Chapter 9 Alternatives

The proposed action is NRC issuance of an early site permit to SNC for approval of the VEGP site for one or more nuclear power facilities separate from filing of an application for a construction permit or combined license (COL) for such a facility. The SNC goal in preparing its 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, thereby maximizing owner and the State of Georgia assurance that new nuclear capability is a viable generation option.

Chapter 9 describes the alternatives to construction and operation of new nuclear units with closed cycle cooling at the Vogtle Electric Generating Plant (VEGP), and alternative plant and transmission systems. The descriptions provide sufficient detail for the reader to evaluate the impacts of the alternative generation options or plant and transmission systems relative to those of the proposed action. The chapter is divided into 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)

Chapter 9 includes two phrases that warrant introduction, “relevant service area” and “region of interest.” SNC uses relevant service area to refer to the geographic area where VEGP Units 3 and 4 co-owners would sell electricity. SNC uses region of interest to refer to the geographic area SNC evaluated for locating alternative energy sources and sites.

For most of this analysis, SNC defined the region of interest to be contiguous with the Southern Company service territory in Georgia, Alabama, Mississippi, and Florida. The Southern Company service territory does not limit power purchase analysis; the co-owners can purchase power generated almost anywhere in the U.S., Canada, or Mexico provided there is transmission capability to import the power. Traditionally utilities could locate alternative energy sources and sites only within their relevant service area (i.e., relevant service area and region of interest were the same).

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9.1 No-Action Alternative

9.1.1 Vogtle Early Site Permit

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 early resolution of siting issues prior to large investments of financial capital and human resources in new plant design and construction, early resolution of issues on the environmental impacts of construction and operation of proposed reactors, the ability to confirm the suitability of sites on which nuclear plants may be located, and 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. For reasons discussed below, however, SNC believes that it is unreasonable to assume that the no-action alternative would result in no additional capacity being constructed.

9.1.2 Combined Construction and Operating License (COL)

SNC has also evaluated the no-action alternative as it would relate to not constructing and operating new generation capacity, which would be the no-action alternative in the case of a COL application (i.e., non-issuance of a COL). This evaluation is consistent with the SNC goal of maximizing the value of an ESP by minimizing the amount of additional environmental review needed for a COL application. Under this no-action alternative, the proposed project would not be constructed or operated at the VEGP site. The applicant would lose the benefits of having an ESP (if issued) and of being able to develop its preferred nuclear plant site.

9.1.3 Additional Capacity Construction Impact of No-Action Alternative

Electricity demand in the Southeast, which is driven primarily by increased population and higher per capita consumption of electricity, is expected to increase by 1.8 percent annually for the foreseeable future **(EIA 2006)**. Without additional capacity, the co-owners of the proposed project would not be able to maintain an adequate reserve margin. One of the co-owners, Georgia Power Company (GPC), would be at potential variance with its public service obligations to provide sufficient power within its service territory, while other co-owners would jeopardize their missions of providing capacity to other electric suppliers throughout the State of Georgia. Customers would lose the possibility of having less expensive nuclear-generated

electricity displace more expensive generation options in the dispatch mix. The co-owners would not be able to support national goals to advance the use of nuclear energy. The regional fuel supply portfolio would remain heavily dependent on coal and continue to increase reliance on natural gas. With no marked change in diversity of fuel supply, the region would remain heavily dependent on fossil-fuel generation and might be negatively affected by increased air emissions and increased fuel costs. If the co-owners took no action at all to meet growing demands, the ability of the co-owners of the proposed project to continue to supply low-cost, reliable power to their customers would be impaired. Consequently, it would be unreasonable for the co-owners or the State to take no action at all to meet growing demands for electricity. Therefore, the no-action alternative could take the following general paths.

- Demand Side Management – Georgia and its utilities have active demand side management (DSM) programs and continue to pursue additional opportunities for DSM. However, state projections, even assuming contributions, show unmet demand.
- No New Generating Capacity – The co-owners and the state may choose not to pursue construction of any new generation capacity, and thus the need for power presumably must be met by other alternative means that involve no new generating capacity. These alternatives would include demand-side management, energy conservation, and power purchased from other electricity providers. This evaluation is discussed in Section 9.2.1. With the recognition of factors shaping decisions in the marketplace, along with current information on relative environmental impacts, a reasonable evaluation of alternatives involving no new generation capacity is possible.
- Construct Non-nuclear Alternatives – The required generating capacity could be provided by the construction of generating alternatives other than the proposed project. The new capacity could be constructed at the VEGP site, other existing generating facility sites or at other, non-designated, “greenfield” sites. Assessments of these alternatives are provided in Section 9.2.2.
- Combination – It is possible that some combination of the above approaches could be taken to provide the equivalent of the generating capacity precluded by the NRC’s denial of the early site permit. For example, the proposed capacity could be met by a certain amount of new coal-fired capacity, combined with power purchased from outside the relevant service area. Combinations of alternative energy sources are considered in Section 9.2.2.13.

Because the no-action alternative is the denial of the early site permit, the proposed project would not be constructed or operated at the VEGP site. It follows, therefore, that the environmental impacts described and predicted in this report for the new nuclear units would not occur. However, while the predicted impacts would not occur at VEGP if the facility were not built, some of these impacts (or greater impacts) could occur at other sites if new nuclear generating capacity is constructed and operated at those other sites to meet the presumed need

for power. These impacts are evaluated (i.e., compared with those of the proposed project) in Section 9.3.

Section 9.1 References

(EIA 2006) Energy Information Administration, Supplemental Tables to the Annual Energy Outlook 2006, Washington, D.C, February, available online at http://www.eia.doe.gov/oiaf/aeo/supplement/index.html.

9.2 Energy Alternatives

Alternatives that do not require new generating capacity are discussed in Section 9.2.1, while new generation alternatives are discussed in Section 9.2.2. In Section 9.2.2, some of the alternatives that require new generating capacity were eliminated from further consideration and discussion based on their availability in the region, overall feasibility, ability to supply baseload power, or environmental consequences. In Section 9.2.3, the alternatives that were not eliminated are investigated in further detail relative to specific criteria such as environmental impacts, reliability, and economic costs.

While alternative energy technologies are reviewed here for the purposes of this environmental report, their availability relative to nuclear technologies was not a factor in selecting emerging nuclear technologies as the superior alternative. The decision to develop nuclear power on land adjacent to the existing VEGP units was based on market factors such as the proximity to an already-licensed station, the ability to incorporate existing environmental permits in the operation and plant parameters, property ownership, and other location features conducive to the plant's intended generating objective.

9.2.1 Alternatives That Do Not Require New Generating Capacity

This section is intended to provide an assessment of the economic and technical feasibility of meeting the demand for energy without constructing new generating capacity. Specific elements may include:

- Purchasing power from other utilities or power generators,
- Reactivating or extending the service life of existing plants within the power system,
- Implementing DSM actions (including conservation measures),
- A combination of these elements that would be equivalent to the output of the project and therefore eliminate its need.
- In Section 9.2.1, the relevant service area definition is applicable only to SNC's demand side management analysis because reducing demand outside the relevant service area would not relieve demand within the relevant service area.

9.2.1.1 Purchasing Power from Other Utilities or Power Generators

SNC has evaluated conventional and prospective purchase power supply options that could be reasonably implemented. The co-owners of the VEGP site have entered into long-term purchase contracts with several entities to provide firm capacity and energy. Power covered by these contracts is already included in current and future capacity estimates. Therefore, SNC does not consider the power purchased by these contracts to be available to satisfy the purchased power alternative.

If power were to be purchased from sources within the U.S., Canada, or Mexico, the generating technology likely would be one of those described in this ER (probably coal, natural gas, or nuclear). The description of the environmental impacts of other technologies described in Section 9.2.2 is representative of the purchased electrical power alternative to the Units 3 and 4. Under the purchased power alternative, the environmental impacts of power production would still occur, but would be located elsewhere within the region or the Nation or in another country.

The Georgia Public Service Commission placed a cap on the amount of total generation capacity that can be met through purchased power contracts. The cap was set at 30 percent so that the state does not become overly reliant on purchased power **(GPSC 2004)**. Consequently, long-term electrical power purchase contracts could defer the need for additional generation capacity, but would not eliminate the need to construct baseload capacity.

Purchasing power from other utilities or power generators is not considered a reasonable or environmentally preferable alternative to the proposed project of large baseload capacity.

9.2.1.2 Reactivating or Extending Service Life of Existing Plants

The plants that would likely replace the proposed project would be coal or natural gas units. Coal and natural gas plants slated for retirement tend to be ones that are old enough to have difficulty in economically meeting today's air emissions limits. In the face of increasingly stringent environmental restrictions, delaying retirement, or reactivating plants in order to avoid the construction of a large baseload plant would require major construction to upgrade or replace plant components. As a result, the environmental impacts of a refurbishment scenario are bounded by the coal- and natural gas-fired alternatives evaluated in Section 9.2.2.

It is conceivable that another nuclear plant could be a potential alternative source by reactivation or license renewal. Of the three nuclear plants operated by SNC, two have received renewed operating licenses. SNC will submit an application for renewal of the operating licenses for VEGP in 2007 and this analysis assumes the continued operation of VEGP Units 1 and 2. Continued operation of a nuclear power plant would avoid the environmental impacts related to construction, so continued operation of a nuclear power plant would have fewer environmental impacts than construction of a new plant. However, continued operation of an existing nuclear plant does not provide additional generating capacity.

Therefore, given a real need for the proposed project, reactivation or extended service life for existing plants are not considered reasonable or environmentally preferable alternative energy sources.

9.2.1.3 Demand Side Management

Demand side management (DSM) is the practice of reducing customers' demand for energy through programs such as energy conservation, efficiency, and load management so that the need for additional generation capacity is eliminated or reduced. DSM can minimize

environmental effects by avoiding the construction and operation of new generating facilities. Those impacts that would result from the construction of the proposed facility, or from the supply of the additional power through other means, would be avoided if DSM were sufficient to reduce the need for additional power.

Georgia and its electric utilities maintain a number of residential, commercial, and industrial programs to reduce both peak demands and daily energy consumption and continue to pursue additional opportunities for DSM.

