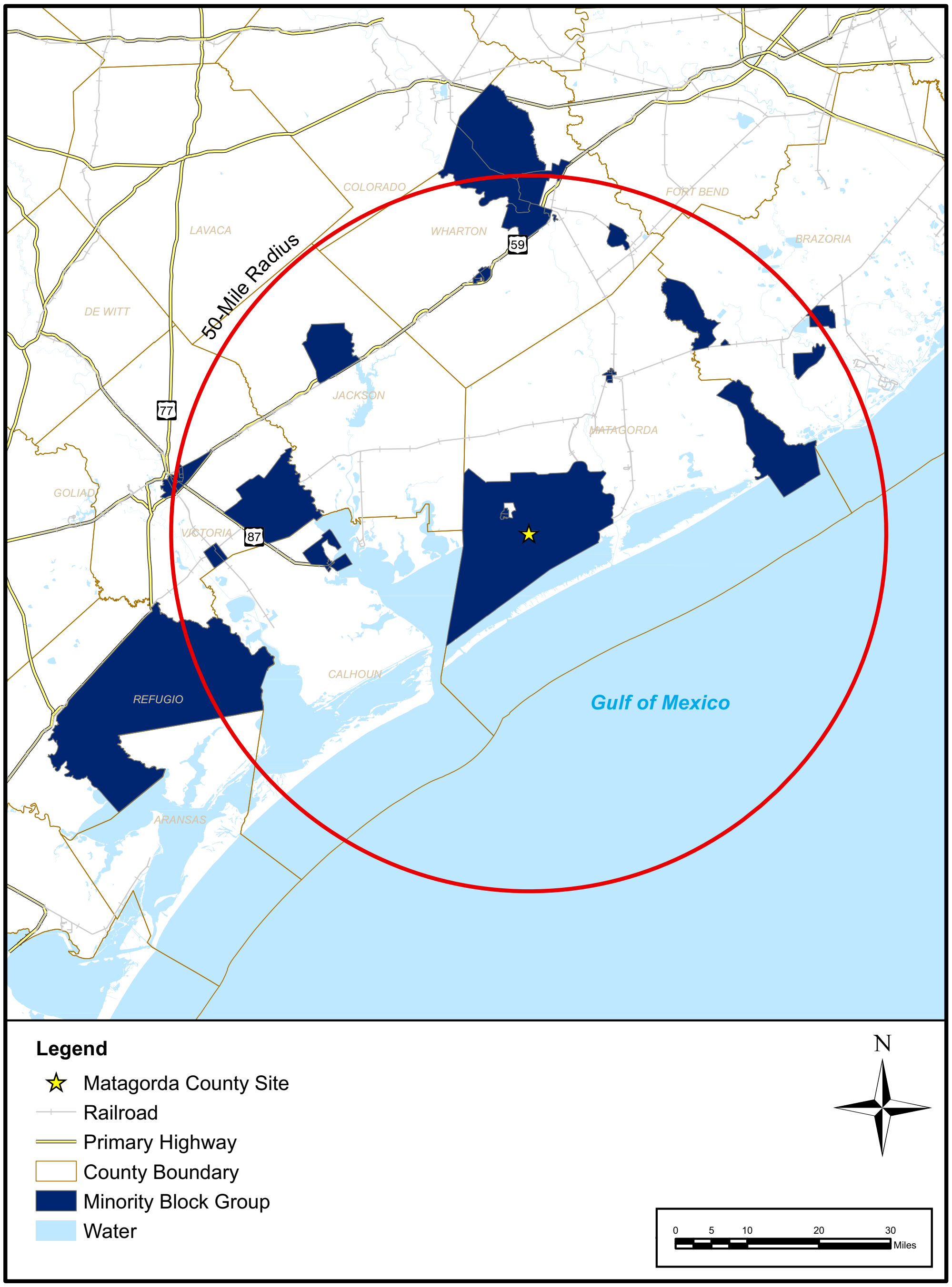

Figure 9.3-7 Minority Population Block Groups within 50 Miles of the Matagorda County Site

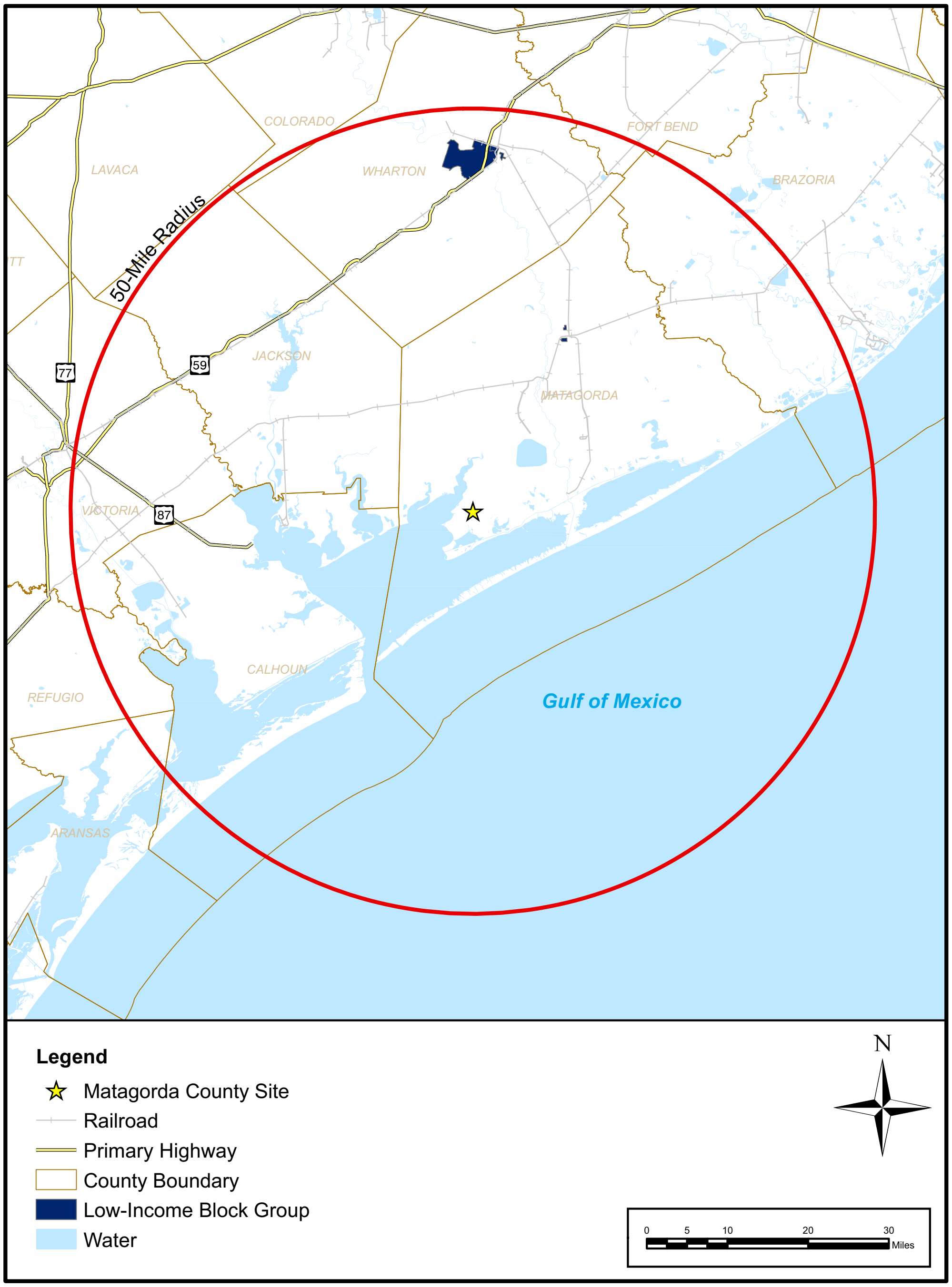

Figure 9.3-8 Low-Income Household Block Groups within 50 Miles of the Matagorda County Site

Figure 9.3-9 Buckeye Site

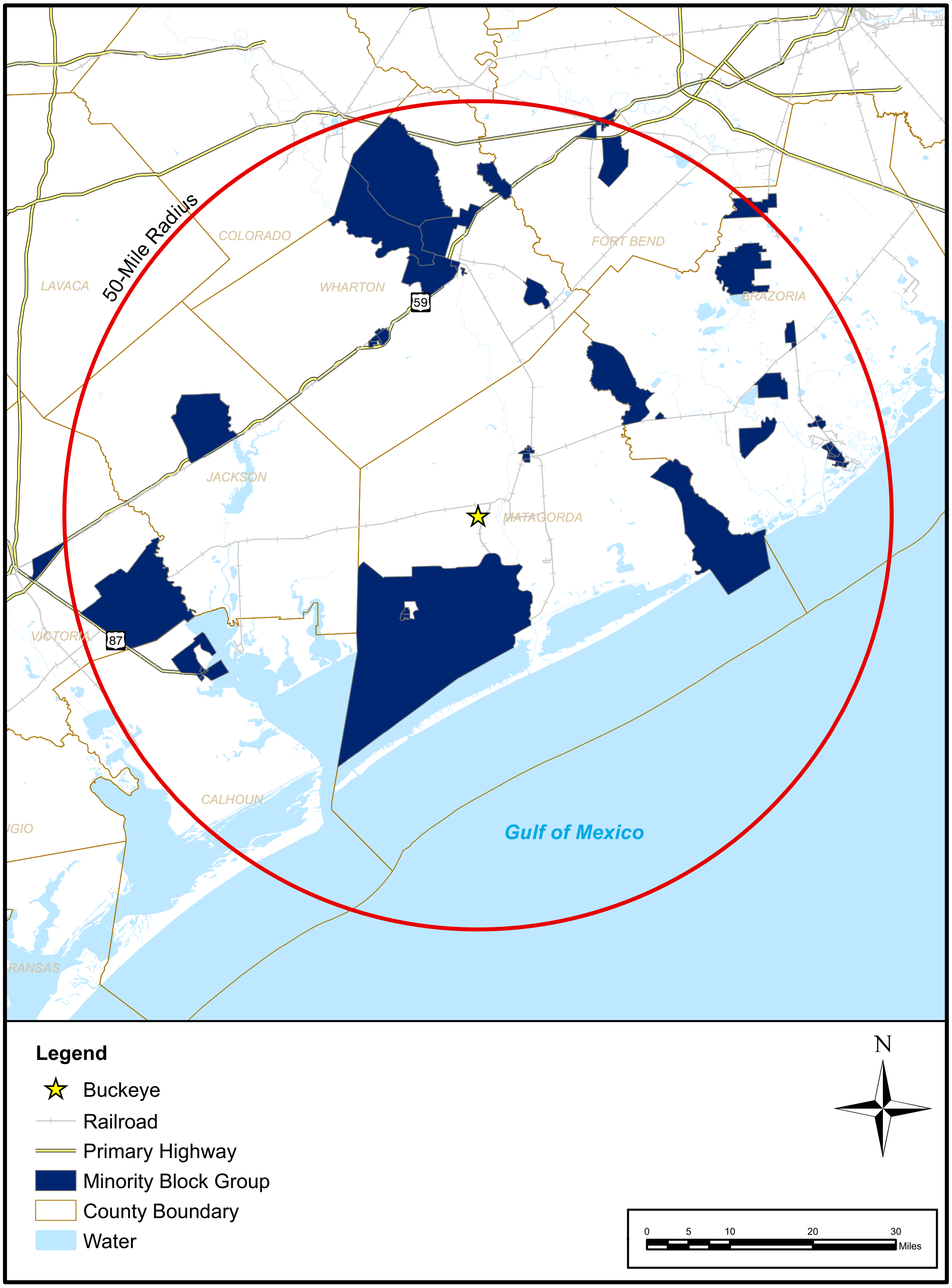

Figure 9.3-10 Minority Block Groups within 50 Miles of the Buckeye Site

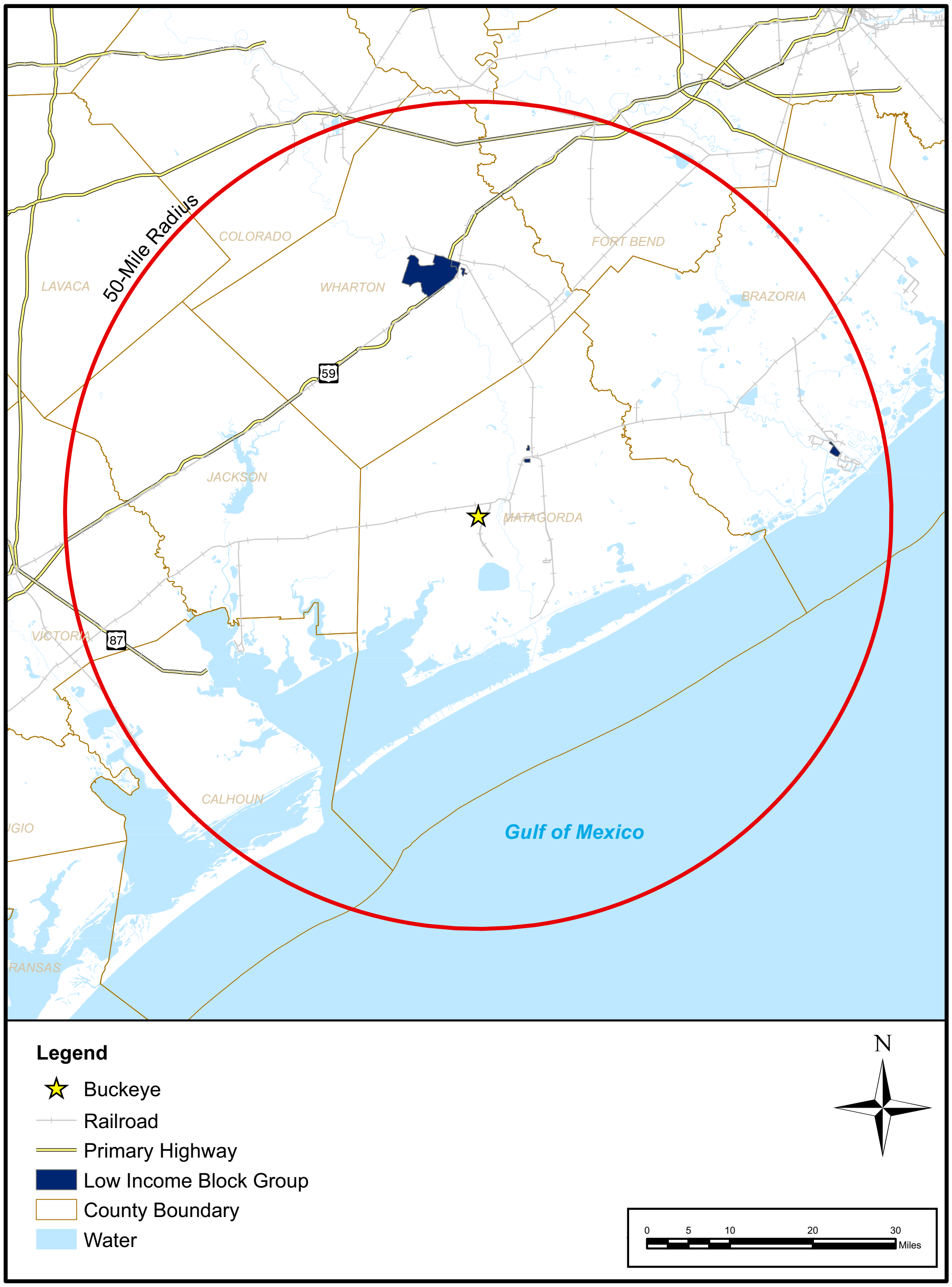

Figure 9.3-11 Low-Income Household Block Groups within 50 Miles of the Buckeye Site

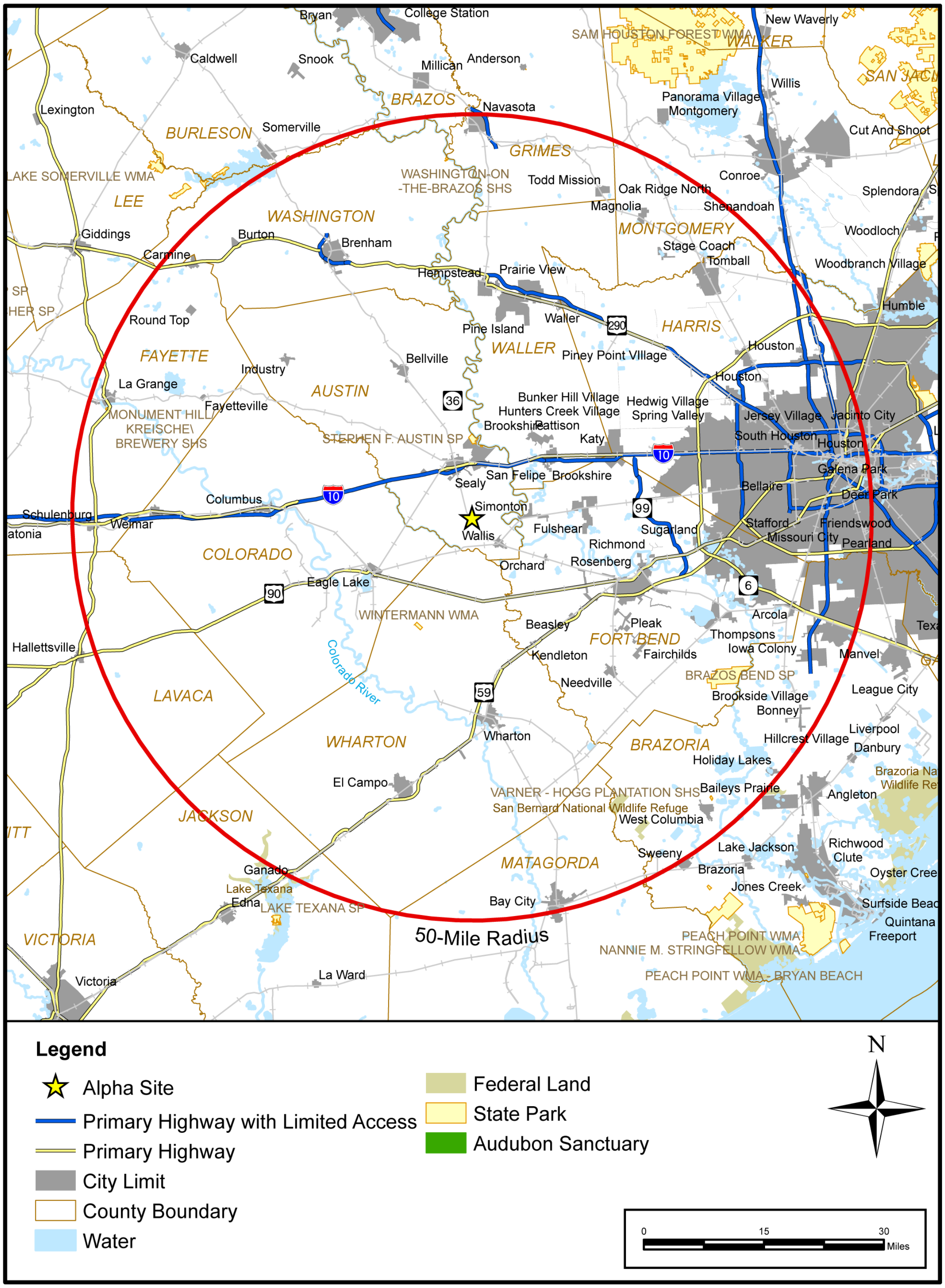

Figure 9.3-12 Alpha Site

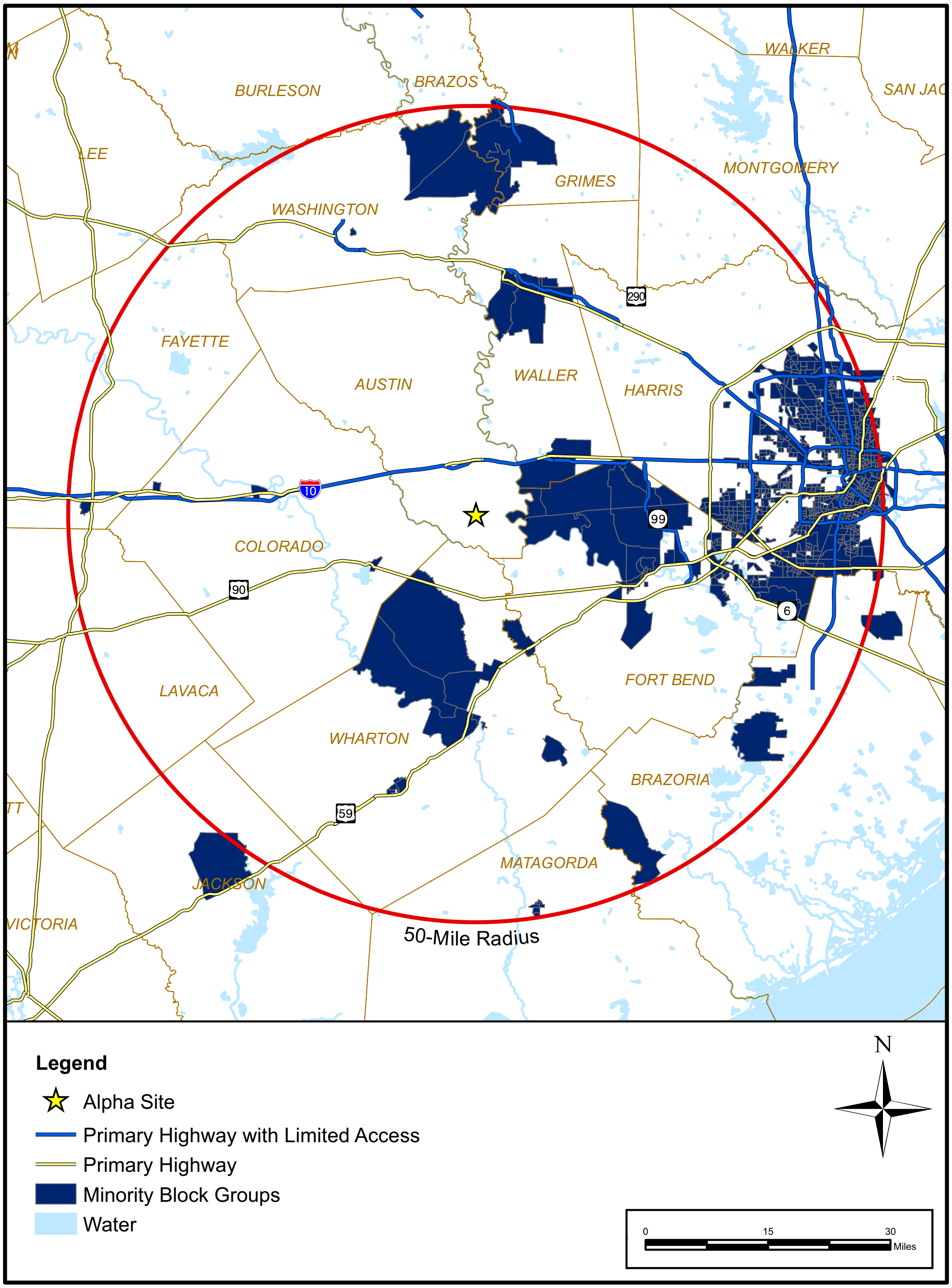

Figure 9.3-13 Minority Block Groups within 50 Miles of the Alpha Site

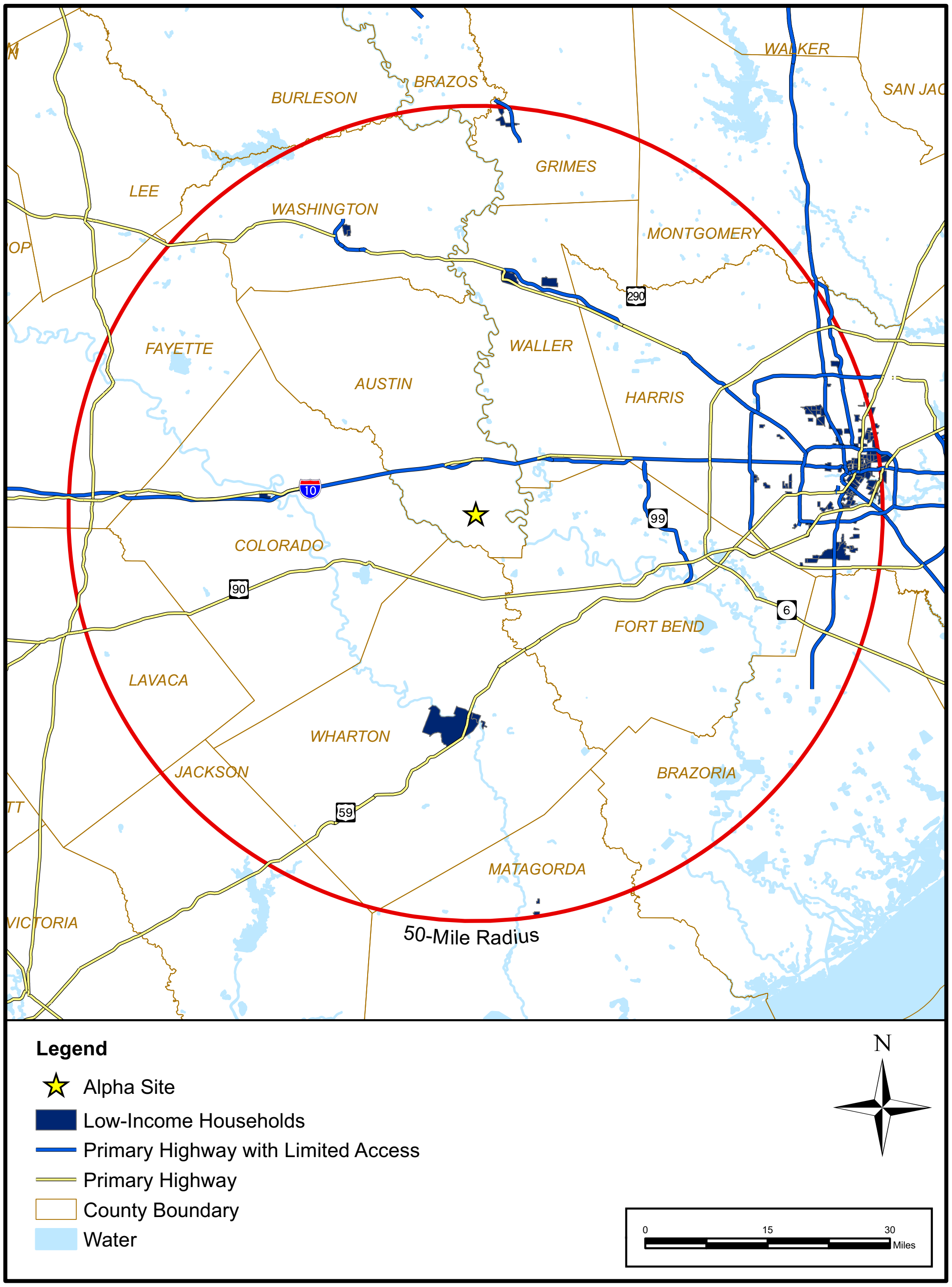

Figure 9.3-14 Low-Income Household Block Groups within 50 Miles of the Alpha Site