For example, GPC, one of the co-owners of the proposed project, uses an assessment and screening methodology in its resource planning to identify DSM measures and conduct a qualitative review of each measure for applicability to the Company's customer base, climate, and to determine the measure's cost-effectiveness. In its most recent Integrated Resource Plan (IRP) filing, GPC evaluated a total of 266 residential DSM measures that provided potential energy savings through:

- increased energy efficiency for electric appliances, electric space cooling and heating equipment, and electric lighting;
- electric water heating measures; and
- heating and cooling savings resulting from improvements to the home's exterior shell.

GPC also evaluated 246 commercial and industrial (non-residential) DSM measures.

A qualitative evaluation was conducted to eliminate DSM measures that were not applicable to the GPC's customer base or climate. A total of 106 residential and 92 non-residential measures were passed from the qualitative screening analysis to the economic screening for cost-effectiveness analysis. The following cost-effectiveness tests were calculated for each measure: Participant's Test (PT), Rate Impact Measure (RIM) test, Total Resource Cost (TRC) test, and the Societal Cost Test (SCT). Measures that passed the TRC were eligible for consideration in DSM program development.

There were 9 residential and 2 non-residential demand-side measures that passed the RIM test. In all cases, those measures passing the RIM test either failed the TRC test, provided insufficient funds from benefits to cover the additional program administrative costs, provided insufficient funds (in the form of a rebate) from benefits to cover a meaningful portion of the measure's incremental costs to the participant, or were measures which had a very high Participant Test benefit/cost ratio (therefore, a high level of free-ridership[1]) thus eliminating the measures as cost effective resources when compared to the alternative supply-side resource. As a result of this, no new DSM programs were identified for development. Instead, GPC plans

[1] Electric utility DSM program "Freeriders" are participants who would have made program-supported changes even in the absence of an efficiency program. Freeriders impose administrative costs without providing benefits.

to continue its existing DSM programs and provide information to customers in their ongoing energy information program regarding the potential new measures which passed the RIM test.

State projections indicate that the available energy savings from DSM programs are insufficient to meet future demand. Energy conservation would offset only a small fraction of the energy needed in the region **(ICF 2005)**. Therefore, conservation alone would not be a reasonable alternative to the proposed project.

From an environmental impact standpoint, conservation could be considered in combination with other sources. Combinations of the viable alternatives, coal and natural gas, are addressed in Section 9.2.2.13. That evaluation concluded that such combinations would not result in an environmentally preferable alternative. The ability to offset some portion of required capacity is not expected to significantly reduce environmental impacts.

9.2.2 Alternatives That Require New Generating Capacity

9.2.2.1 Introduction

This section discusses possible alternatives requiring new generating capacity that could reasonably be expected to meet the additional generating capacity expected from the proposed project for the VEGP site. SNC's ESP application is premised on the installation of a facility that would primarily serve as a large baseload generator and that any feasible alternative would also need to be able to generate baseload power. In performing this evaluation, SNC determined that NUREG-1437 *Generic Environmental Impact Statement for License Renewal of Nuclear Plants,* 1999 (NUREG-1437) provides a useful analysis of alternative sources. SNC also analyzed integrated gasification combined cycle as an additional alternative. To generate the reasonable set of alternatives in NUREG-1437, the NRC included commonly known generation technologies and consulted various state energy plans to identify alternative generation sources typically being considered by state authorities across the country. From this review, the NRC established a reasonable set of alternative technologies for power generation. This section, as a starting point, considers (1) alternatives not yet commercially available, (2) fossil fuels, and (3) alternatives available within the Southeast.

During the lifetime of the proposed project, technology is expected to continue to improve operational and environmental performances. Thus, any analyses of future relative competitiveness or impacts are subject to that uncertainty. However, as in the case of alternatives evaluated in Section 9.2.1, SNC believes that sufficient knowledge is available to make a reasonable assessment.

The NRC considered these reasonable alternatives pursuant to its statutory responsibility under NEPA: wind, geothermal, oil, natural gas, hydropower, municipal solid wastes (MSW), coal, photovoltaic cells, solar thermal power, fuel cells, and biomass. Although NUREG-1437 is specific to license renewal, the alternatives analysis in it can be compared to the proposed

action to determine if the alternative technology represents a reasonable alternative to the proposed action and satisfies the intent and requirements of 10 CFR 52 regarding an ESP application.

The alternative technologies considered in this analysis are consistent with national policy goals for energy use, and are not prohibited by federal, state, or local regulations. Each of the alternatives are assessed and discussed in the subsequent sections relative to the following criteria:

- The alternative energy conversion technology is developed, proven, and available in the relevant region within the life of the proposed project.
- The alternative energy source provides baseload generating capacity equivalent to the capacity needed, and to the same level of availability as the proposed VEGP units.
- The alternative energy source does not result in environmental impacts in excess of a nuclear plant, and the costs of an alternative energy source do not exceed the costs that make it economically impractical.

Based on one or more of these criteria, several of the alternative energy sources were considered technically or economically infeasible after a preliminary review and were not considered further. Alternatives that were considered to be technically and economically feasible were assessed in greater detail in Section 9.2.3.

SNC is considering a two unit plant using Westinghouse's Advanced Passive pressurized water reactor (AP1000) configuration for the VEGP site. For analysis purposes, SNC assumed a target value of 2,234 MWe for the net electrical output from a new two-unit facility at VEGP. This is a bounding value and is the basis for the alternatives analysis in the following paragraphs.

9.2.2.2 Wind

Wind power systems produce power intermittently because they are only operational when the wind is blowing at sufficient velocity and duration **(McGowan and Connors 2000)**. While recent advances in technology have improved wind turbine reliability, average annual capacity factors for wind power systems are relatively low (25 to 40 percent) **(McGowan and Connors 2000)** compared to 90 to 95 percent industry average for a baseload plant such as a nuclear plant.

The energy potential in the wind is expressed by wind generation classes ranging from 1 (least energetic) to 7 (most energetic). Wind regimes of Class 4 or higher are suitable for the advanced utility-scale wind turbine technology currently under development. Class 3 wind regimes may be suitable for future utility-scale technology. **(APPA 2004)**

According to the Wind Energy Resource Atlas of the United States **(NREL 1986)**, the Southeast region is a Class 1 area, and the only places in the region with wind regimes of Class 3 or higher are exposed ridge crests and mountain summits in the southern Appalachian Mountains.

Offshore wind energy potential is in the initial stages of investigation in the Southeast. Southern Company (parent company of GPC) and the Georgia Institute of Technology are collaborating on an offshore wind power project off the coast of Savannah, Georgia that could generate 10 MWe of power. The goal of the project is to determine if offshore wind power is a feasible and efficient renewal energy option for power generation. (Southern Company 2005)

Mountain ridges are highly confined and represent an extremely small percentage of exposed land in the Southeast region **(NREL 1986)**. The total wind energy potential in the Southeast is approximately 171 MWe. The available land area within the Southeast with wind regimes of Class 3 or higher is approximately 35 square miles **(AWEA 2002)**.

Mountain ridge-top locations are remote, requiring incremental costs for developing access roads and power transmission infrastructure. Moreover, the hilly terrain increases the complexity of installation and the overall costs of wind energy due to the variable directional wind flows observed in mountainous regions compared to flatter landscapes. This variation tends to decrease the amount of usable energy that can be extracted from the wind, resulting in lower capacity factors. Reduced capacity factors increase overall cost per kilowatt-hour of energy generated. **(Bowers 2005)**

Use of mountain ridge tops is of additional concern in the Southeast due to aesthetic concerns. Southeastern mountain locations are enjoyed for recreation by a large percentage of the public. Scenic vistas are important and considerable public resistance to the use of mountainous areas for the location of wind farms in the Southeast is likely **(Bowers 2005)**. In addition, wind energy is at a minimum in the Southeast in the summer months **(Bowers 2005)**, but the co-owners are summer-peaking utilities. Consequently, wind generation requires redundant power generation resources to meet seasonal peak loads.

Estimates based on existing installations indicate that a utility-scale wind farm would require about 50 acres per MWe of installed capacity **(McGowan and Connors 2000)**. Wind farm facilities would occupy 3 to 5 percent of the wind farm's total acreage **(McGowan and Connors 2000)**. Assuming ideal wind conditions and a 35 percent capacity factor, a wind farm with a net output of 2,234 MWe would require about 319,143 acres (499 sq mi) of which about 9,574 acres (15 sq mi) would be occupied by turbines and support facilities. Based on the amount of land needed, the wind alternative would require a large green field site, which would result in a LARGE environmental impact.

Capital costs for wind energy systems range from $1,300 to $1,700 per kilowatt **(FPL Energy 2006)**. In areas with wind regimes of Class 4 or higher, the levelized cost of electricity produced by wind energy systems is 4.0 to 6.0 cents per kilowatt-hour **(FPSC&DEP 2003)**. Wind energy costs are expected to be higher in areas like the Southeast that have lower wind regimes **(FPSC&DEP 2003)**.

Wind energy is not a reasonable alternative because wind energy, due to its intermittent nature, cannot be relied upon for baseload power. Furthermore, there are insufficient wind resources in the relevant service area to offer a comparable generating capacity, and wind energy offers a distinct environmental disadvantage, relative to nuclear energy due to its LARGE land use impacts.

SNC has concluded that, due to the limited availability of area having suitable wind speeds, daily and seasonal variability of wind in the region, the amount of land needed, and aesthetic impacts, wind generation is not a reasonable alternative for baseload power in the Southeast.

9.2.2.3 Solar Technologies

There are two basic types of solar technologies that produce electrical power: photovoltaic and solar thermal power. Photovoltaics convert sunlight directly into electricity using semiconducting materials. Solar thermal power systems use mirrors to concentrate sunlight on a receiver holding a fluid or gas, heating it, and causing it to turn a turbine or push a piston coupled to an electric generator. **(Leitner and Owens 2003)**

Solar technologies produce more electricity on clear, sunny days with more intense sunlight and when the sunlight is at a more direct angle (i.e., when the sun is perpendicular to the collector). Cloudy days can significantly reduce output. To work effectively, solar installations require consistent levels of sunlight (solar insolation). **(Leitner and Owens 2003)**

Solar thermal systems can be equipped with a thermal storage tank to store hot heat transfer fluid, providing thermal energy storage. By using thermal storage, a solar thermal plant can provide dispatchable electric power. **(Black & Veatch 2005)**

The lands with the best solar resources are usually arid or semi-arid. While photovoltaic systems use both diffuse and direct radiation, solar thermal power plants can only use the direct component of the sunlight. This makes solar thermal power unsuitable for areas like the Southeastern U.S. with high humidity and frequent cloud cover, both of which diffuse solar energy and reduce its intensity. In addition, the average annual amount of solar energy reaching the ground needs to be 6.0 kilowatt-hours per square meter per day or higher for solar thermal power systems **(Leitner 2002)**. The Southeast receives 3.5 to 5 kilowatt hours of solar radiation per square meter per day **(NREL 2005)**.