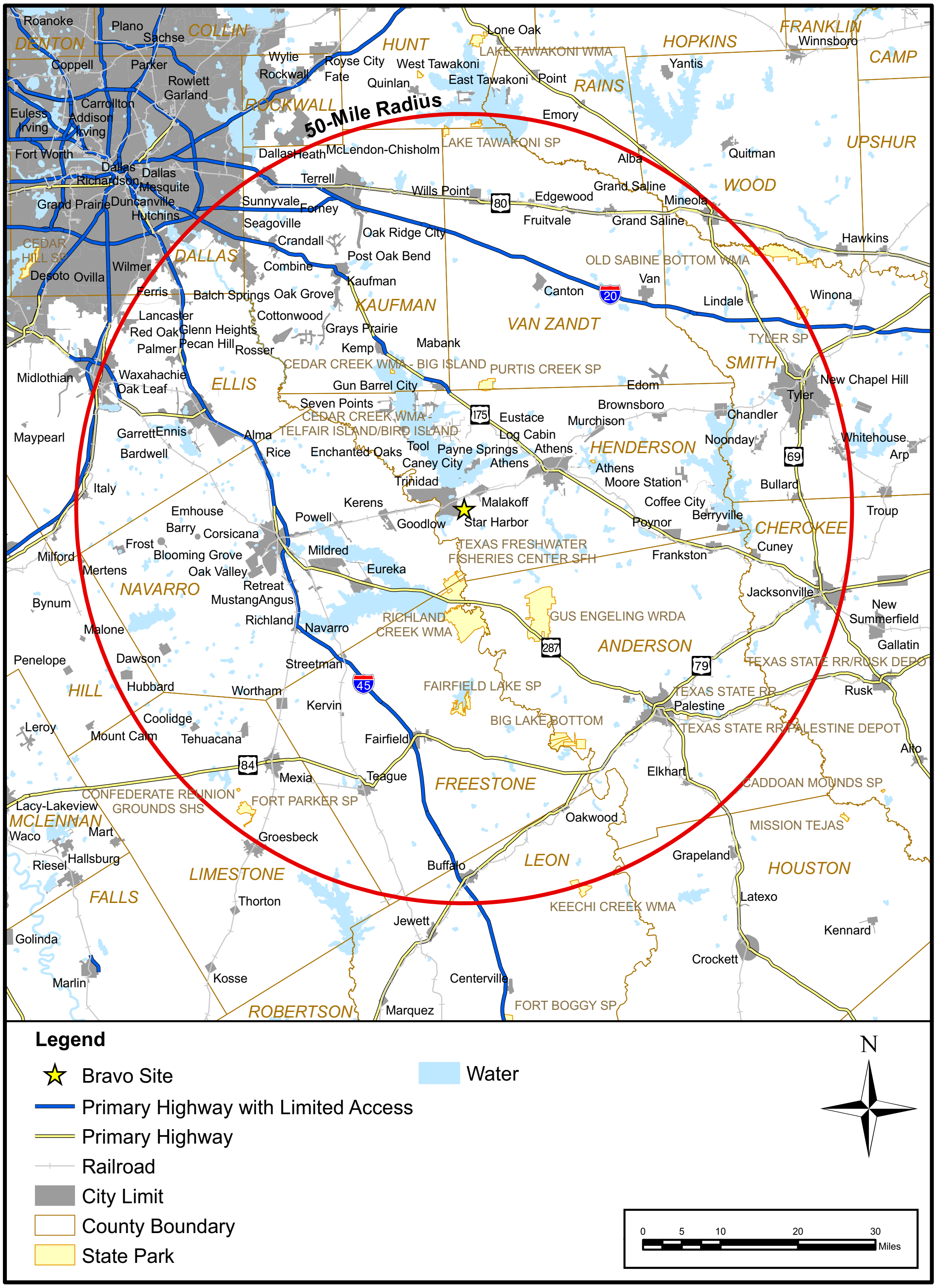

Figure 9.3-15 Bravo Site

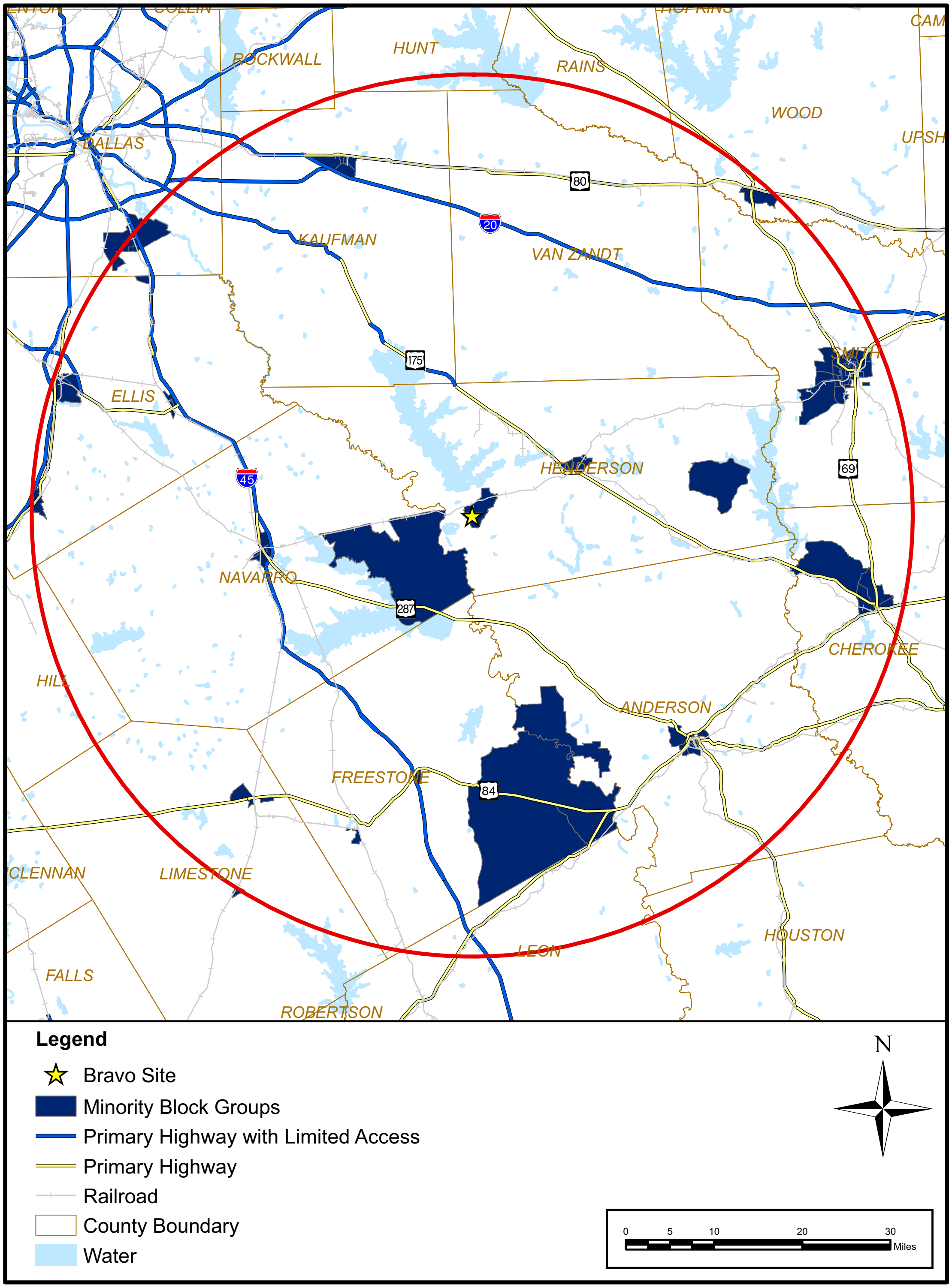

Figure 9.3-16 Minority Block Groups within 50 Miles of the Bravo Site

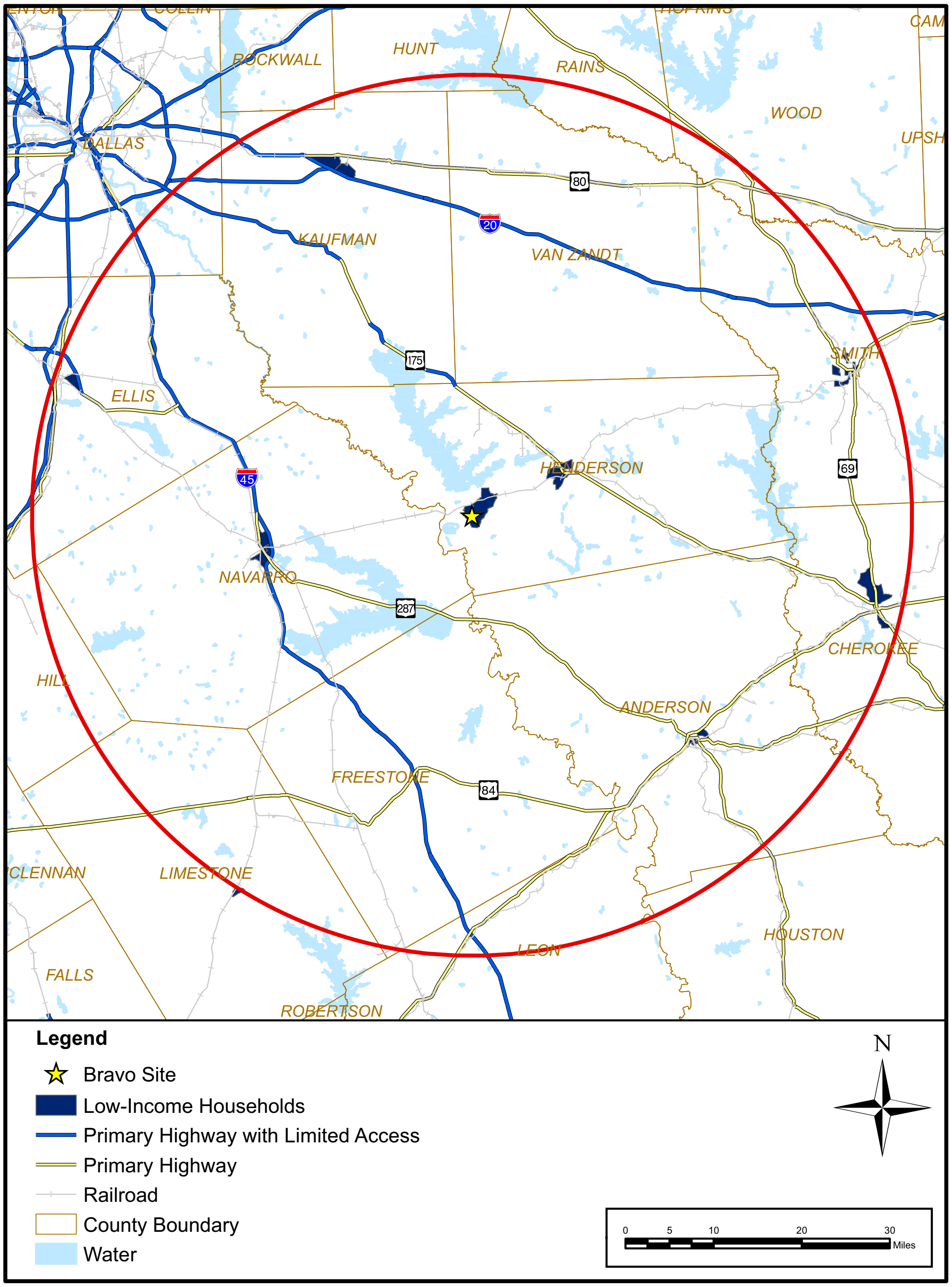

Figure 9.3-17 Low-Income Household Block Groups within 50 Miles of the Bravo Site

9.4 Alternative Plant and Transmission Systems

This section discusses alternative systems for the proposed VCS. Subsection 9.4.1 evaluates alternative heat dissipation systems, Subsection 9.4.2 evaluates alternative circulating water systems, and Subsection 9.4.3 evaluates alternative transmission systems.

9.4.1 Heat Dissipation Systems

9.4.1.1 Screening of Alternative Heat Dissipation Systems

This subsection discusses alternatives to the proposed heat dissipation system (described in Section 3.4) based on the guidance provided in NUREG-1555. Alternatives considered are those generally included in the broad categories of "once through" and "closed cycle" systems. The closed cycle category includes the following types of heat dissipation systems:

- Cooling ponds
- Spray ponds
- Dry cooling towers
- Mechanical draft wet cooling towers
- Natural draft wet cooling towers
- Wet-dry cooling towers

An initial environmental screening of the alternative designs was done to eliminate those systems that are obviously unsuitable for use at the VCS site.

Cooling ponds (base case) — The proposed design will include an approximately 4900-acre cooling basin (pond), using makeup water withdrawn from the Guadalupe River, as discussed in Sections 3.3, 3.4, and 5.3. An alternative would consist of cooling basins of varying sizes (areal extent and depth). The proposed design was optimized based on the seepage and evaporation rates, which vary with the size of the impoundment, and constraints on the rate of makeup water supply.

Once-through cooling — The water requirements for a once-through cooling system would be approximately 2.56 million gpm (5709 cfs). This withdrawal rate is approximately 55 times the average makeup water withdrawal rate of 103.5 cfs for the proposed cooling basin. Nearly all of the water would eventually be returned; however, the source water body would need to have sufficient stream flow or volume to meet the intake water demand of the once-through system. As discussed in Subsection 2.3.1, the historical 7-day low flow for the Guadalupe River downstream of the confluence with the San Antonio River is estimated at 46.3 cfs, and the 10-year, 7-day low flow (7Q10) is 221.6 cfs. The 10-year (1997 – 2006) annual mean flow is estimated at 4341 cfs, or 1368 cfs less than the projected demand for a once-through cooling system. The accessible surface water supplies would not be adequate to support once-through cooling for VCS. It is unlikely that Exelon could obtain authorization for a diversion of this size from any water bodies in the VCS region. In addition, once-through cooling would pose risks of thermal effects and damage to aquatic organisms due to changes in water quality, impingement, and entrainment. EPA regulations (40 CFR Part 125) governing cooling water intake structures under Section 316(b) of the Clean Water Act (CWA) pose stringent requirements for steam electric generating plants to use once-through cooling systems. For these reasons, once-through cooling was eliminated from further consideration.

Spray ponds — This alternative is similar to cooling ponds, as it involves the creation of new surface water bodies. Assuming sufficient heat dissipation could be achieved with a spray pond size of approximately 1 acre per 15 MWe, VCS would require approximately 227 acres of spray pond. Spray modules promote evaporative cooling in the pond, which reduces the land requirement relative to cooling ponds. However, this advantage is offset by higher operating and maintenance costs for the spray modules. A water storage reservoir would be required to manage the availability of makeup water from the Guadalupe River. This storage reservoir would be smaller in size than the proposed cooling basin but the impacts from the combination of the spray pond, storage reservoir, and makeup water delivery system would not be appreciably different from those for the proposed system. This alternative has higher initial and operating costs and would not reduce the environmental impacts relative to the proposed cooling basin system. For these reasons, it was eliminated from further consideration.

Dry cooling towers — Dry cooling carries high capital and operating and maintenance costs that are sufficient to pose a barrier to entry to the marketplace for some facilities. In addition, dry cooling has a detrimental effect on electricity production by reducing the efficiency of steam turbines. Dry cooling tower performance is dependent on the ambient dry bulb temperature. Thermal performance limitations under high ambient air temperature conditions would result in a large dry tower array and/or the plant efficiency would be significantly reduced due to high condenser water temperature and the increase in steam turbine backpressure. Dry cooling requires the facility to use more energy than would be required with wet cooling towers to produce the same amount of electricity. This energy penalty is most significant in the warmer southern regions during summer months, when the demand for electricity is at its peak. The energy penalty would result in an increase in environmental impacts as replacement generating capacity would be needed to offset the loss in efficiency from dry cooling. The EPA concluded in the preamble to its final rule addressing intake structures for new facilities (66 FR 6526; December 18, 2001) that dry cooling is appropriate in areas with limited water available for cooling or where the source of cooling water is associated with extremely sensitive biological resources (e.g., endangered species, specially protected areas). There is adequate water supply available from the Guadalupe River to meet the demand of the proposed cooling basin system (Section 5.2). As discussed in Subsection 2.4.2, no state or federal listed threatened or endangered species were observed in Exelon's aquatic resource surveys of the Guadalupe River or the Guadalupe-Blanco River Authority’s (GBRA’s) canal system. Therefore, the conditions at the VCS site do not warrant further consideration of dry cooling.

Wet and wet-dry cooling towers — Wet and wet-dry hybrid cooling towers are potential alternate heat dissipation systems for VCS. A detailed evaluation of potential alternative cooling tower designs was performed to identify the most viable option for the VCS site. The following potential alternatives were considered:

Rectilinear induced draft cooling tower — This is often the “default” cooling tower design for power applications and its relatively low profile makes it a good choice when aesthetics are a major concern. This type of tower is in widespread use in industry, and many cooling tower vendors would be able to supply a rectilinear tower. If necessary, this type of tower could be designed to be plume abated. Plume abatement should be considered when towers are located such that the plume would visually disturb surrounding communities or if the plume can settle on roadways, causing dangerous fogging and icing conditions. There is enough available area at the VCS site to sufficiently mitigate these issues, and thus plume abatement was not considered for this type of cooling tower. It would take several rectilinear towers to handle the required duty and flow, and adequate spacing would be necessary to minimize interference between the towers.

Natural draft cooling tower — This design is the most commonly used cooling tower for nuclear power plants in the United States. Favorable features include the absence of fans, which provides for very low operating cost, low auxiliary power requirements, and minimal noise impact. Natural draft towers are relatively tall and may have negative public perception because the towers and plume are visible from a great distance. However, the height can be favorable in terms of environmental impact, because the drift is dispersed at such a great height that the concentration that accumulates around the tower is lower than other tower designs.

Round forced draft hybrid tower — This design uses dedicated dry section fans, which can result in decreased water usage versus other designs. However, the extra section of fans results in a high auxiliary power load and makes this design taller than a rectilinear tower. The round design minimizes required spacing between the towers.

Hybrid system consisting of dry cooling tower and round forced draft hybrid cooling tower — In this design, the circulating water flows in series, first through a dry tower and then through a round forced draft cooling tower. This system provides the important benefit of water savings because when the dry tower is used, the duty on the round tower is lowered, decreasing evaporation. However, the dry tower component is large, requiring additional fans and resulting in higher overall power consumption. This design has the highest capital costs. The EPA's *Technical Development Document for the Final Regulations Addressing Cooling Water Intake Structures for New Facilities* (U.S. EPA Nov 2001) notes that the common hybrid systems do not dramatically reduce water use as compared to wet cooling towers. The water usage of a hybrid system is generally one-third to one-half of that for wet cooling towers. The comparative cost increases of the hybrid systems to the wet cooling systems do not outweigh water use savings of approximately one-half to two-thirds (U.S. EPA Nov 2001).

Because each cooling tower type has its own pros and cons, a matrix type selection process was used to identify the most favorable candidate. Based on the size and thermal output of the light water reactor (LWR) technologies being considered, as well as the geographic characteristics of the VCS site, the following criteria were developed and applied in selecting the most viable alternative. These criteria (weighted as numbered in order of importance, with 7 being the most important consideration) include:

7 Water usage

6 Tower height

5 Drift deposition concentration

4 Noise impact

3 Auxiliary power consumption with maximum output

2 Number of towers required per unit

1 History of nuclear application

Detailed descriptions of the weighting factors are provided in Table 9.4-1. Using the above weighting factors, the four potential tower types were ranked from 1-4, with 4 being the most favorable design. Scores were assigned based on a combination of engineering expertise and preliminary design information obtained from the cooling tower vendor. The results of this evaluation of the alternative cooling tower designs are summarized in Table 9.4-2. The natural draft tower yielded the highest total weighted score. This design represents the most favorable alternative to the cooling basin for the VCS site and is evaluated in detail in Subsection 9.4.1.2. In accordance with NUREG-1555, the feasible heat dissipation alternatives (the proposed cooling basin and the recommended cooling tower alternative) were evaluated for land use, water use, and other environmental requirements (Table 9.4-3).

9.4.1.2 Analysis of Recommended Cooling Tower Alternative

Exelon modeled the impacts from natural draft cooling towers using the Seasonal/Annual Cooling Tower Impact (SACTI) code described in Subsection 5.3.3.1. For comparison purposes, engineering data for the ESBWR is considered representative of advanced LWR technologies and was used to develop input to the SACTI model. Four identical cooling towers (two cooling towers per unit) were modeled, each with a heat rejection rate of 1448 MW and circulating water flows of 335,500 gpm per tower. The tower height was set at 550 feet. The meteorological data was from the National Weather Service meteorological station located at the Victoria Regional Airport for the years 2003 to 2007, purchased from the National Climatic Data Center (NCDC 2008). This five-year recent set of meteorological data was input into the SACTI code.

Additional physical and performance characteristics of the natural draft cooling towers would be as follows:

Parameter	Value
Base diameter of cooling tower	369 feet
Maximum drift rate (percentage of circulating water flow rate)	0.001%
Cooling range	29.8°F
Approach	8.4°F
Dry bulb temperature	86.5°F
Wet bulb temperature	78.7°F
Cycles of concentration	1.5
Salt (NaCl) concentration	220 mg/L

The value for the salt concentration is derived from the Guadalupe River water quality data (see Subsection 2.3.3) assuming 1.5 cycles of concentration for the natural draft cooling towers.

Length and Frequency of Elevated Plumes — The SACTI code calculated the expected plume lengths by season and direction for the combined effect of the four natural draft cooling towers. The longest average plume lengths would occur in the spring months while the shortest would be in the winter and fall. The plumes would occur in all compass directions. No impacts other than aesthetic would result from the plumes. Although visible from offsite, the plumes resemble clouds and would not disrupt the aesthetic view.

Projected plume lengths, directions, and frequencies are provided in the table below.

	Winter	Spring	Summer	Fall	Annual
Plume Direction					
Predominant Plume Direction	S	NNW	N	S	N
Frequency of the Predominant Plume Direction	17%	20%	16%	14%	13%
Plume Length					
Average Plume Length (miles)	3.5	2.2	1.7	2.7	2.5
Median Plume Length (miles)	4.4	0.43	0.31	2.7	0.93

	Winter	Spring	Summer	Fall	Annual
Plume Height					
Average Plume Height (feet)	2200	1600	1400	1900	1800
Median Plume Height (feet)	3300	560	560	3300	3300
Time Plume Extends Beyond Site Boundary					
Maximum Hours in any Direction	251	207	91	171	552
Direction of Maximum Time Beyond Site Boundary	S	NW	NW	S	S

Ground-Level Fogging and Icing — Fogging from the natural draft cooling towers is not expected due to their height. Therefore, icing would also not occur from these towers.

Salt Deposition — Water droplets drifting from the cooling towers would have the same concentration of dissolved salts as the water in the cooling tower basin. The water in the cooling tower basin is assumed to have salt concentrations 1.5 times that of the Guadalupe River, the source of cooling water makeup. As these droplets evaporate, either in the air or on the vegetation or equipment, they would deposit these salts.

The maximum predicted salt deposition rate from the combination of the four towers would be as follows:

Maximum pounds per acre per month:	0.00045
Distance (miles) to maximum deposition:	0.68
Direction to maximum deposition:	NNW
Season of maximum deposition	Spring

The maximum predicted salt deposition is 0.00045 pounds per acre per month. This is much less than the NUREG-1555 significance level for possible visible effects to vegetation of 8.9 pounds per acre per month.

The electrical switchyard for VCS would be located approximately 3000 feet to the west of the centerpoint of where the cooling towers would be located. Salt deposition was not predicted to occur at the electrical switchyard.

The predicted salt deposition from the operation of the cooling towers would be less than the NUREG-1555 significance level where visible effects to vegetation may be observed. Salt deposition in other potentially sensitive areas, including the VCS switchyard, are not expected to impact these facilities. The impact from salt deposition from the cooling towers would be SMALL and would not require mitigation.