Like wind, capacity factors are too low to meet baseload requirements. Average annual capacity factors for solar power systems are relatively low (24 percent for photovoltaics and 30 to 32 percent for solar thermal power) compared to 90 to 95 percent for a baseload plant such as a nuclear plant. **(Leitner 2002)**

Land use requirements (and associated construction and ecological impacts) are also much greater for solar technologies than for a nuclear plant. The area of land required depends on the available solar insulation and type of plant, but is about 8 acres per megawatt for

photovoltaic systems and 3.8 acres per megawatt for solar thermal power plants **(Leitner 2002)**. Assuming capacity factors of 24 percent for photovoltaics and 32 percent for solar thermal power, facilities having 2,234 MWe net capacity are estimated to require 74,467 acres (116 sq mi), if powered by photovoltaic cells, and 26,529 acres (41 sq mi), if powered by solar thermal power.

Solar-powered technologies-photovoltaic cells and solar thermal power-do not currently compete with conventional technologies in grid-connected applications due to higher capital costs per kilowatt of capacity. Capital costs for photovoltaic installations range from $3,600 to $8,050 per kilowatt and capital costs for solar thermal installations range from $2,700 to $4,600 per kilowatt. Recent estimates indicate that in areas with good solar insolation, the levelized cost of electricity produced by photovoltaic cells is 19.4 to 47.4 cents per kilowatt-hour, and electricity from solar thermal systems can be produced for a cost of 10.8 to 18.7 cents per kilowatt-hour. Solar energy costs are expected to be much higher in areas like the Southeast that have lower solar insolation. **(FPSC&DEP 2003)**

SNC has concluded that solar energy is not a reasonable alternative because solar energy, due to its intermittent nature, cannot be relied upon for baseload power. Furthermore, SNC finds that there are insufficient solar resources in the relevant service area to offer a comparable generating capacity, solar energy generating costs exceed nuclear power, and solar energy offers a distinct environmental disadvantage, relative to nuclear energy due to its LARGE land use impacts.

Solar-powered technologies do not currently compete with conventional fossil-fueled technologies in grid-connected applications due to higher capital costs per kW of capacity. Southern Company has evaluated numerous solar options over the past 20 years. Data derived from these technology evaluations, coupled with high capital costs, indicate that solar power is not practical as a utility-scale power generation option. **(Bowers 2005)**

SNC has concluded that, due to the high cost, low capacity factors, lack of sufficient incident solar radiation, and the substantial amount of land needed to produce the desired output, solar energy is not practical as a utility-scale power generation option.

9.2.2.4 Hydroelectric power

Hydroelectric power is a fully commercialized technology. About 5 percent of the electric generating capacity in the Southeast is hydroelectric **(EIA 2004a)**. Hydropower's percentage of U.S. generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern over flooding, destruction of natural habitat, and destruction of natural river courses **(EIA 2005)**.

According to the U.S. Hydropower Resource Assessment the undeveloped hydropower potential in the Southeast is approximately 1,066 MW. Studies have concluded that there are

no remaining sites in the Southeast that would be environmentally suitable for a large hydroelectric facility **(Conner et al. 1998)**.

Land use for a large scale hydropower facility is estimated to be quite large. NUREG-1437 estimates land use of 1,600 square miles per 1,000 MWe generated by hydropower. Based on this estimate, a 2,234 MWe project would require flooding more than 3,574 sq mi resulting in a LARGE impact on land use. Further, operation of a hydroelectric facility would alter aquatic habitats above and below the dam, which would adversely impact aquatic species.

Recent estimates indicate that capital costs for a hydropower facility range from $1,300 to $5,980 per kilowatt. The levelized cost of electricity produced from new hydropower facilities is estimated at 4.0 to 14.0 cents per kilowatt-hour. **(FPSC&DEP 2003)**

SNC has concluded that, due to the lack of suitable sites in the Southeast and the amount of land needed, in addition to the adverse environmental impacts, hydropower is not a reasonable alternative for baseload power.

9.2.2.5 Geothermal

Geothermal energy is a proven resource for power generation. Geothermal power plants use naturally heated fluids as an energy source for electricity production. To produce electric power, underground high-temperature reservoirs of steam or hot water are tapped by wells and the steam rotates turbines that generate electricity. Typically, water is then returned to the ground to recharge the reservoir. **(NREL 1997)**

Geothermal energy can achieve average capacity factors of 95 percent and can be used for baseload power where this type of energy source is available **(NREL 1997)**. Widespread application of geothermal energy is constrained by the geographic availability of the resource **(NREL 1997)**. In the U. S., high-temperature hydrothermal reservoirs are located in the western states, Alaska and Hawaii. There are no known high-temperature geothermal sites in the Southeast. **(SMU 2004)**

Geothermal power plants require relatively little land. An entire geothermal field uses 1 to 8 acres per MWe **(Shibaki 2003)**. Assuming a 95 percent capacity factor, a geothermal power plant with a net output of 2,234 MWe would require at least 2,352 acres (4 sq mi).

The major environmental concerns associated with geothermal development are the release of small quantities of carbon dioxide and hydrogen sulfide, noise, and disposal of sludge and spent geothermal fluids **(Shibaki 2003, NREL 1997)**. Subsidence and reservoir depletion may be a concern if withdrawal of geothermal fluids exceeds natural recharge or injection **(Shibaki 2003)**.

Recent estimates indicate that capital costs for geothermal power plants range from $2,560 to $3,840 per kilowatt. The levelized cost of electricity produced from geothermal power plants is estimated to be in the range of 4.7 to 7.6 cents per kilowatt-hour. **(CEC 2003)**

SNC has concluded that, due to the lack of high-temperature geothermal reservoirs, geothermal power is not a reasonable alternative for baseload power in the relevant service area.

9.2.2.6 Biomass Related Fuels

Electric power generation from combustion of biomass has been demonstrated and offers a reliable source of renewable energy. Because biomass technologies employ combustion processes to produce electricity, they can generate electricity at any time. Biomass fired facilities generate electricity using commercially available equipment and well-established technology.

The Southeast does have abundant biomass resources in the form of wood waste and other agricultural residues. Over 22 million tons of biomass with an average heat content of 13 million BTU per ton is produced each year in Georgia alone **(Curtis et al. 2003)**.

Energy crops such as switchgrass could be grown to ensure a reliable supply of biomass feedstocks for generation of electricity. The environmental impacts from converting large tracts of land to production of energy crops may include detrimental effects on wildlife habitat and biodiversity, reduced soil fertility, increased erosion, and reduced water quality. The net environmental impacts would depend on previous land use, the particular energy crop, and how the crop is managed. Displacing natural land cover, such as forests and wetlands, with energy crops would likely have negative impacts.

Nearly all of the biomass-energy-using electricity generation facilities in the United States use steam turbine conversion technology. The technology is relatively simple to operate and it can accept a wide variety of biomass fuels. However, at the scale appropriate for biomass (the largest biomass power plants are 40 to 50 MW in size), the technology is expensive and inefficient. Therefore, the technology is relegated to applications where there is a readily available supply of low-, zero-, or negative-cost delivered feedstocks.

Recent estimates indicate that capital costs for biomass power plants range from $2,000 to $3,450 per kilowatt. The levelized cost of electricity produced from biomass power plants is 6.3 to 11.8 cents per kilowatt-hour. **(FPSC&DEP 2003)**

Construction of a biomass-fired plant would have an environmental impact that would be similar to that for a coal-fired plant, although facilities using wood waste and agricultural residues for fuel would be built on smaller scales. Like coal-fired plants, biomass-fired plants require areas for fuel storage, processing, and waste (i.e., ash) disposal. Additionally, operation of biomass-fired plants has environmental impacts, including potential impacts on the aquatic environment and air.

Another option for using biomass feedstocks to generate electricity is co-firing with coal. For more than 10 years, Southern Company has been evaluating co-firing biomass fuels in existing coal-fired generating plants. While Southern Company has proven that biomass can be

successfully co-fired with coal, it is not without technical challenges. Biomass is much less dense than coal, requiring a large volume of fuel to be handled. Larger areas of biomass storage and additional handling are required to accommodate the lower-density materials. Moreover, the ash residue left from combusting biomass contains alkali and alkaline earth elements, such as sodium, potassium and calcium. These compounds bind irreversibly with the catalysts used in selective catalytic reduction (SCR) reactors that have been installed on coal-fired generating plants. These compounds can lead to increased catalyst plugging and cause deactivation of SCR catalysts, thus reducing or eliminating the ability of this technology to reduce NOx emissions. **(Bowers 2005)**

SNC has concluded that, due to the small scale of biomass generating plants, high cost, and lack of an obvious environmental advantage, biomass energy is not a reasonable alternative for baseload power.

9.2.2.7 Municipal Solid Waste

Municipal solid waste (MSW) can be directly combusted in waste-to-energy facilities to generate electricity. At the power plant, MSW would be unloaded from collection trucks and shredded or processed to ease handling. Recyclable materials would be set aside, and the remaining waste would be fed into a combustion chamber to be burned. The heat released from burning the MSW would be utilized to produce steam, which turns a steam turbine to generate electricity.

The initial capital costs for MSW plants are greater than for comparable steam turbine technology at biomass-fired facilities due to the need for specialized waste separation and handling equipment. Recent estimates indicate that capital costs for MSW plants range from $2,500 to $4,600 per kilowatt. The levelized cost of electricity produced from MSW plants is 3.5 to 15.3 cents per kilowatt-hour. **(FPSC&DEP 2003)**

The decision to burn MSW to generate energy is usually driven by the need for an alternative to landfills, rather than by energy considerations. MSW power plants reduce the need for landfill capacity because disposal of ash created by MSW combustion requires less volume and land area as compared to unprocessed MSW **(EPA 2006)**. It is unlikely, however, that many landfills will begin converting waste to energy due to the numerous obstacles and factors that may limit the growth in MSW power generation. Chief among them are environmental regulations and public opposition to siting MSW facilities near feedstock supplies.