Cloud Shadowing and Additional Precipitation — The SACTI code predicted that cloud shadowing would occur for a maximum of 312 hours at agricultural areas in the vicinity of the site during the spring season and a total of 982 hours annually. This compares to a total of 1220 hours of daylight during the spring season and 4440 hours of daylight annually at the VCS site.

The SACTI code predicted that induced precipitation would be expected from the natural draft cooling towers. The maximum precipitation would occur in the spring, with a seasonal total of less than an inch of precipitation at 3600 feet north-northwest of the towers. This value is small compared to the average annual rainfall for Victoria County of 40 inches during the 1970–2000 period (NWS Apr 2008).

Other Impacts — The potential for increases in absolute and relative humidity exist where there are visible plumes.

9.4.1.3 **Summary**

Table 9.4-3 contains a summary comparison of the relative environmental impacts and regulatory restrictions for the base case and the alternative heat dissipation systems for VCS. This table identifies the cooling basin as the preferred cooling system option because of its advantages from a water usage perspective. The potential for fogging and salt deposition would not be significantly greater for the natural draft towers than for the cooling basin. Natural draft towers would pose somewhat greater aesthetic impact due to their height (550 feet) versus the height of the other proposed VCS structures (approximately 230 feet above grade) and the cooling basin. The natural draft cooling towers would consume more water relative to the cooling basin, as shown in Table 9.4-3. Given the significance of water availability relative to these other considerations for the VCS site, the natural draft cooling towers would not be environmentally preferable to the proposed cooling basin.

9.4.2 **Circulating Water Systems**

In accordance with NUREG-1555, this section considers alternatives to the following components of the plant circulating water system:

- Intake systems
- Discharge systems
- Water supply
- Water treatment

NUREG-1555 indicates that the applicant should consider only those alternatives that are applicable at the proposed site and are compatible with the proposed heat dissipation system. As discussed in

Subsection 9.4.1, only the proposed cooling basin and wet cooling towers are considered viable and feasible heat dissipation systems for the VCS site.

The proposed heat dissipation system relies on evaporation and thermal radiation from the cooling basin for heat transfer. The water lost to the atmosphere through evaporation or as seepage from the basin must be replaced. In addition, this evaporation would result in an increase in the concentration of solids in the circulating water. To control solids, a portion of the recirculated water must be removed, or blown down, and replaced with freshwater. Water obtained from the Guadalupe River (Subsection 9.4.2.1) would be used to replace water lost by evaporation, seepage, and blowdown from the cooling basin. Blowdown water would be returned to the Guadalupe River via a multi-port diffuser.

9.4.2.1 **Intake Systems**

The raw water makeup (RWMU) system would consist of the 3150-foot-long intake canal, the 200-foot-long pumphouse intake basin, the 3400-foot-long fish return sluiceway, the RWMU pumphouse on the escarpment southwest of the Guadalupe River, and a buried pipeline leading to the cooling basin at the VCS site. The location of the raw water intake is shown in Figure 2.3.1-12. Details of the proposed RWMU system are shown in Figures 3.4-2 and 3.4-3.

As described in Subsection 3.4.2.1, the proposed RWMU system pumphouse would be a reinforced concrete structure with three pump bays. The intake face would be perpendicular to the intake bay/ intake canal and occupy approximately 93 feet of shoreline. The pumphouse would extend approximately 110 feet inland. It would have three pump bays with a continuous line of trash racks at the intake, a pair of traveling water screens for each bay, provisions for stop logs or gates, and spray wash pumps for the traveling water screens. Each pump bay would be equipped with a 33 percent capacity pump driven by a variable frequency drive in order to maximize the pumps' operating range. During drought conditions, one 33 percent capacity pump would be able to deliver water at lower flow rates when water from the intake canal is limited. All three of the 33 percent capacity pumps could operate to recover the cooling basin level following an extended dry period. The proposed RWMU system pumphouse would comply with the technology requirements of Section 316(b) of the CWA by virtue of a design intake velocity that is less than or equal to 0.5 feet per second (fps) and the fact that no threatened or endangered species have been identified as living or breeding in the vicinity of the cooling water intake structure. Reducing design intake velocity to less than or equal to 0.5 fps is one of the technology-based performance requirements for minimizing adverse impacts of cooling water intake structures at facilities having a design intake flow of 10 million gpd or greater (40 CFR 125.84(b)(2)).

The most important elements of the intake system are its location and configuration. The following factors were considered in siting the intake system:

- Water availability
- Water quality
- Intake hydraulics
- Constructability and cost
- Maintenance and dredging
- Operation and maintenance

Water availability and water quality considerations are addressed in Subsection 9.4.2.3. The proposed location for the RWMU system pumphouse would place the VCS intake at a location downstream of the GBRA diversion canal which supplies water to senior users under the combined GBRA/Union Carbide Corporation water rights (Subsection 2.3.2). The intake is at a location that can be protected from seasonal flooding and saltwater intrusion. Infrastructure to support pumphouse operations is available at this location, and the land is currently owned by the GBRA.

Depending on the route selected, the RWMU intake pipeline would run 8.5 to 11 miles to the VCS cooling basin. The pipeline would cross the San Antonio River and potentially one or more creeks or bayous. Construction techniques such as directional drilling would be used to pass underneath those waterways, if required, to reduce the effects on ecological resources.

The alternative intake systems considered for raw water makeup to VCS are the following:

- Shoreline pump intake using active screening (base case)
- Onshore pumphouse with offshore intake using submerged passive screens such as wedge wire screens
- Offshore intake with velocity cap in conjunction with onshore pump intake and active screening

The following is a general description of potential intake system alternatives that can be considered at the Guadalupe River withdrawal location.

Shoreline pump intake

For the proposed design, the RWMU pumphouse would be located on an escarpment above the floodplain that is approximately 0.6 miles from the Guadalupe River. Water would be carried to the pumphouse via a 3150-foot-long intake canal and a 200-foot-long intake basin. The pumphouse would be oriented so that water enters the trash racks at a 90 degree angle. Trash racks would be provided to filter out debris.

After passing through the trash racks, intake water would pass through traveling screens of a modified Ristroph design with a maximum face velocity of 0.50 fps. Each traveling screen would be a continuous linkage of framed baskets approximately 12.5 feet wide and smooth woven mesh basket screening wire with 3/8-inch openings. Each basket would have a trough (fish bucket) on the lower lip designed to prevent re-impingement of fish and provide the mechanism to return fish to the Guadalupe River. The fish buckets would allow organisms to remain in the water while being lifted to the fish return trough. As the traveling screen panel traveled over the head sprocket of the traveling screen, low pressure sprays [10 pounds per square inch (psi) nominal] would wash the organisms into the fish return trough. As the traveling screen panel traversed further, high pressure sprays (90 psi nominal) would wash the remaining debris into the debris trough. The debris trough would discharge to a trash basin and the overflow water from the trash basin would be returned to the intake bay. The fish return trough would collect the fish that are washed from the fish buckets by the low pressure screen wash pumps and carry them the short distance to the fish return sluiceway located immediately to the east of the RWMU pumphouse. The sluiceway would discharge to the Guadalupe River downstream from the intake canal. The discharge point would be 1 foot lower than the minimum water level in the river in order to maintain submergence. An intake velocity of less than or equal to 0.5 fps would comply with CWA Section 316(b) Track 1 technology requirements for aquatic habitat protection. A detailed description of the proposed intake system is provided in Subsection 3.4.2.1 and the potential impacts of operating the proposed system are discussed in Subsection 5.3.1.

Offshore passive wedge wire screens

This option would combine the use of an onshore pump structure of the vertical wet pit design and passive fine screens offshore. The passive intake screen system eliminates the need for trash racks, associated raking mechanism, traveling water screens, screen wash pumps, debris collection/return trough, and a fish return system.

For a design flow of 267 cfs, the intake system would consist of 12 wedge wire tee-screens. Each tee-screen would be 4 feet in diameter with a slot width of 2 mm. The through slot velocity would be lower than 0.5 fps. The screens would be installed in a unidirectional configuration to align with the predominant flow direction in the river. A cone-shape deflector would be installed at the upstream end of each screen to facilitate the sweeping action of the current to carry debris away from the screens. The wedge wire screens would be equipped with an air backwash clearing system that is designed to dislodge and scour debris from the face of the screens. The air vessel and compressor would be located near the pump structure with an air line extending to the offshore screens. A chlorination line to the screens would be installed if necessary for biofouling control.

Each tee-screen would be installed with a clearance of about 2.5 feet from the bottom of the river. Water depth required for the operation of the wedge wire screens would be about 9 feet at the intake location. The water depth in the river in its current condition is too shallow for the installation of this alternative intake system. To make use of the passive wedge wire screen system, a portion of the river in front of the pump structure would have to be dredged. The screens would be placed at a clear distance away from the bank of the river. Wooden piles, or similar, would be installed to protect the submerged screens from damage by small water vessels or large debris. For a passive wedge wire screen system to perform as intended, a current velocity of approximately 1 fps in the ambient source water is generally accepted as sufficient to carry debris downstream of the screens, although this system has been used in slower moving ambient flows.

Assuming the river at the intake location can be modified to allow the successful operation of the passive screen system, water entering the wedge wire screens would be diverted to the pump structure via three buried intake pipes, each of 48-inch diameter, to the pump structure. Three intake pipes are preferred over one combined intake pipe of 78-inch diameter because of the relatively short distances of the screens from the pump structure. One of the feasible screen arrangements is to group the 12 screens into three sets, each with four screens connected to a common header. Each common header would be flow connected to one of the three 48-inch intake pipes going to the pump structure. Due to the air backwash action, the bank of the river would need to be reinforced to prevent erosion.

Wedge wire screen is passive without the capability for debris cleaning beyond air backwash. Its use relies upon the flow velocity or current speed to sweep the debris off the screen face. It is most applicable for river intakes. However, during low flows in the river, debris would potentially pile up against the screens causing reduced or disrupted flow toward screens. While wedge wire screens may offer added protection to aquatic life, the proposed intake design with active screening offers adequate protection of aquatic ecosystems. Both designs include features to minimize impingement mortality and entrainment, such as maintaining a design intake velocity of less than 0.5 fps. Based on the above, the level of impacts would be similar and this option would not be environmentally preferable to the proposed intake system.

Offshore submerged velocity caps

This option would combine an offshore intake with velocity cap with an onshore pump structure equipped with active screening for debris removal. For the same design flow rate of 267 cfs, the velocity cap concept would require eight velocity caps, each 7.5 feet in diameter with a 3-foot vertical opening, to achieve an inlet velocity of 0.5 fps or less. The minimum water depth would be about 9 feet, as with the wedge wire screen system. A portion of the river would have to be dredged to accommodate the velocity caps. Water would enter each cap laterally through the vertical opening to the intake pipes that lead to the onshore pump structure. The pump structure would be similar, except near the entrance, to the proposed system. Since there would be no screen installed at the offshore velocity caps, debris screening would be provided by trash racks and traveling screens installed at the pump structure before the pump bays. One possible arrangement would be to group the caps into two sets of three caps and one set of two caps. Each set of velocity caps would be connected to a common header that is tied to a dedicated intake pipe that goes to the pumphouse.

The velocity cap concept is not expected to be acceptable based on the potential ecological impacts and CWA Section 316(b) considerations. Although the inlet velocity would be less than 0.5 fps, there would be no mechanism for fish to escape once they enter the velocity cap. In contrast, the proposed system would include traveling screens and a fish return trough to return impinged fish to the river downstream of the intake canal in addition to having a maximum through-screen velocity of 0.5 fps. Accordingly, the velocity cap option would not be environmentally preferable to the proposed intake system.

9.4.2.2 **Discharge Systems**

As noted above, the circulating water system for VCS would be a closed loop system using a cooling basin for heat dissipation. The final plant discharge, including the treated liquid radiological waste effluent, would be discharged to the Guadalupe River. The discharge flow would originate from the cooling basin, which collects site nonradioactive wastewaters and cooling tower blowdown for both units. Cooling basin blowdown would be pumped from the “cold side” of the cooling basin, where the circulating water and blowdown pumps would be located, to the Guadalupe River via a 48-inch diameter discharge line. The blowdown line would terminate in a shoreline surface diffuser designed to promote mixing with the receiving water. Treated liquid radiological waste effluent would be discharged via a pipeline that would tie into the cooling basin blowdown pipeline between the cooling basin and the VCS site boundary. Thus, the two separate effluent streams would share a common blowdown diffuser, and the nonradiological blowdown from the cooling basin would dilute the treated radiological waste effluent from the plant prior to discharge to the Guadalupe River.