Because ash and other residues from MSW operations may contain toxic materials, the power plant wastes must be disposed of in an environmentally safe manner to prevent toxic substances from migrating (leaching) into groundwater supplies. Current regulations require MSW ash sampling on a regular basis to determine its hazardous status. Hazardous ash must be managed and disposed of as hazardous waste. Depending on state and local restrictions, nonhazardous ash may be disposed of in a MSW landfill or recycled for use in roads, parking lots, or daily covering for sanitary landfills. **(EPA 2006)**

The overall level of construction impacts from a waste-fired plant should be approximately the same as that for a conventional coal-fired plant **(FPSC&DEP 2003)**. The air emission profile and other operational impacts (including impacts on the aquatic environment, air, and waste disposal) for a MSW plant would also be similar to a conventional fossil-fueled unit **(FPSC&DEP 2003)**. Some of these impacts would be small, but still larger than the proposed action.

SNC has concluded that, due to the high costs and lack of obvious environmental advantages, other than reducing landfill volume, burning municipal solid waste to generate electricity is not a reasonable alternative for baseload power.

9.2.2.8 Petroleum Liquids

The Southeast has several petroleum-fired units (including units fired by distillate fuel oil, residential fuel oil, petroleum coke, jet fuel, kerosene, other petroleum and waste oil); however, they produce less than one percent of the region's electricity. While capital costs for new petroleum-fired plants would be similar to the cost of a new gas-fired plant, petroleum-fired operation is more expensive due to the high cost of petroleum. Recent estimates indicate that the levelized cost of electricity produced by petroleum-fired operation is 6.1 to 6.7 cents per kilowatt-hour **(DeLaquil, et al. 2005)**. Future increases in petroleum prices are expected to make petroleum-fired generation increasingly more expensive relative to other alternatives.

The high cost of petroleum has prompted a steady decline in its use for electricity generation in recent decades (EIA 2005b) and no new oil-fired units have been constructed in the U. S. since 1981 **(Cole 2003)**. From a peak of 365 million MWh in 1978 (17 percent of total U.S. net electricity generation in that year), petroleum accounted for just 118 million MWh – three percent – of net electricity generated in 2004 **(EIA 2005b)**. With the peak of domestic petroleum production in 1970, rising imports since then, increasing global prices over the last few years and the prospect for more of the same, plus competition for this valuable fuel commodity not only from the transportation sector but also from the petrochemical industry, it is likely that the downward trend for using petroleum to generate electricity will continue.

Also, construction and operation of a petroleum-fired plant would have identifiable environmental impacts. For example, NUREG-1437 estimates that construction of a 1,000-MWe petroleum-fired plant would require about 120 acres. Assuming a 95 percent capacity factor, a petroleum-fired power plant with a net output of 2,234 MWe would require about 282 acres. Additionally, operation of petroleum-fired plants would have environmental impacts (including impacts on the aquatic environment and air) that would be similar to those from a coal-fired plant. **(NUREG-1437)**

Petroleum-fired generation is not a reasonable alternative for baseload power, based on the high cost of the fuel, combined with concerns related to availability, energy independence, and lack of obvious environmental advantage.

9.2.2.9 Fuel Cells

Fuel cell power plants are in the initial stages of commercialization. While more than 650 large stationary fuel cell systems have been built and operated worldwide, the global stationary fuel cell electricity generating capacity in 2003 was only 125 MWe **(Fuel Cell Today 2003)**. The production capability of the largest stationery fuel cell manufacturer is 50 MWe per year **(CSFCC 2002)**. The largest stationary fuel cell power plant yet built is only 11 MWe **(Fuel Cell Today 2003)**.

Fuel cells are not cost effective when compared with other generation technologies, both renewable and fossil-based. Recent estimates indicate that the levelized cost of electricity produced by fuel cells is 9.7 to 43.5 cents per kilowatt-hour and capital costs for fuel cell installations range from $1,730 to $4,965 per kilowatt **(CEC 2003)**. Recent estimates suggest that manufacturers would need to at least triple their production capacity to achieve a competitive price of $1,500 to $2,000 per kilowatt **(Shipley and Elliott 2004)**.

SNC believes that this technology has not matured sufficiently to support production for a baseload facility. SNC has concluded that, due to the cost and production limitations, fuel cell technology is not a reasonable alternative for baseload capacity.

9.2.2.10 Pulverized Coal

Pulverized coal-fired steam electric plants provide the majority of electric generating capacity in the U.S., accounting for about 51 percent of the electricity generated and about 33 percent of electric generating capacity in 2003 **(EIA 2004b)**. In the Southeast, pulverized coal-fired plants provide about 55 percent of the electricity generated and about 37 percent of its electric generating capacity **(EIA 2004a)**. The environmental impacts of constructing a typical pulverized coal-fired steam plant are well known because coal is the most prevalent type of central generating technology in the U.S.

There are two primary technologies identified for generating electrical energy from pulverized coal: conventional pulverized coal boiler and fluidized bed combustion (FBC). As part of the pulverized coal alternatives evaluation, both technologies (conventional and FBC) were evaluated.

In conventional pulverized coal-fired plants, pulverized coal is blown into a combustion chamber of a boiler where it is combusted. The hot gases and heat energy from the combustion process convert water in the boiler into steam. This high-pressure steam is then passed into a steam turbine to produce electricity. Flue gas is transferred from the steam generator, through a selective catalytic reducer (SCR) for nitrogen oxides (NOx) reduction and into an air heater. From the air heater the flue gas flows to a sulfur dioxide (SO_2) scrubber system and a particulate removal system.

Conventional pulverized coal-fired boilers have been built to match steam turbines which have outputs between 50 and 1300 MWe. In order to take advantage of the economies of scale,

most new units are rated at over 300 MWe, but there are relatively few really large ones with outputs from a single boiler/turbine combination of over 700 MWe. This is because of the substantial effects such units have on the distribution system if they should 'trip out' for any reason, or be unexpectedly shut down. (Burns & McDonnell 2005)

FBC is an advanced electric power generation process that minimizes the formation of gaseous pollutants by controlling coal combustion parameters and by injecting a sorbent (such as crushed limestone) into the combustion chamber along with the fuel. Crushed fuel mixed with the sorbent is fluidized on jets of air in the combustion chamber. Sulfur released from the fuel as SO2 is captured by the sorbent in the bed to form a solid compound that is removed with the ash. The resultant by-product is a dry, benign solid that is potentially a marketable byproduct for agricultural and construction applications. More than 90 percent of the sulfur in the fuel is captured in this process. NOx formation in FBC power plants is lower than that for conventional pulverized coal boilers because the operating temperature range is below the temperature at which thermal NOx is formed **(DOE 2003).**

Currently, FBC units are limited to a maximum size of approximately 265 MW **(DOE 2003)**. Although a multi-unit facility could be built, this would not be able to benefit from the economies of scale associated with a 2,234 MW project. Also, because of the lower operating temperature of the FBC system, it doesn't achieve the higher efficiency levels achieved by conventional pulverized coal boilers. Due to the limited size of available units, and lower thermal efficiency FBC is not a cost-effective alternative for the proposed project.

To improve the thermal efficiency of the FBC technology, a new type of FBC boiler is being proposed that encases the entire boiler inside a large pressure vessel. Burning coal in a pressurized fluidized bed boiler (PFBC) results in a high-pressure stream of combustion gases that can spin a gas turbine to make electricity, then boil water for a steam turbine. It is estimated that boilers using the PFBC technology will be able to generate 50 percent more electricity from coal than a regular power plant from the same amount of coal **(DOE 2003)**. The PFBC technology is currently in the demonstration phase and is not a feasible alternative for the proposed project.

SNC defined the pulverized coal-fired alternative as consisting of four conventional boiler units, each with a net capacity of 530-MWe for a combined capacity of 2,120 MWe. SNC chose this configuration to be equivalent to the gas-fired alternative described below. This equivalency makes impact characteristics most comparable, facilitating impact analysis. Table 9.2-1 describes assumed basic operational characteristics of the coal-fired units. SNC based its emission control technology and percent-control assumptions on alternatives that the EPA has identified as being available for minimizing emissions (EPA 1998). For the purposes of analysis, SNC has assumed that coal and limestone (calcium oxide) would be delivered by rail after upgrading the existing rail spur into VEGP.

Recent estimates indicate that capital costs for conventional pulverized coal-fired power plants range from $1,094 to $1,169 per kilowatt. The levelized cost of electricity produced from pulverized coal-fired power plants is 3.3 to 4.1 cents per kilowatt-hour. **(University of Chicago 2004)**

The U.S. has abundant low-cost coal reserves, and the price of coal for electric generation is likely to increase at a relatively slow rate. Pulverized coal-fired plants are likely to continue to be a reliable energy source well into the future, assuming environmental constraints do not cause the gradual substitution of other fuels. Even with recent environmental legislation, new coal capacity is expected to be an affordable technology for reliable, near-term development. **(EIA 2005)**

Based on the well-known technology, fuel availability, and generally understood environmental impacts associated with constructing and operating a coal-fired power generation plant, it is considered a competitive alternative and is therefore examined further in Section 9.2.3.

9.2.2.11 Integrated Gasification Combined Cycle (IGCC)

Integrated Gasification Combined Cycle (IGCC) is an emerging, advanced technology for generating electricity with coal that combines modern coal gasification technology with both gas turbine and steam turbine power generation. The technology is substantially cleaner than conventional pulverized coal plants because major pollutants can be removed from the gas stream prior to combustion.

The IGCC alternative generates substantially less solid waste than the pulverized coal-fired alternative. The largest solid waste stream produced by IGCC installations is slag, a black, glassy, sand-like material that is potentially a marketable byproduct. Slag production is a function of ash content. The other large-volume byproduct produced by IGCC plants is sulfur, which is extracted during the gasification process and can be marketed rather than placed in a landfill. IGCC units do not produce ash or scrubber wastes.

At present however, IGCC technology still has insufficient operating experience for widespread expansion into commercial-scale, utility applications. Each major component of IGCC has been broadly utilized in industrial and power generation applications. But the integration of coal gasification with a combined cycle power block to produce commercial electricity as a primary output is relatively new and has been demonstrated at only a handful of facilities around the world, including five in the U.S. Experience has been gained with the chemical processes of gasification, coal properties and their impact on IGCC design, efficiency, economics, etc. However, system reliability is still relatively lower than conventional pulverized coal-fired power plants. There are problems with the integration between gasification and power production as well. For example, if there is a problem with the gas cleaning process, the gas can cause various damages to the gas turbine. **(Rardin et al. 2005)**

To advance the technology, Southern Company and the Orlando Utilities Commission (OUC) are building a $557 million advanced IGCC facility in Central Florida as part of the U.S. Department of Energy's (DOE) Clean Coal Power Initiative. The 285 MW plant will be built at OUC's Stanton Energy Center near Orlando and will gasify coal using state-of-the-art emissions controls. The DOE will contribute $235 million and OUC and Southern Company will contribute $322 million. **(OUC 2004)**

Overall, IGCC plants are estimated to be about 15 to 20 percent more expensive than comparably sized pulverized coal plants, due in part to the coal gasifier and other specialized equipment. Recent estimates indicate that overnight capital costs for coal-fired IGCC power plants range from $1,400 to $1,800 per kilowatt **(EIA 2005a)**. The production cost of electricity from a coal-based IGCC power plant is estimated to be about 3.3 to 4.5 cents per kilowatt-hour.

Southern Company provides wholesale power in Florida, and the Orlando IGCC project has commercial, availability and technical risk factors that may be appropriate for wholesale power producers, but are not appropriate for a traditional cost-of-service utilities. In addition, risks for the Orlando project are mitigated because it is only a 285 MW project; Orlando Utility Commission is a participant, and $235 million in DOE co-funding was secured. These mitigating factors are not available to the co-owners of the proposed project.

Because IGCC technology currently is not cost-effective and requires further research to achieve an acceptable level of reliability, an IGCC facility is not a reasonable alternative to the proposed project.

9.2.2.12 Natural Gas

SNC has chosen to evaluate gas-fired generation, using combined-cycle turbines, because it has determined that the technology is mature, economical, and feasible. Recent estimates indicate that capital costs for gas-fired power plants range from $466 to $590 per kilowatt. The levelized cost of electricity produced from gas-fired power plants is 3.9 to 4.4 cents per kilowatt-hour. **(University of Chicago 2004)**

Existing manufacturers' standard-sized units include a gas-fired combined-cycle plant of 530-MWe net capacity, consisting of two 184-MWe gas turbines (e.g., General Electric Frame 7FA) and 182 MWe of heat recovery capacity. SNC assumed four 530-MWe units, having a total capacity of 2,120 MWe, as the gas-fired alternative at the VEGP site. Although this provides less capacity than two AP1000 units, it ensures against overestimating environmental impacts from the alternatives. The shortfall in capacity could be replaced by other methods, such as purchasing power. Table 9.2-2 describes assumed basic operational characteristics of the gas-fired units. As for the coal-fired alternative, SNC based its emission control technology and percent-control assumptions on alternatives that the EPA has identified as being available for minimizing emissions **(EPA 2000)**. For the purposes of analysis, SNC has assumed that there would be sufficient gas availability.

Based on the well-known technology, fuel availability, and generally understood environmental impacts associated with constructing and operating a natural gas-fired power generation plant, it is considered a competitive alternative and is therefore examined further in Section 9.2.3.

9.2.2.13 Combination of Alternatives

Even though individual alternatives might not be sufficient on their own to provide 2,234 MWe capacity due to the small size of the resource or lack of cost-effective opportunities, it is conceivable that a mix of alternatives might be cost effective. The possible combinations of fuel types to generate 2,234 MWe is large, and SNC has not exhaustively evaluated each combination. However, SNC reviewed combinations that due to technological maturity, economics, and other factors, could be reasonable alternatives to the proposed project. Two of these combinations of alternatives are addressed below.

As discussed in Section 9.2.2.2, wind energy, as a stand-alone technology, is not a feasible alternative for baseload power. However, it is conceivable that a mix of wind energy and gas-fired combined cycle units could provide baseload power. For example, the 2,234 MWe target capacity could be met by developing a 120 MWe wind farm, along with four 530 MWe natural gas combined-cycle units. When operating, a combined cycle plant can "follow" the wind load by ramping up and down quickly. When the wind is blowing hard, the combined cycle plant can be ramped down; when the wind is not blowing or is blowing too softly to turn the wind turbines, the combined cycle plant can be ramped up. The impacts associated with the wind portion of the alternative – land use impacts, noise impacts, visual impacts, impacts on birds, etc. – would be more than the stand alone natural gas alternative; therefore, the combination would have greater impacts than a single fuel type. The environmental impacts associated with the combined alternative would compare unfavorably with the proposed project.

If the hypothetical mix included coal-fired generation, the environmental impacts associated with construction (land use, ecology) and air quality would be expected to be greater than that of the proposed project. For example, the 2,234 MWe target capacity could be met by building two 530 MWe coal-fired units along with two 530 MWe natural gas combined-cycle units. The shortfall in capacity could be replaced by other methods, such as purchasing power. This combination coal-gas facility would require approximately 428 acres for permanent structures. As discussed in Section 4.1.1, construction of the proposed project would require about 500 acres of which about 310 acres would be required for permanent facilities. Air quality impacts for two 530 MWe coal-fired units would compare unfavorably with the proposed project due to the large amount of combustion products from coal-fired generation. The additional impact resulting from the two natural gas units would only strengthen the overall favorable position of the proposed project.

Other combinations of the various alternatives are not discussed here. In general, poor annual average capacity factors, higher environmental impacts (land use, ecological, air quality),

immature technologies, and a lack of cost-competitiveness are not expected to lead to a viable, competitive combination of alternatives which would be either environmentally equivalent or preferable.

9.2.3 Assessment of Reasonable Alternative Energy Sources and Systems

This section evaluates the environmental impacts from what SNC has determined to be reasonable alternatives to the proposed project: pulverized coal-fired generation and gas-fired generation.

SNC has identified the significance of the impacts associated with each issue as SMALL, MODERATE, or LARGE. This characterization is consistent with the criteria that 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. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.

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.

In accordance with NEPA practices, SNC considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are small receive less mitigative consideration than impacts that are large).

9.2.3.1 Pulverized Coal-Fired Generation

SNC has reviewed the NRC analysis of environmental impacts from coal-fired generation alternatives in NUREG-1437 and found NRC's analysis to be reasonable. Construction impacts could be substantial, due in part to the large land area required (which can result in natural habitat loss) and the large workforce needed. NRC pointed out that siting a new coal-fired plant where an existing nuclear plant is located would reduce many construction impacts. NRC identified major adverse impacts from operations as human health concerns associated with air emissions, waste generation, and losses of aquatic biota due to cooling water withdrawals and discharges.

The coal-fired alternative defined by SNC in Section 9.2.2.10 would be located at the VEGP site.

9.2.3.1.1 Air Quality

Air quality impacts of coal-fired generation are considerably different from those of nuclear power. A coal-fired plant would emit sulfur dioxide (SO_2, as SOx surrogate), oxides of nitrogen (NOx), particulate matter (PM), and carbon monoxide (CO), all of which are regulated pollutants. As Section 9.2.2.10 indicates, SNC has assumed a plant design that would minimize air emissions through a combination of boiler technology and post combustion pollutant removal. SNC estimates the coal-fired alternative emissions to be as follows:

SO_2 = 5,587 tons per year

NOx = 1,815 tons per year

CO = 1,815 tons per year

PM:

PM_{10} (particulates having a diameter of less than 10 microns) = 91 tons per year

$PM_{2.5}$ (particulates having a diameter of less than 2.5 microns) = 0.39 tons per year

The acid rain requirements of the Clean Air Act Amendments capped the nation's SO_2 emissions from power plants. Each company with fossil-fuel-fired units was allocated SO_2 allowances. To be in compliance with the Act, the companies must hold enough allowances to cover their annual SO_2 emissions. In 2002, emissions of SO_2 and NOx from Georgia's generators ranked 5th and 10th highest nationally, respectively **(EIA 2004a)**. Both SO_2 and NOx emissions would increase if a new coal-fired plant were operated at VEGP. To operate a fossil-fuel burning plant, Southern Company would have to purchase SO_2 allowances from the open market or shut down existing fossil-fired capacity and apply the credits from that plant to the new one.

In October 1998, EPA promulgated the NOx State Implementation Plan Call regulation that requires 22 states, including Georgia, to reduce their NOx emissions by over 30 percent to address national ozone transport. The regulation imposes a NOx "budget" to limit the NOx emissions from each state. In October 2004, the EPA announced that it would stay implementation of the rule as it relates to Georgia, while it initiates rulemakings to address issues raised in a petition for reconsideration filed by a coalition of Georgia industries. If the NOx reduction rules are implemented in Georgia, each electrical generating unit would need to hold enough NOx credits to cover its annual NOx emissions.

In March 2005, EPA issued the final Clean Air Interstate Rule which addresses power plant SO_2 and NOx emissions that contribute to non-attainment of the eight-hour ozone and fine particulate matter standards in downwind states. Twenty-eight eastern states, including each of the states within the region of interest, are subject to the requirements of the rule. The rule calls for further reductions of NOx and SO_2 emissions from power plants. These reductions can be

accomplished by the installation of additional emission controls at existing coal-fired facilities or by the purchase of emission allowances from a cap-and-trade program.

The likelihood of buying allowances for a new facility would be extremely remote, if possible at all. The coal-fired alternative, while possible, would not be economically feasible because there are no mitigating efforts (like emissions trading) to make the alternative worthwhile. In addition, emission credits' trading generally applies to non-attainment areas. The site that SNC has chosen as the preferred site is located in an attainment area, making emission credit trading not effective as a mitigation technique.