Extreme low flow rates in the Guadalupe River (lowest stream flow for seven consecutive days, expected to occur once in 10 years, also referred to as 7Q10) are of the same order of magnitude as the proposed blowdown flow rate. Therefore, for the purpose of calculating impacts, minimum river flows were assumed below which blowdown would not be discharged. The flow specification was based on the mixing required to comply with state surface water quality standards. As discussed in Subsection 5.3.2, the reach of the river into which the blowdown would flow, designated Stream Segment 1803 by the Texas Commission on Environmental Quality (TCEQ), has been assigned a site-specific, absolute maximum temperature criterion, 93°F, but the general criterion for temperature rise over ambient (ΔT) in freshwater streams, 5°F, applies to this segment of the Guadalupe River (Title 30, Texas Administrative Code, Section 307.4, *General Criteria*). No TPDES permit has yet been obtained for VCS, but Exelon assumes that these criteria would be included in the permit, and so designed the discharge system to comply with them. The DuPont-INVISTA manufacturing plant is located across the river and has a surface discharge outfall approximately 3 miles downstream of the proposed blowdown discharge location. The DuPont-INVISTA discharge mixing zone is 100 feet upstream and 300 feet downstream from the point of discharge. The flow specification sought to determine at what flow the maximum discharge ΔT would be reduced to 2.5°F (one-half the allowable amount under the assumed permit guidelines). Addition of a safety factor to accommodate thermal discharges from the DuPont-INVISTA plant downstream resulted in a multiplier of seven, meaning that, for this analysis blowdown would only be discharged to the river when the natural flow of the river was at least seven times the discharge flow.

For example, the river flow must be a minimum of 623.84 cfs in order to allow discharge at a maximum blowdown flow of 40,000 gpm (89.12 cfs). Discharge thermal plume modeling was performed for river flows as low as the 7Q10 low flow of 110 cfs. At the 7Q10 flow, the elevation of the river surface at the discharge structure was estimated at 9.63 feet NAVD 88. The elevation of the top of the discharge pipes would be at the 7Q10 river elevation. The maximum allowable blowdown flow for 7Q10 river flow is 7053 gpm (15.71 cfs, or 110 cfs/7).

Three generic submerged discharge designs, single-port subsurface diffuser, multi-port subsurface diffuser, and surface discharge, are handled by the CORMIX code. The proposed design is modeled as a surface discharge because the top of the discharge pipes would be at the river elevation under the 7Q10 flow. For subsurface diffuser designs, CORMIX requires that the discharge diameter of a diffuser be less than 1/3 of the discharge depth; a larger diameter would negate the basic assumptions implicit in the subsurface mixing mechanics.

A single subsurface discharge port would have to be (at most) 0.6 feet in diameter (1/3 of 1.81 foot depth corresponding to a river flow of 110 cfs, the 7Q10). CORMIX design recommendations, based on reasonable pumping costs, are for a maximum discharge velocity (discharge flow divided by the discharge cross-sectional area) on the order of 25 fps. For the maximum blowdown flow of 40,000 gpm, a 0.6 foot diameter discharge would require a discharge velocity of 315 fps. Therefore, a single-port subsurface diffuser was rejected as impractical.

A subsurface multi-port diffuser has the same diameter limitation as a single-port diffuser. Test runs of the CORMIX code for a line of 0.6 foot diameter ports indicated that, even for the 7Q10/7 discharge flow of 7053 gpm, discharge interactions with the river bank in the near-field (where discharge momentum is the controlling mixing mechanism) result in uncertain CORMIX results. A multi-port subsurface diffuser was rejected as impractical.

A shoreline multi-port diffuser (modeled as a surface discharge) was chosen as the generic blowdown discharge design. An open channel discharge was considered but rejected because as river flow (and river velocity) increase, discharge velocity would decrease (the river surface being a hydraulic control on the height of the discharge). This would result in undesirable shore hugging of the discharge as well as the potential for siltation at the discharge entrance to the river.

In order to maintain reasonable discharge velocities while also maintaining acceptable thermal performance, four 1.5-foot diameter pipes discharging at the shoreline are proposed. Those pipes would be spaced 2.25 feet apart (centerline-to-centerline). Such a release would have discharge velocities of 2.22 feet per second at 7Q10/7 blowdown flow and 12.61 fps at maximum blowdown flow.

Figure 2.3.1-7 shows the location of the proposed VCS discharge structure. The location of the discharge outfall would be such that it has sufficient water depth for thermal mixing/dilution. The VCS outfall location must be sufficiently upriver of the existing DuPont-INVISTA discharge to produce a mixing zone that would be compliant with the standards of the Texas Administrative Code, Title 30, §307.8(b), i.e., mixing zones will not overlap unless it can be demonstrated that no applicable standards will be violated in the area of overlap and existing and designated uses will not be impaired by the combined impact of a series of contiguous mixing zones. The release of the VCS effluent through the proposed blowdown discharge line was determined to have minimal impact to aquatic biota in the river (Subsection 5.3.2.2). If the mixing zone resulting from the proposed diffuser design described above had been inconsistent with the assumed permit guidelines or industry best practice, additional alternatives would have been considered.

9.4.2.3 **Water Supply**

As discussed above, there would be a need for makeup water to the VCS closed loop circulating water system. The maximum makeup water flow to the proposed cooling basin is estimated at 217 cfs (97,433 gpm).

There are two potential sources of makeup water supply for VCS. The proposed system would use freshwater obtained from the Guadalupe River. Saltwater may be obtained from the Gulf of Mexico, either from one of the bays or from the Victoria Barge Canal. Groundwater wells (Subsection 2.3.1 and Section 3.3) would not provide sufficient freshwater volume to support the makeup requirements of the circulating water system (normal use of 75,000 acre-ft per year or roughly 46,500 gpm) in addition to other operational demands.

9.4.2.3.1 Alternate Freshwater Supply

Exelon evaluated an alternate freshwater intake location on the GBRA main canal. The intake would be a shoreline structure and include features to reduce impingement mortality.

After passing through the trash racks, intake water would flow through vertical traveling screens of a modified Ristroph design with a maximum face velocity of 0.5 fps. Each traveling screen would be a continuous linkage of framed baskets approximately 12.5 feet wide and smooth woven mesh basket screening wire with 3/8-inch openings. Each basket would have a trough (fish bucket) on the lower lip designed to prevent re-impingement of fish and provide the mechanism to return fish to the main canal downstream of the intake structure. The fish buckets would allow organisms to remain in the water while being lifted to the fish return trough. As the traveling screen panel traveled over the head sprocket of the traveling screen, low pressure sprays would wash the organisms into the fish return trough. As the traveling screen panel traversed further, high pressure sprays would wash the remaining debris into the debris trough. The fish and debris troughs would be combined and returned to the canal at a sufficient distance from the intake to minimize the likelihood of re-impingement on the traveling screens.

Freshwater would be pumped from the canal via a buried pipeline to the VCS cooling basin to replace water lost to evaporation and seepage. The pipeline would cross the Guadalupe River and Victoria Barge Canal. As for the proposed intake location and water supply pipeline, construction techniques such as directional drilling would be used to pass underneath those waterways, if required, to reduce the effects on ecological resources.The pipeline would cross several small streams and wetlands, and these areas would be subject to some temporary erosion and sedimentation.

The intake design flow rate would be approximately 267 cfs, with a maximum 217 cfs supplied to the VCS cooling basin. The average pumping rate would be approximately 103.5 cfs supplied to the cooling basin.

The intake structure would be constructed of reinforced concrete. Its layout would include a three-bay pumphouse with through-flow traveling water screens in each bay, provisions for stop logs or stop gates, spray wash pumps for the traveling water screens, makeup water pumps, and all necessary support facilities for operation of the intake structure. The intake face would be parallel to, and flush with, the bank of the main canal and would occupy approximately 93 feet of shoreline. The intake structure would be equipped with steel trash racks (grates) with 1.0-inch openings to prevent heavy debris from entering the intake and damaging the traveling screens. After passing through the trash racks, intake water would flow through vertical traveling screens of a modified Ristroph design. Maximum through-screen velocity would be 0.5 fps.

Limiting the withdrawal of water from the Guadalupe River to no more than 5 percent of its mean annual flow and limiting through-screen velocities to 0.5 fps or less at the intake structure trash racks and traveling screens are "technology-based performance standards" established in the EPA's Phase I rule addressing cooling water intake structures for new facilities (66 FR 65256). Ristroph-style traveling screens and fish handling (return) systems are listed in the Phase I rule as potentially effective design and construction technologies available for installation at cooling water intake structure for minimizing adverse impacts.

Impingement

Impingement and impingement mortality associated with the RWMU system pumphouse on the GBRA main canal would be similar to that described for the RWMU system pumphouse in Subsection 5.3.1.2.1. Under the design flow rate of 267 cfs, the approach velocity would be less than 0.5 fps at the trash racks, intake apertures, and traveling screens. The maximum through-screen velocity would be 0.5 fps. Intake velocities of this magnitude are rarely a threat to healthy adult and juvenile fishes, but do have the potential to impinge younger, smaller individuals and unhealthy individuals. The Ristroph traveling screens and associated fish return system would further reduce impingement mortality, as any fish impinged would be gently washed from the traveling screens and sluiced back into the canal at a point far enough removed from the intake to prevent re-impingement. Impacts from impingement would be small as they were for the proposed intake structure at the Guadalupe River.

Entrainment

Exelon surveyed fish, including ichthyoplankton (eggs and larvae), in the Guadalupe River, Goff Bayou, and the GBRA main canal in 2008. In the GBRA main canal, ichthyoplankton were sampled over the February–October 2008 period at the approximate location of the alternate intake structure. Sampling methods and data treatment are summarized in Subsection 5.3.1.2.2.

Based on observed larval densities, most spawning activity in the GBRA main canal took place in March, April, and May (Table 9.4-4 and Table 9.4-5). There was a second pulse of spawning activity in August, when large numbers of sunfish larvae were collected. Most sunfish in Texas spawn over a seven-month period in spring and summer (March-September), with peaks in reproductive activity that coincide with favorable environmental conditions (optimal water temperatures and water levels).

Ichthyoplankton collections from the GBRA main canal in 2008 were dominated by three groups: sunfish (*Lepomis*, 38.2 percent of total), shad (*Dorosoma,* 32.6 percent), and inland silverside (*Menidia beryllina,* 19.4 percent). More than 90 percent of larvae collected were from these three genera. Relatively small numbers of pugnose minnow (6.3 percent of total), red shiner (2.1 percent), common carp (<1 percent), and bluefin killifish (<1 percent) were also collected.

Based on larval densities in the canal in 2008 and the maximum withdrawal rate of 217 cfs, an estimated 736,633 sunfish (*Lepomis* species) larvae would have been entrained at the RWMU system intake, primarily in August. Five *Lepomis* species were collected at the GBRA Main Canal during monthly surveys of adult and juvenile fish, but the overwhelming majority were longear sunfish (*Lepomis megalotis*), warmouth (*Lepomis gulosus*), and bluegill (*Lepomis macrochirus*). The reproductive behavior of these three sunfish is quite similar. All three are nest builders and nest guarders. All three spawn over the spring and summer, with the bluegill spawning period extending into September. Fecundity is determined by body size and ranges from 4500 (small warmouth) to 80,000 (large bluegill) eggs per female (Hassan-Williams and Bonner 2009). Based on known fecundity rates and mortality rates (U.S. EPA Feb 2002), the estimated entrainment loss equals the production of 49 to 925 female sunfish.

Substantial numbers of shad larvae were also collected in the GBRA main canal. Because adult gizzard shad (*D. cepedianum*) were more abundant than adult threadfin shad (*D. petenense*) (Subsection 2.4.2), the analysis that follows assumes that these shad larvae were predominantly gizzard shad. Based on the densities of shad in the GBRA main canal in 2008 and the maximum withdrawal rate, an estimated 629,125 larvae would have been entrained at the RWMU intake, the vast majority in March and April. Gizzard shad make use of a range of spawning habitats, including large rivers, backwaters of rivers, ponds, lakes, and reservoirs (Jenkins and Burkhead Feb 1994). Females broadcast eggs near the surface; eggs sink to the bottom or adhere to vegetation. A single female may produce from 22,000 to 540,000 eggs per spawning season, depending on its age and size (Carlander 1969). Given that approximately 10 percent of gizzard shad eggs survive and hatch into larvae (U.S. EPA Feb 2002), the maximum estimated entrainment over the February–October 2008 spawning period at the RWMU system intake represents the spawn of 12 (very large) to 286 (small) female shad.

Based on larval densities in the canal in 2008 and the maximum withdrawal rate, an estimated 374,289 inland silverside larvae would have been entrained at the RWMU system intake, primarily in spring and early summer (March-June). The inland silverside is a short-lived schooling fish, rarely living past its first breeding season. Inland silversides develop rapidly, and may reach sexual maturity in their first year of life (Hassan-Williams and Bonner 2009). In Lake Texoma, which lies on the Texas-Oklahoma border, fecundity of inland silverside ranged from 200 to 2000 eggs per female, with average-sized females producing around 835 eggs daily (Hassan-Williams and Bonner 2009). Along the Gulf Coast, spawning commences in March and extends into July, with multiple peaks of high spawning activity (Weinstein 1986). Females may produce from 20,000 to 170,000 eggs during their reproductive lifetime (Weinstein 1986), which equates to 10,000 to 85,000 eggs per year per individual, as fish normally live for 1 to 2 years. Assuming 10 percent of inland silverside eggs hatch into larvae (U.S. EPA Feb 2002), the 374,289 larvae represent the annual production of 44 to 374 inland silverside (*M. beryllina)*.