Air impacts from fossil fuel generation would be substantial. Adverse human health effects from coal combustion have led to important federal legislation in recent years and public health risks, such as cancer and emphysema, have been associated with coal combustion. Global warming and acid rain are also potential impacts. SNC concludes that federal legislation and concerns such as global warming and acid rain are indications of concerns about destabilizing important attributes of air resources. SO_2 emission allowances, NOx emission allowances, low NOx burners, overfire air, fabric filters or electrostatic precipitators, and scrubbers are regulatorily imposed mitigation measures. As such, SNC concludes for purposes of this alternatives analysis that the coal-fired alternative may have MODERATE impacts on air quality: the impacts may be noticeable, but would not destabilize air quality in the area due to the use of mitigating technologies.

9.2.3.1.2 Waste Management

The coal-fired alternative would generate substantial solid waste. The coal-fired plant, using coal having an ash content of 10.87 percent, would annually consume approximately 7,260,000 tons of coal. Particulate control equipment would collect most (99.9 percent) of this ash, approximately 788,000 tons per year. Southern Company recycles 35 percent of its coal ash **(Southern Company 2003)**. Assuming continuation of this waste mitigation measure, the coal-fired alternative would generate approximately 512,500 tons of ash per year for disposal.

SOx-control equipment, annually using approximately 183,000 tons of limestone, would generate another 218,000 tons per year of waste in the form of scrubber sludge. SNC estimates that ash and scrubber waste disposal over a 40-yr plant life would require approximately 406 acres.

With proper placement of the facility, coupled with current waste management and monitoring practices, waste disposal would not destabilize any resources. There would be space within VEGP property for this disposal. After closure of the waste site and revegetation, the land would be available for other uses. For these reasons, SNC believes that waste disposal for the coal-fired alternative would have MODERATE impacts; the impacts of increased waste disposal would be clearly noticeable, but would not destabilize any important resource and further mitigation of the impact would be unwarranted.

9.2.3.1.3 Other Impacts

Construction of the power block and coal storage area would impact approximately 697 acres of land and associated terrestrial habitat. Because most of this construction would be in previously disturbed areas, impacts would be minimal. Visual impacts would be consistent with the industrial nature of the site. As with any large construction project, some erosion, sedimentation, and fugitive dust emissions could be anticipated, but would be minimized by using best management practices. It is assumed that construction debris from clearing and grubbing could be disposed of on site and municipal waste disposal capacity would be available. Socioeconomic impacts would result from the approximately 200 people needed to operate the coal-fired facility. SNC believes that these impacts would be SMALL due to the mitigating influence of the site's proximity to the surrounding population area. Cultural resource impacts would be unlikely due to the previously disturbed nature of the site, and could be, if needed, minimized by survey and recovery techniques.

Impacts to aquatic resources and water quality would be minimized due to the plant's use of cooling towers and SNC believes that these impacts would be SMALL. The new stacks, boilers, and rail deliveries would be an incremental addition to the visual impact from existing VEGP structures and operations. Coal delivery would add noise and transportation impacts associated with unit-train traffic.

SNC believes that other construction and operation impacts would be SMALL. In most cases, the impacts would be detectable, but they would not destabilize any important attribute of the resource involved. Due to the minor nature of these impacts, mitigation would not be warranted beyond that mentioned.

9.2.3.1.4 Design Alternatives

The VEGP location lends itself to coal delivery by rail. Section 9.4.1 analyzes alternative designs for the VEGP units 3 and 4 heat dissipation systems. Based on this analysis, SNC assumed that cooling towers would be used for the coal-fired alternative. Use of cooling towers would minimize impingement, entrainment, and thermal impacts; consumptive water use through evaporation would be a SMALL impact, and 100-foot-high mechanical towers or 600-foot-high natural draft towers would introduce a visual impact.

9.2.3.2 Natural Gas Generation

SNC has reviewed the NRC analysis of environmental impacts from gas-fired generation alternatives in NUREG-1437 that focused on combined-cycle plants and found it to be reasonable. Section 9.2.2.12 presents SNC's reasons for defining the gas-fired generation alternative as a combined-cycle plant at VEGP. Land-use impacts from gas-fired units would be less than those of the coal-fired alternative. Reduced land requirements, due to construction on the existing site and a smaller facility footprint would reduce impacts to ecological, aesthetic, and cultural resources as well. As discussed under "Other Impacts," an incremental increase in

the workforce could have socioeconomic impacts. Human health effects associated with air emissions would be of concern, but the effect would be less than those of coal-fired generation.

The gas-fired alternative defined by SNC in Section 9.2.2.12 would be located at the VEGP site.

9.2.3.2.1 Air Quality

Natural gas is a relatively clean-burning fossil fuel. Also, because the heat recovery steam generator does not receive supplemental fuel, the combined-cycle operation is highly efficient (56 percent vs. 33 percent for the coal-fired alternative). Therefore, the gas-fired alternative would release similar types of emissions, but in lesser quantities than the coal-fired alternative. Control technology for gas-fired turbines focuses on the reduction of NOx emissions. SNC estimates the gas-fired alternative emissions to be as follows:

SO_2 = 169 tons per year

NOx = 540 tons per year

CO = 112 tons per year

PM = 94 tons per year (all particulates are $PM_{2.5}$)

The Section 9.2.3.1 discussion of regional air quality, Clean Air Act requirements, and the NOx State Implementation Plan Call is also applicable to the gas-fired generation alternative. NOx effects on ozone levels, SO_2 allowances, and NOx allowances could be issues of concern for gas-fired combustion. SNC concludes that emissions from a gas-fired alternative would be detectable, but they would not noticeably alter local air quality. Air quality impacts would therefore be SMALL, but substantially larger than those of nuclear generation.

9.2.3.2.2 Waste Management

Gas-fired generation would result in almost no waste generation, producing minor (if any) impacts. SNC concludes that gas-fired generation waste management impacts would be SMALL.

9.2.3.2.3 Other Impacts

Similar to the coal-fired alternative, the ability to construct the gas-fired alternative at VEGP would reduce construction-related impacts relative to construction on a greenfield site.

There are two natural gas pipelines within 20 miles of VEGP that could be used to supply natural gas to a gas-fired facility at VEGP. One pipeline, located near Waynesboro, Georgia, approximately 19 miles southwest of VEGP, includes a 14-inch diameter line and a 20-inch diameter line. The other pipeline, located near Augusta, Georgia, approximately 20 miles northwest of VEGP, consists of two 16-inch diameter lines.

To the extent practicable, SNC would route the gas supply pipeline along previously disturbed rights-of-way to minimize impacts. However, this would still be a costly (i.e., approximately

$1 million/mile) and potentially controversial action with ecological impacts from installation of a minimum of 20 miles of buried 16-inch gas pipeline to the VEGP site. An easement encompassing approximately 242 acres would need to be graded to permit the installation of the pipeline. Construction impacts would be minimized through the application of best management practices that minimize soil loss and restore vegetation immediately after the excavation is backfilled. Construction would result in the loss of some less mobile animals (e.g., moles and salamanders). Because these animals are common throughout the area, SNC expects negligible reduction in their population as a result of construction. SNC does not expect that installation of a gas pipeline would create a long-term reduction in the local or regional diversity of plants and animals. In theory, impacts from construction of a pipeline could be reduced or eliminated by locating the gas-fired plant at a site adjacent to an existing pipeline.

Construction of the combined cycle plant would impact approximately 159 acres of land. This much previously disturbed acreage is available at VEGP, reducing loss of terrestrial habitat. Aesthetic impacts, erosion and sedimentation buildup, fugitive dust, and construction debris impacts would be similar to the coal-fired alternative, but smaller because of the reduced site size. Socioeconomic impacts would result from the approximately 88 people needed to operate the gas-fired facility. SNC believes that these impacts would be SMALL due to the mitigating influence of the site's proximity to the surrounding population area.

9.2.3.2.4 Design Alternatives

Section 9.4.1 analyzes alternative designs for the VEGP Units 3 and 4 heat dissipation systems. Based on this analysis, SNC assumed that cooling towers would be used for the gas-fired alternative. Use of cooling towers would minimize impingement, entrainment, and thermal impacts; consumptive water use through evaporation would be a SMALL impact, and 100-foot-high mechanical towers or 600-foot-high natural draft towers would introduce visual impacts.

9.2.4 Conclusion

As shown in detail in Table 9.2-3, based on environmental impacts, SNC has determined that neither a coal-fired nor a gas-fired plant would provide an appreciable reduction in overall environmental impact relative to a nuclear plant. Furthermore, each of these types of plants would entail a significantly greater relative environmental impact on air quality than would the proposed project. Therefore, SNC concludes that neither a coal-fired or gas-fired plant would be environmentally preferable to the proposed project.

Table 9.2-1 Coal-Fired Alternative

Characteristic	*Basis*
Unit size = 530 MWe ISO rating net[a]	Assumed
Unit size = 562 MWe ISO rating gross[a]	Calculated based on 6 percent onsite power
Number of units = 4	Assumed
Boiler type = tangentially fired, dry-bottom	Minimizes nitrogen oxides emissions **(EPA 1998)**
Fuel type = bituminous, pulverized coal	Typical for coal used in Georgia
Fuel heating value = 11,754 Btu/lb	2001 value for coal used in Georgia **(EIA 2004c)**
Fuel ash content by weight = 10.87 percent	2001 value for coal used in Georgia **(EIA 2004c)**
Fuel sulfur content by weight = 0.81 percent	2001 value for coal used in Georgia **(EIA 2004c)**
Uncontrolled NOx emission = 10 lb/ton	Typical for pulverized coal, tangentially fired, dry-bottom, NSPS **(EPA 1998)**
Uncontrolled CO emission = 0.5 lb/ton	Typical for pulverized coal, tangentially fired, dry-bottom, NSPS **(EPA 1998)**
Heat rate = 10,200 Btu/kWh	Typical for coal-fired, single-cycle steam turbines **(EIA 2002)**
Capacity factor = 0.85	Typical for large coal-fired units
NOx control = low NOx burners, overfire air and selective catalytic reduction (95 percent reduction)	Best available and widely demonstrated for minimizing NOx emissions **(EPA 1998)**
Particulate control = fabric filters (baghouse-99.9 percent removal efficiency)	Best available for minimizing particulate emissions (EPA 1998)
SOx control = Wet scrubber - limestone (95 percent removal efficiency)	Best available for minimizing SOx emissions **(EPA 1998)**

a. The difference between "net" and "gross" is electricity consumed onsite.