Entrainment losses under the maximum pumping rate (217 cfs) would be small and minimally affect fish populations in the GBRA Calhoun Canal system. Entrainment losses associated with the average pumping rate of 103.5 cfs would have correspondingly less effect on local fish populations. Table 9.4-4 and Table 9.4-5 show estimated entrainment losses at withdrawal rates of 217 cfs and 103.5 cfs, respectively.

Impacts from entrainment at a RWMU system pumphouse on the GBRA main canal would be small because (1) the design includes features to mitigate impacts of cooling water intake structures on aquatic ecosystems, (2) entrainment rates would be low in comparison to reproductive potential, (3) species that would be affected are common-to-ubiquitous in the Guadalupe River drainage, (4) no sensitive or special-status species are present, and (5) the GBRA main canal provides no recreational or commercial fishing opportunities, as it is off limits to the general public. As discussed in Section 5.3.1, projected entrainment losses at the proposed intake location on the Guadalupe River based on 2008 data were also very low. The calculated entrainment rate for the alternative intake location on the GBRA main canal was almost five times higher than the entrainment rate for the Guadalupe River intake. For recreationally important species (sunfish), this disparity was even more pronounced. The calculated entrainment rate for sunfish was 26 times higher for the GBRA main canal than the Guadalupe River. Section 5.3.1 suggests low densities of larval fish in the main channel of the lower Guadalupe River reflect the fact that the main channel offers only limited spawning habitat for resident fish. Most resident fish are presumed to spawn in sheltered areas (e.g., sloughs, backwaters, and oxbow lakes) or tributary streams rather than the main channel. This is especially true of black bass (*Micropterus* spp) and Lepomids. The GBRA main canal, by contrast, offers no such backwaters, sloughs, or tributaries, so fish are compelled to spawn in the canal proper; therefore, larvae are more susceptible to capture in plankton nets. For the same reason, they would also be more vulnerable to entrainment at the RWMU pumphouse. Therefore an alternative intake location on the GBRA main canal would not be environmentally preferable to the proposed RWMU pumphouse on the Guadalupe River.

9.4.2.3.2 **Saltwater Supply**

Exelon evaluated two options for a saltwater cooling system for VCS. Both systems would use saltwater as makeup to mechanical draft wet cooling towers, which are preferable over natural draft cooling towers for saltwater operation. The towers would be located in the area to the north of the power block and switchyard. The towers would be constructed of materials resistant to saltwater corrosion and be designed to reduce drift rates. There would be three towers per unit, with a makeup water demand of 116,000 gpm (258 cfs). The total blowdown discharge rate would be approximately 77,000 gpm (172 cfs). The pumphouse would be a shoreline concrete structure approximately 97 feet wide, with three 31-foot wide pump bays, each with a 50 percent capacity pump. Each pump bay would be equipped with two traveling screens. The offshore intake pipeline would be equipped with a velocity cap. The options involve different intake and discharge locations as described below.

Option 1 — This option would obtain makeup water from the Victoria Barge Canal using an intake pumphouse located on the Long Mott Branch of the canal. The makeup water would be transported 22 miles via a 96-inch pipeline to the cooling tower basins at VCS. The discharge would be directed to a location in San Antonio Bay south of Seadrift, Texas. The 102-inch discharge pipeline would be 30 miles long and would be routed parallel to the makeup pipeline. It would continue south, along Highway 185, past the intake pumphouse and past the town of Seadrift, to a submerged discharge structure located in San Antonio Bay, approximately 2 miles offshore. For approximately 1 mile along each of their routes, the makeup and discharge pipelines would be installed by directional boring under the Guadalupe River and the Victoria Barge Canal.

The Victoria Barge Canal supports barge traffic between the Gulf Intracoastal Waterway and the Port of Victoria. The saltwater intake would be located approximately 5.75 miles from San Antonio Bay. The induced flow velocity in the canal from a makeup water flow rate of 258 cfs would be approximately 0.1 fps, producing a frictional gradient of approximately 1 foot per 20 miles of canal. A northbound current of 0.1 fps and a frictional gradient of less than 0.3 feet over the 5.75 miles of canal are not expected to be a problem for navigation.

Option 2 — This option would obtain makeup water from the Gulf of Mexico using an intake pumphouse located on the mainland near the Espiritu Santo Bay shoreline. The discharge would also be directed to the Gulf of Mexico. For this option, 11 miles of 144-inch intake piping would extend from the intake pumphouse, across the bay, under the barrier island, and out to the intake velocity cap in the Gulf of Mexico (4 miles under salt marshes, 2 miles under Espiritu Santo Bay, 1.5 miles under the beach on the barrier island, and 3.5 miles under the sands of the Gulf of Mexico). The makeup line would be 32 miles of 96-inch pipe and the discharge line would be 41 miles of 108-inch pipe (including 9 miles that would extend from the shoreline of Espiritu Santo Bay to the submerged discharge structure, 1.5 miles into the Gulf of Mexico). For approximately 1 mile along each of their routes, the makeup and discharge pipelines would be installed by directional boring under the Guadalupe River and the Victoria Barge Canal.

The electricity consumption associated with pumping the water to the VCS site would be approximately 52,000 MW-hr per year for Option 1 and 67,000 MW-hr per year for Option 2. For comparison, the estimated electricity use for a freshwater supply system is 21,000 MW-hr per year. Both saltwater supply systems would require more than twice the electricity to operate than that of a freshwater supply.

Both saltwater intake options pose greater potential ecological concerns than the proposed freshwater intake at the Guadalupe River. The Victoria Barge Canal provides habitat for commercially and recreationally important fishes, including redfish. In addition to providing foraging and rearing habitat, deep channels adjacent to shallow estuarine waters are known to be used as thermal refuges for estuarine fishes during winter. For example, the movement of redfish into lower reaches of rivers during fall and winter has been attributed to their seeking warmer freshwater sources (Shipp 1986, page 137). It is possible that the Victoria Barge Canal serves this purpose during cold weather along the Texas coast.

The Gulf intake option could pose potential problems for recreational and commercial fisheries and, thus, be viewed as undesirable by the agencies charged with protecting estuarine nursery grounds (U.S. EPA Dec 2006, Gulf of Mexico Fisheries Management Council 1998). In addition, there would be concerns with threatened or endangered sea turtles, which are known to travel these waters. The barrier islands serve as nesting grounds for sea turtles (TSTNR 2007) and critical habitat for wintering piping plovers (66 FR 36038). Concern over this critical habitat could require that the pipeline to the Gulf be established under the barrier islands by horizontal directional drilling.

Pipeline Construction Impacts in Estuary/Bay:

The intake and discharge pipelines could cross areas that provide habitat for submerged aquatic vegetation, oysters, commercially important shrimp species, and several finfish species that are recreationally or commercially important. Rooted aquatic plants and sessile organisms are the focus of the assessment of construction impacts as their growth, reproduction, and even survival can be jeopardized by turbidity and silt/sediment associated with construction. Most finfish simply leave the area when confronted with construction noise and construction-generated silt and, therefore, are not likely to be harmed by noise or sediment as adults. The impact of pipeline construction on spawning and nursery areas is of potentially greater significance.

Even when control techniques are employed, dredging typically can cause an increase in suspended sediment in the immediate area, and may result in a plume of suspended sediment some distance from the site. In a study of the effects of hopper dredging in the Chesapeake Bay, near-field concentrations of suspended sediment, <980 feet from the dredge, reached 840 to 7200 mg per liter or 50 to 400 times the normal background level. Far-field concentrations (>980 feet) were enriched 5 to 8 times background concentrations and persisted 34 to 50 percent of the time during a dredging cycle (1.5 to 2.0 hours) (Nichols 1990).

The ecological effect of the suspended sediment depends on a variety of factors, including the type of dredge used, the timing and duration of the dredging, the particle size of the suspended sediment, the presence of toxins in the sediment, the success of environmental controls to contain suspended sediment, and the life stage of the species present. Both short term direct behavioral effects (such as entrainment, turbidity, fish injury, and noise) and long term cumulative effects (such as contaminant release and habitat alteration) on marine organisms can result from dredging (Nightingale and Simenstad 2001).

As discussed in Subsection 2.4.1.5, Aransas National Wildlife Refuge is listed as critical wintering habitat for the endangered whooping crane. Construction of the pipeline and operation of the intake and/or discharge in the shallows of San Antonio Bay could be viewed as detrimental to the cranes' foraging habitat.

While the saltwater intake options have the potential to conserve freshwater resources, they present greater impacts related to the increased distances the makeup water supply and blowdown discharges must travel. Those distances result in substantially greater material and operating costs and increased land disturbance related impacts. If the additional energy needed to transfer the makeup water and blowdown over greater distances were supplied by fossil-fueled sources, there would be an increase in air emissions relative to the proposed freshwater supply. The saltwater intake and discharge locations also present somewhat greater ecological concerns. The saltwater supply options would not be environmentally preferable to the proposed makeup water supply from the Guadalupe River.

9.4.2.4 **Water Treatment**

As described in Subsection 3.3.2, groundwater and surface water used at VCS would be treated based on qualities of groundwater and surface water available for VCS.

As described in Subsection 3.3.1.1, groundwater would be supplied from wells installed in the Evangeline aquifer. Treatment may be required for disinfection of groundwater prior to its use. The treated groundwater would be placed in a storage tank to supply VCS potable water demands. Groundwater would also be filtered and placed in a storage tank(s) to supply the fire water and demineralized water treatment systems. Water feeding the demineralized water treatment system and fire protection system makeup would typically be treated for pH control, scale control, biofouling, and dechlorination, as necessary.

Evaporation of water from the cooling basin is expected to lead to an increase in concentration of dissolved impurities in the circulating water, which in turn can increase the scaling tendencies of the water. The circulating water would be treated for biofouling, scaling, and suspended matter, using chemicals such as biocides, antiscalants, and dipersants. These chemicals would be injected either continuously or in batches into the cooling basin near the suction of the circulating water pumps.

The cooling basin would be operated so that the concentration of dissolved impurities in the cooling basin would be at acceptable levels. The concentration ratio (cycles of concentration) would be sustained through blowdown of the circulating water from the cooling basin to the Guadalupe River and the addition of makeup water from the Guadalupe River.

Evaporation of water from the mechanical draft cooling towers is expected to lead to an increase in concentration of dissolved impurities in the cooling tower basins. The water would be treated for pH control, biofouling, scale control, and dechlorination using appropriate chemicals. These chemicals would be injected into the basins of the cooling towers either continuously or in batches.

The cooling towers would be operated so that the concentration of dissolved impurities in the basin would be at acceptable levels. The concentration ratio (cycles of concentration) would be sustained through blowdown from the cooling towers to the cooling basin and makeup from the cooling basin to the cooling towers.

During the periods when the RWMU system pumps are transferring water to the cooling basin from the Guadalupe River, a biocide such as sodium hypochlorite would be added either continuously or in batches to shock the pump bay near the suction of the makeup pumps to prevent fouling in the makeup water supply pipeline.

The final choice of water treatment chemicals or combination of chemicals is dictated by groundwater and surface water conditions, technical feasibility, economics, and discharge permit requirements. The treatment chemicals, to be used to improve the conditions of the groundwater and surface water, would be chosen from those approved by the EPA or the state of Texas, and the volume and concentration of each chemical constituent discharged to the environment would meet the requirements established in the applicable permits.

9.4.3 **Transmission Systems**

Planning, siting, and constructing transmission lines is a multi-year process that has already begun but would not be completed until after Exelon decides to construct VCS. Therefore, at the ESP application stage, information on the proposed transmission system is, necessarily, limited and is even more limited on alternatives to that system. Subsection 2.2.2 provides as much information as is available on the corridors for the proposed transmission system and describes the transmission line siting process. Section 3.7 discusses the electrical and structural design characteristics of the proposed transmission lines. This section provides the information available on alternatives to transmission system design.

9.4.3.1 **Alternative Corridor Routes**

American Electric Power (AEP), the transmission service provider, would design, construct, own, and operate any new transmission lines. In its application to the Public Utility Commission of Texas (PUCT) for a Certificate of Convenience and Necessity, AEP would present its corridor routing analysis, which would contain a preferred route as well as multiple alternative routes for approval. While that process is years away from completion, Exelon has performed its own routing study described in Subsection 2.2.2 of this ER using the Electric Power Research Institute (EPRI) Transmission Siting process. Because the EPRI process is similar to the PUCT Certificate of Convenience and Necessity (CCN) process, Exelon considers that the CCN results would not be significantly different from Exelon's. As described in Subsection 2.2.2, a large study area was selected to contain the proposed transmission lines, and then macrocorridors were selected that minimize impacts to land use, cultural resources, ecological resources, and other considerations. The EPRI process defined a 3-mile wide macrocorridor that has a 95 percent probability of covering the preferred and alternate corridors. Although there are no definite alternate corridor routes that can be presented in this subsection, the EPRI process assures that the route selection process employs environmental values as major selection criteria.