Btu = British thermal unit
ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch
kWh = kilowatt hour
NSPS = New Source Performance Standard
lb = pound
MWe = megawatt
NOx = nitrogen oxides
SOx = oxides of sulfur
≤ = less than or equal to

Table 9.2-2 Gas-Fired Alternative

Characteristic	*Basis*
Unit size = 530 MWe ISO rating net:[a]	Assumed **(Chase and Kehoe 2000)**
Unit size = 551 MWe ISO rating gross[a]	Calculated based on 4 percent onsite power
Number of units = 4	Assumed
Fuel type = natural gas	Assumed
Fuel heating value = 1,025 Btu/ft^3	2001 value for gas used in Georgia **(EIA 2004c)**
Fuel SOx content = 0.0034 lb/MMBtu	EPA 2000, Table 3.1-2a
NOx control = selective catalytic reduction (SCR) with steam/water injection	Best available for minimizing NOx emissions **(EPA 2000)**
Fuel NOx content = 0.0109 lb/MMBtu	Typical for large SCR-controlled gas fired units with water injection **(EPA 2000)**
Fuel CO content = 0.00226 lb/MMBtu	Typical for large SCR-controlled gas fired units **(EPA 2000)**
Fuel $PM_{2.5}$ content [b]= 0.0019 lb/MMBtu	EPA 2000, Table 3.1-2a
Heat rate = 6,040 Btu/kWh	**(Chase and Kehoe 2000)**
Capacity factor = 0.85	Assumed based on performance of modern plants

[a] The difference between "net" and "gross" is electricity consumed onsite.
[b] All particulate matter is $PM_{2.5}$.

Btu	=	British thermal unit
ft^3	=	cubic foot
ISO rating	=	International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch
kWh	=	kilowatt hour
MM	=	million
MWe	=	megawatt
NOx	=	nitrogen oxides
PM2.5	=	particulates having diameter of 2.5 microns or less
≤	=	less than or equal to

Table 9.2-3 Comparison of Environmental Impacts of Alternative Energy Sources to a New Nuclear Unit

Category	Nuclear	Coal	Natural Gas
Air Quality	SMALL	MODERATE	SMALL[a]
Waste Management	SMALL	MODERATE	SMALL
Land Use	SMALL	SMALL	SMALL
Water Use and Quality	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	SMALL
Ecology (including threatened and endangered species)	SMALL	SMALL	SMALL
Socioeconomic	SMALL (Adverse) to LARGE (Beneficial)	SMALL (Adverse) to LARGE (Beneficial)	SMALL (Adverse) to LARGE (Beneficial)
Aesthetics	SMALL	SMALL to MODERATE[b]	SMALL
Historic and Cultural Resources	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL	SMALL

a. Impacts would be SMALL, but substantially larger than nuclear generation.
b. Coal deliveries by rail would add visual and noise impacts associated with unit-train traffic.

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9.3 Alternative Sites

As required by 10 CFR 52.17(a)(2), this section provides an analysis of alternatives to the proposed ESP site for the construction and operation of the proposed project. NEPA mandates that reasonable alternatives to an action be evaluated. Consistent with this requirement, the site selection process focused on those alternative sites that are considered to be reasonable with respect to the purpose of this application for an ESP. The objective of this evaluation is to verify there is no "obviously superior site" for the eventual construction and operation of the proposed project.

The traditional way of reviewing alternative sites has changed because existing nuclear sites capable of supporting additional units can be included in the mix of alternatives. Existing sites offer decades of environmental and operational information about the impacts of a nuclear plant on the environment. These sites are licensed nuclear facilities, thus, the NRC has found them to be acceptable. The NRC recognizes (in NUREG-1555, Section 9.3(III)(8)) that proposed sites may not be selected as a result of a systematic review:

> *"Recognize that there will be special cases in which the proposed site was not selected on the basis of a systematic site-selection process. Examples include plants proposed to be constructed on the site of an existing nuclear power plant previously found acceptable on the basis of a NEPA review and/or demonstrated to be environmentally satisfactory on the basis of operating experience, and sites assigned or allocated to an applicant by a State government from a list of State-approved power-plant sites. For such cases, the reviewer should analyze the applicant's site-selection process only as it applies to candidate sites other than the proposed site, and the site-comparison process may be restricted to a site-by-site comparison of these candidates with the proposed site. As a corollary, all nuclear power plant sites within the identified relevant service area having an operating nuclear power plant or a construction permit issued by the NRC should be compared with the applicant's proposed site."*

The review process outlined in this section was consistent with the special case noted in NUREG-1555, and took into account the advantages already present at existing nuclear facilities within the relevant service area which have been previously reviewed by NRC and found to be suitable for construction and operation of a nuclear power plant. That prior review process included an alternative site analysis.

9.3.1 Site Preferences and the Region of Interest

9.3.1.1 Site Preferences

The review procedure described in this chapter compares and evaluates existing nuclear sites within the region of interest. The candidate site criteria described in NUREG-1555 are incorporated into the site review in Section 9.3.3. This section explains the applicant's preference for an existing nuclear site. The following preference factors influenced the decision to review existing nuclear sites within the region of interest.

- There are benefits offered by existing nuclear sites. For example, co-located sites offer existing infrastructure and support facilities.
- The environmental impacts of an existing plant are known and the impacts of a new facility should be comparable to those of the operating nuclear plant.
- Site physical criteria, primarily geologic/seismic suitability, have been characterized at existing sites; these criteria are important in determining site suitability.
- Transmission is available and the existing sites have nearby markets.
- Existing nuclear plants have local support and the availability of experienced personnel.

Initially, candidate sites within the region of interest were identified and screened. As discussed in Sections 9.3.2 and 9.3.3, the economically and environmentally preferable alternative for the ESP facility is co-location; therefore, consideration of alternative sites within the relevant service area focused primarily on sites with an existing nuclear power facility. The analysis considered additional issues such as environmental impacts, land use, transmission congestion, proximity to population centers, and economical viability. The assessment focused on existing nuclear sites controlled by Southern Company subsidiaries, but an evaluation was also performed for a greenfield site that had previously been proposed for a four-unit nuclear plant.

9.3.1.2 Region of Interest

NUREG-1555 provides that the region of interest includes the state where the candidate site is located, so that alternatives sites may be considered for review. Southern Company subsidiaries have generating facilities that supply electric power to customers located in Georgia, Alabama, and Mississippi (and a small portion of Florida). Therefore, SNC has defined the region of interest as the three-state Southern Company service area. Three existing nuclear sites meet the threshold criteria discussed below. The region of interest also was the geographic area considered in identifying an appropriate greenfield site. The topography, ecology, and socioeconomics throughout the region are roughly the same. Generally, the region is rural/agricultural with pockets of heavy population near important waterways such as the Savannah River, or in traditionally populated areas such as state capitals and university campuses.

9.3.2 Superiority of Existing Sites Within the Region of Interest

During initial review, SNC determined that the advantages of co-locating the new facility with an existing nuclear power facility outweighed the advantages of any other probable siting alternative. In addition to the factors assessed and described previously in this section, there are several advantages to co-locating nuclear facilities as a general rule. Some of the potential environmental and market advantages include:

- The total number of required generating sites is reduced.

- Construction of new transmission corridors may not be required due to potential use of existing corridors.
- No additional land acquisitions will be necessary, and the applicant can readily obtain control of the property.
- The site has already gone through the alternatives review process mandated by NEPA, and was the subject of extensive environmental screening during the original selection process.
- The site development costs and environmental impact of any preconstruction activities are reduced.
- Construction, installation, and operation and maintenance costs are reduced because of existing site infrastructure.

Existing facilities where SNC could obtain access and control were preferred over the other sites within the region of interest. Sites that were originally designed for more generation than actually constructed also received preference.

Within the region of interest, SNC considered the three existing Southern Company nuclear sites with currently licensed, operating plants; and an undeveloped ("greenfield") site in central Alabama that was originally proposed for a 4-unit nuclear plant in the 1970's, but never developed. Candidate sites include:

- Joseph M. Farley Nuclear Plant (FNP)
- Edwin I. Hatch Nuclear Plant (HNP)
- Vogtle Electric Generating Plant (VEGP)
- Barton Site (greenfield)

9.3.3 Alternative Site Review

The proposed ESP site (VEGP) is reviewed at length in this environmental report. This section reviews other candidate sites using the selection criteria suggested in NUREG 1555, in order to consider whether any of the candidate sites is "obviously superior" to VEGP.

Regulatory Guide 4.2, *Preparation of Environmental Reports for Nuclear Power Stations* (Rev. 2, 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 recently updated safety analysis report (USAR) information about the existing plants and the surrounding area and existing environmental studies. The Barton Site, an undeveloped (greenfield) site in central Alabama, was also reviewed in order to determine if greenfield sites are obviously superior to an existing nuclear site.

In accordance with 10 CFR 51, potential impacts from construction and operation of the proposed project at candidate sites other than the proposed ESP 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 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, SNC determined the criteria used by NRC in NUREG-1437 were appropriate for the analyses presented here and reviewed the 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 new units at VEGP.

9.3.3.1 Evaluation of the Joseph M. Farley Nuclear Plant Site

Farley Nuclear Plant (FNP) is located in southeast Alabama on the west side of the Chattahoochee River about 6 miles north of the intersection of U. S. Highway No. 84 and State Highway No. 95 (Figure 9.3-1). It is in the northeastern section of Houston County, Alabama, just across the river from Early County, Georgia. The site is about 100 miles southeast of Montgomery, Alabama, and about 180 miles south-southwest of Atlanta, Georgia, in a sparsely populated, largely rural area. The Chattahoochee River flows in a north-to-south direction, forming the eastern border of the site, and serving as the boundary between Houston County, Alabama (to the west) and Early County, Georgia (to the east). Water is diverted to FNP from the Chattahoochee River and is stored in a 108-acre pond for use as service and make-up water for the facility. Three cooling towers per unit are used to dissipate heat from each closed-loop circulating water system. A small portion of the circulating water flow is returned to the Chattahoochee River.

The exclusion area is bounded by two circles with radii of 4,140 feet, centered on each of the reactor containment centerlines. The FNP property is approximately 1,850 acres.