9.4.3.2 **Alternatives to the Proposed Transmission System Design**

AEP has performed an interconnection study that examined multiple alternatives to the transmission system design for each of two voltages: the predominant 345 kilovolt (kV) system in the region and 765 kilovolts, which is being considered for use within the Electric Reliability Council of Texas service area.

For the 345-kV system, AEP examined eight transmission interconnection options. Each of the eight options proved to be viable, although all resulted in thermal overloads that required upgrades in the existing transmission system. Option 345D was selected for analysis in this ER, based on several factors:

- Option factored into the impact of South Texas Project (STP) 3 & 4 on grid (conservative)
- Option maximized use of existing 345-kV lines and substations
- Least cost

This option is further discussed in Subsection 2.2.2 and Section 3.7. The study assumed the existence of 3633 MW of planned generation currently under study and scheduled for service before 2010. Seven of the options involved eight new transmission lines with variations in the termination points and one involved nine new lines. The alternative analyses were performed with and without STP 3 & 4.

AEP examined 10 options that contained a combination of 345-kV and 765-kV lines. Nine of the options required two 765-kV lines and four 345-kV lines. One required five 345-kV lines in addition to the two 765-kV lines. Currently there are no 765-kV lines in Texas. However, Electric Transmission Texas, LLC (a proposed joint venture of AEP and MidAmerican Energy Holdings) is proposing a 765-

kV “backbone” through Texas designed to connect renewable energy sources in west Texas with load centers in the south, central, and north-central parts of the state. Given the lack of current 765-kV infrastructure in Texas, there would be significant costs associated with these options. New long transmission lines would be required to create the 765-kV interconnections. These issues were the main factors in determining all 10 options to be nonviable.

NUREG-1555 requires evaluation of tower options for the new transmission lines. As stated in Section 3.7, the new lines would be either lattice steel structures or tubular designs. Both options have advantages based on terrain and installation requirements. AEP has not specified which design they would pursue at this point. Underground installation as part of the routing is not viable due to the voltage levels.

The environmental impacts of the proposed transmission system are presented in Sections 4.1, 4.3, and 5.6. No analysis of environmental impacts was performed for the alternatives identified in this section because Exelon considers the impacts to the proposed system (to the extent that it can be specified) to be representative of the viable options. During the siting and design process for the proposed new transmission lines it is expected that AEP would examine not only routing alternatives but alternatives in tower designs.

9.4.4 **References**

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Table 9.4-1
Weight Factors Used in Evaluating Potential Cooling Tower Alternatives

Weight Factor	Definition
7	Water usage — Each of the two potential sources for makeup water presents difficult design considerations. One potential makeup source is the Guadalupe River, which has a supply limitation of 75,000 acre-feet per year for the proposed project. The second potential source is the Gulf of Mexico, which is approximately 36 miles from the site and thus would require large quantities of piping to bring the water to the site. The intake structure in the Gulf would require careful design to minimize environmental impact. The Gulf of Mexico water source would also result in more expensive material selections due to the water quality. Water usage must be limited to ensure that the water limitations for the Guadalupe River are not exceeded, and to minimize the piping costs if makeup is routed from the Gulf of Mexico.
6	Tower height — Due to the site's proximity to U.S. Route 77 and the city of Victoria, the height should be minimized to limit the aesthetic impact the towers would have in the area.
5	Drift deposition concentration — Drift is circulating water lost from the tower as liquid droplets entrained in the exhaust air stream and would have the same water chemistry as the circulating water. These droplets would deposit salts (depending on the water quality) in the vicinity of the towers, which can impact vegetation and soil and leave unfavorable salty residue on surrounding cars and buildings. For a given water quality, the concentration of solids deposited is a function of different tower design characteristics, and the tower should be chosen that minimizes drift concentration.
4	Noise impact — Noise from a cooling tower is generated by falling water, fans, and motors. Noise levels should be minimized to avoid negatively impacting surrounding wildlife and communities.
3	Auxiliary power consumption with maximum output — It is desirable for a tower to be able to achieve the lowest possible cold water temperature while requiring the least auxiliary power for fans and pumps. This helps to maximize plant output.
2	Number of towers required per unit — Not a high priority because the site area is large, but as the number of towers increases, the potential for wider-spread environmental impacts also increases. Pumping and piping costs may also increase with the number of towers.
1	History of nuclear application — Some of the tower types have been used widely at power plants worldwide, while some have never been constructed and are conceptual ideas only.

Table 9.4-2
Screening Summary of Potential Cooling Tower Systems

	Minimum Water Usage	Minimum Tower Height	Minimum Drift Deposition Concentration	Minimum Noise Impact	Minimum Auxiliary Power Consumption/ Maximum Output	Minimum Number of Towers per Unit	History of Nuclear Application	Total Weighted Score
Weighting Factor	7	6	5	4	3	2	1	
Rectilinear Tower	2	4	2	2	3	3	3	74
Natural Draft Cooling Tower	2	2	4	4	4	4	4	86
Round Forced Draft Hybrid Tower	3	3	3	3	2	4	2	82
Dry + Wet Hybrid Cooling Tower	4	3	3	1	1	4	1	77

Table 9.4-3 (Sheet 1 of 2)
Screening of Alternative Heat Dissipation Systems

Factors Affecting System Selection	Cooling Basin (Base Case)	Natural Draft Wet Cooling Tower (NDCT)
Land Use		
Onsite land requirements	A cooling basin would require more land (5,785 acres for both units). A cooling basin could be placed within the confines of the VCS site.	NDCT system would require less land per reactor unit. An NDCT system could be placed within the confines of the VCS site.
Terrain considerations	Terrain features of the VCS site are suitable for the cooling basin.	Terrain features of the VCS site are suitable for an NDCT system.
Water Use	Consumptive water use of 23,000 gpm per reactor unit.[(a)]	Raw water consumption of 28,900 gpm per reactor unit.
Atmospheric Effects	The cooling basin presents limited potential for fogging and salt deposition (Subsection 5.3.3).	Fogging from NDCT is not expected due to their height. NDCT present limited potential for salt deposition (Subsection 9.4.1.2).
Thermal, Chemical, and Physical Effects	Discharges associated with the cooling basin would meet water quality standards. The plume would be diluted rapidly and concentrations in the water would return to ambient levels almost immediately downstream of the discharge pipe. Because of the relatively low discharge velocities, the discharge velocity would be quickly attenuated by the slower moving river, and minimal scouring of the river bottom would be expected (Subsection 5.3.3).	Discharges associated with NDCT would meet water quality standards. Because of the relatively low discharge velocities, the discharge velocity would be quickly attenuated by the slower moving river and minimal scouring of the river bottom would be expected.
Noise Levels	Pumps associated with the proposed cooling basin system would emit broadband noise that is consistent with existing background noise levels at the VCS site and is unobtrusive at the nearest residence (Subsection 5.3.4.2).	NDCT would emit broadband noise that is consistent with existing background noise levels at the VCS site and is unobtrusive at the nearest residence.
Aesthetic and Recreational Benefits	Consumptive water use for the cooling basin would be consistent with minimum flow requirements for the Guadalupe River and environmental maintenance, fish and wildlife water demand, and recreation. Fogging associated with the cooling basin is not expected to disrupt the viewscape.	Consumptive water use for an NDCT system would be consistent with minimum flow requirements for the Guadalupe River and environmental maintenance, fish and wildlife water demand, and recreation. NDCT plumes resemble clouds and would not disrupt the viewscape; however, the towers themselves would be visible for many miles.

Table 9.4-3 (Sheet 2 of 2)
Screening of Alternative Heat Dissipation Systems

Factors Affecting System Selection	Cooling Basin (Base Case)	Natural Draft Wet Cooling Tower (NDCT)
Legislative Restrictions	The makeup water intake structure for the proposed cooling basin would meet Section 316(b) of the CWA and the implementing regulations, as applicable. Thermal discharge would be consistent with TCEQ temperature standard and mixing zone regulations. The regulatory restrictions would not negatively impact application of this heat dissipation system.	A makeup intake structure for an NDCT system would meet Section 316(b) of the CWA and the implementing regulations, as applicable. Thermal discharge would be consistent with TCEQ temperature standard and mixing zone regulations. The regulatory restrictions would not negatively impact application of this heat dissipation system.
Is this a suitable alternative for the VCS site?	Yes	Yes

(a) Water consumption estimate is based on normal evaporation and seepage rates from Table 3.3-1. Raw water makeup withdrawals from the Guadalupe River would be reduced by approximately 9,773 gpm by the average precipitation collected in the cooling basin.

Table 9.4-4 (Sheet 1 of 2)
Estimated Number of Larvae Entrained Per Month (2008), Maximum Withdrawal Case (217 cfs)

Species	February	March	April	May	June	July	August	September	October	Annual Total
Shad spp.										
Day	0	89,591	358,362	15,927	0	0	0	0	0	–
Night	0	115,472	49,773	0	0	0	0	0	0	–
Monthly Total	0	205,063	408,135	15,927	0	0	0	0	0	629,125
Inland silverside										
Day	0	29,864	89,591	0	33,845	0	0	0	0	–
Night	0	29,864	49,773	77,645	0	0	0	0	63,709	–
Monthly Total	0	59,727	139,363	77,645	33,845	0	0	0	63,709	374,289
Common carp										
Day	0	15,927	0	0	0	0	0	0	0	–
Night	0	0	0	0	0	0	0	0	0	–
Monthly Total	0	15,927	0	0	0	0	0	0	0	15,927
Pugnose minnow										
Day	0	0	0	0	0	0	0	0	0	–
Night	0	27,873	17,918	0	0	0	75,654	0	0	–
Monthly Total	0	27,873	17,918	0	0	0	75,654	0	0	121,445
Red shiner										
Day	0	0	0	0	0	0	0	0	0	–
Night	0	0	0	0	0	0	39,818	0	0	–
Monthly Total	0	0	0	0	0	0	39,818	0	0	39,818
Bluefin killifish										
Day	0	13,936	0	0	0	0	0	0	0	–
Night	0	0	0	0	0	0	0	0	0	–
Monthly Total	0	13,936	0	0	0	0	0	0	0	13,936

Table 9.4-4 (Sheet 2 of 2)
Estimated Number of Larvae Entrained Per Month (2008), Maximum Withdrawal Case (217 cfs)

Species	February	March	April	May	June	July	August	September	October	Annual Total
Sunfish spp.										
Day	0	0	135,381	25,882	0	0	525,598	0	0	–
Night	0	0	0	0	0	17,918	31,854	0	0	–
Monthly Total	0	0	135,381	25,882	0	17,918	557,452	0	0	736,633

Table 9.4-5 (Sheet 1 of 2)
Estimated Number of Larvae Entrained Per Month (2008), Average Withdrawal Case (103.5 cfs)

Species	February	March	April	May	June	July	August	September	October	Annual Total
Shad spp.										
Day	0	42,731	170,924	7,597	0	0	0	0	0	–
Night	0	55,075	23,739	0	0	0	0	0	0	–
Monthly Total	0	97,806	194,663	7,597	0	0	0	0	0	300,066
Inland silverside										
Day	0	14,244	42,731	0	16,143	0	0	0	0	–
Night	0	14,244	23,739	37,034	0	0	0	0	30,386	–
Monthly Total	0	28,487	66,470	37,034	16,143	0	0	0	30,386	178,521
Common carp										
Day	0	7,597	0	0	0	0	0	0	0	–
Night	0	0	0	0	0	0	0	0	0	–
Monthly Total	0	7,597	0	0	0	0	0	0	0	7,597
Pugnose minnow										
Day	0	0	0	0	0	0	0	0	0	–
Night	0	13,294	8,546	0	0	0	36,084	0	0	–
Monthly Total	0	13,294	8,546	0	0	0	36,084	0	0	57,924
Red shiner										
Day	0	0	0	0	0	0	0	0	0	–
Night	0	0	0	0	0	0	18,992	0	0	–
Monthly Total	0	0	0	0	0	0	18,992	0	0	18,992
Bluefin killifish										
Day	0	6,647	0	0	0	0	0	0	0	–
Night	0	0	0	0	0	0	0	0	0	–
Monthly Total	0	6,647	0	0	0	0	0	0	0	6,647

Table 9.4-5 (Sheet 2 of 2)
Estimated Number of Larvae Entrained Per Month (2008), Average Withdrawal Case (103.5 cfs)

Species	February	March	April	May	June	July	August	September	October	Annual Total
Sunfish spp.										
Day	0	0	64,571	12,345	0	0	250,688	0	0	–
Night	0	0	0	0	0	8,546	15,193	0	0	–
Monthly Total	0	0	64,571	12,345	0	8,546	265,882	0	0	351,344