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

The FNP site consists of 1,850 acres on the west bank of the Chattahoochee River in Houston County, Alabama. Approximately 500 acres are used for generation and maintenance facilities, laydown areas, parking lots, and roads. The developed areas are located primarily on a plateau

approximately one-half mile west of the river, with the area adjacent to the river mostly undeveloped. The remainder of the site consists of forested areas, ponds, wetlands, and open fields. Alabama Power Company (APC) currently maintains approximately 1,300 acres of the FNP site as a wildlife preserve. The proposed project would require that a portion (up to 550 acres) of the wildlife preserve be cleared for development, reducing habitat for onsite wildlife. However, these impacts would be SMALL because approximately 800 acres of wildlife preserve at FNP would remain undisturbed.

Most land in Houston County is rural, either forested or used as farmland. This rural/agricultural character is found throughout the county, with the exception of the City of Dothan. Following forest and agricultural, transportation and residential are the predominant land uses in Houston County **(SEARP&DC 2003)**. The construction and operation of the proposed project at the site would not be expected to affect the land-use patterns of the area.

There are six transmission lines connecting FNP to the transmission system. These include approximately 326 miles of lines that occupy approximately 5,938 acres of corridor **(NRC 2005)**. The corridors pass through land that is primarily rolling hills covered in forests or farmland. The areas are mostly remote with low population densities. For this analysis SNC assumed that the proposed project would necessitate the addition of one 500-kilovolt transmission line requiring a 200-foot wide transmission corridor. SNC assumed that the line would connect to the Webb Substation, which is approximately 10 miles from FNP and two miles east of Dothan, Alabama. Routing the new transmission line to Webb Substation would require an additional 238 acres of transmission corridor. Land use in the vicinity of the Farley-Webb transmission line corridor is largely agricultural and residential in character. Numerous homes are adjacent to the corridor and hayfields, pastures, and row crops are located within or adjacent to the corridor. A few portions of the corridor traverse small isolated wetlands and forested areas. Widening this corridor by 200 feet would not be expected to permanently affect agricultural areas, but has the potential to affect residents along the right-of-way. For this reason, impacts to land use along the right-of-way would be SMALL to MODERATE.

Houston County, Alabama, is not within the Alabama Coastal Zone (Code of Alabama 1975, Section 9-7-15). One transmission line runs through Jackson County, Florida. Although the State of Florida's coastal zone encompasses the state's 67 counties, the state has limited its federal consistency review of federally licensed and permitted activities to activities located in or seaward of one of the state's 35 coastal counties. Jackson County is not one of Florida's coastal counties [Section 308.23(3)(c) F.S.].

9.3.3.1.2 Air Quality

Air quality impacts of construction and operation of the proposed project would likely be similar at the VEGP site and FNP. The construction impacts would include dust from disturbed land, roads, and construction activities and emissions from construction equipment. These impacts

would be similar to the impacts associated with any large construction project. Mitigation measures similar to those described for the VEGP site would be taken. Air pollution emissions during construction would be regulated by the Alabama Department of Environmental Management (ADEM) under an Air Permit which would specify any notification, operation and maintenance, performance testing, monitoring, reporting, and record keeping requirements **(ADEM 2005)**. The Air Permit would ensure that construction impacts to air quality in the area would be SMALL.

Houston County, Alabama is part of the Southeast Alabama Intrastate Air Quality Control Region (AQCR) (40 CFR 81.267). The AQCR is designated as being unclassified or in attainment for all criteria pollutants. The nearest non-attainment areas, (for ozone and particulate matter [$PM_{2.5}$]), are Bibb and Monroe Counties, Georgia (Macon), multiple counties in the Metropolitan Atlanta Intrastate AQCR, and Jefferson, Shelby, and Walker Counties (Birmingham, Alabama) **(EPA 2005)**. These Counties are all located 125 to 150 miles from FNP. During station operation, standby diesel generators used for auxiliary power would have air-pollution emissions. It is expected that these generators would see limited use and, if used, would be used for short time periods. The impacts of station operations on air quality are expected to be minimal. As with the existing units, the proposed project would be subject to a Synthetic Minor Operating Permit to ensure that the operation of the proposed project would not interfere with attaining or maintaining National Primary Ambient Air Quality Standards and National Secondary Ambient Air Quality Standards as established by the Clean Air Act **(ADEM 2005)**.

9.3.3.1.3 Hydrology, Water Use, and Water Quality

The Chattahoochee River (a small river) provides FNP service water, make-up to the circulating water system, and dilution water during periods of low flow, when releases to the river would exceed permit limits. Cooling tower blowdown is returned to the Chattahoochee River. Groundwater is used for potable water, and as make-up water for the demineralizer and fire-protection systems. FNP also discharges service water (composed of surface water and groundwater) to the Chattahoochee River directly and via two tributaries to the river (an unnamed tributary and Wilson Creek). It is assumed that the proposed project at FNP would withdraw water from the Chattahoochee River and pump groundwater to support operation of the new nuclear units.

SNC assumed that the proposed project at FNP would withdraw make-up water from the Chattahoochee River. The average withdrawal rate for the existing units is 69,854 gpm (155 cfs). FNP returns water (directly and via tributaries) to the Chattahoochee at a rate of 57,844 gpm (129 cfs) for a net loss to the Chattahoochee River of 11,692 gpm (26 cfs). Assuming the cooling tower evaporation rate for the proposed project would be 28,880 gpm (~64 cfs), the cumulative net loss to the Chattahoochee River would be 90 cfs. For water years 1976-2004, the annual mean and lowest annual mean flows for the Chattahoochee River near Columbia,

Alabama (Station 02343801) were 10,660 cfs and 4,950 cfs, respectively **(Psinakis et al. 2005)**. The cumulative evaporative loss for the proposed project and existing units would represent 0.8 percent of the annual mean flow and 1.8 percent of the lowest annual mean flow for the Chattahoochee River.

Although the withdrawal from the Chattahoochee River would represent a small percentage of the Chattahoochee River flow, increased water use could cause controversy in the area because of water use conflicts between Alabama, Georgia, and Florida. Demand for Chattahoochee River water from upstream users has increased dramatically in recent years. The largest user of the Chattahoochee River is metropolitan Atlanta, Georgia. Metropolitan Atlanta's consumptive use more than doubled from 1980 to 2000. Increased water withdrawal reduces flows downstream, affecting the amount of water available for downstream users, water quality, ecological habitats, navigation, and recreation **(Lipford 2004)**. Although the ACF Compact was created in 1997 to study the impacts of increased demand on the Chattahoochee River, develop allocation formulas for the resource, and monitor the use of the resource **(JSU 2002)**, the Compact was dissolved in 2003 without resolution of the problem **(Pointevent 2003)**. The amount of water from the Chattahoochee River that proposed project would require is small compared with major users in the watershed (i.e., metro Atlanta), and impacts to Chattahoochee River as a result would be SMALL. However, any increase in water withdrawal from the Chattahoochee River might be challenged by neighboring states.

FNP withdraws groundwater for potable water, and as make-up water for the demineralizer and fire-protection systems. Approximately 130 gpm is currently used at FNP **(NRC 2005)** for approximately 950 employees. Assuming that groundwater use is proportional to the number of employees at the plant, an additional 660 employees would require an additional 90 gpm, for a cumulative groundwater withdrawal of 220 gpm. Most of the current groundwater is withdrawn from the deep major (Nanafalia) aquifer, which has a yield of approximately 100 to 700 gallons per minute **(Mayer 1997)**.

Groundwater overdraft areas have recently developed within the southeast Alabama region. The increased demand for water exacerbated by the increase in population in the area is placing strains on the groundwater supply **(SEARP&DC 2003)**. Water problems are most critical in Houston County because it supports the largest population base in southeast Alabama. Depressions have already formed in the potentiometric surface of the Nanafalia aquifer in and near Dothan. No well users in the vicinity of Farley use significantly large amounts of groundwater. Well surveys have shown that municipalities and industries near the site do not require or use large amounts of groundwater. As a result, no significant cones of depression exist in the area surrounding the site. Additional groundwater withdrawal would have little effect on the Nanafalia aquifer, and therefore impacts as a result of operation would be SMALL. However, because groundwater availability is an issue in southeast Alabama, siting additional units at FNP may cause public concern with respect to groundwater availability.

FNP currently operates under a National Pollutant Discharge Elimination System (NPDES) permit issued by the ADEM. 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 hurt water quality or human's health. Any releases of contaminants to Chattahoochee River (or other Alabama waters) as result of construction or operation of the proposed project at FNP would be regulated by the ADEM through the NPDES permit process to ensure that water quality is protected. Therefore, impacts to water quality would be SMALL.

9.3.3.1.4 Terrestrial Resources Including Protected Species

The FNP site consists of 1,850 acres. Approximately 500 acres are currently used for generation and maintenance facilities, laydown areas, parking lots, and roads. The developed areas are primarily located on a plateau approximately one-half mile west of the river, with the area adjacent to the river mostly undeveloped. The remainder of the site consists of forested areas, ponds, wetlands, and open fields, and 1,300 acres of this land is managed by APC as a wildlife preserve. It is assumed that structures for the proposed project would require that a portion of the wildlife preserve be cleared and developed.

Terrestrial wildlife species that occur in the forested portions of the FNP property are those typically found in similar habitats in south Alabama. Common mammals at the site include the opossum (*Didelphis virginiana*), armadillo (*Dasypus novemcinctus*), eastern cottontail (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*). Wading birds (egrets and herons) occur in wetlands, along the edges of ponds, and along the Chattahoochee River. Numerous bird species (e.g., common bobwhite [*Colinus virginianus*], blue jay [*Cyanocitta cristata*], and various warblers), as well as several reptile and amphibian species, including the gopher tortoise (*Gopherus polyphemus*), occur at the site. The gopher tortoise is listed as protected by the Alabama Department of Conservation and Natural Resources (ADCNR). **(NRC 2005)**

There are six transmission lines connecting FNP to the transmission system. These include approximately 326 miles of lines that occupy approximately 5,938 acres of corridor **(NRC 2005)**. The corridors pass through land that is primarily rolling hills covered in forests or farmland. No areas designated by the U.S. Fish and Wildlife Service (FWS) as critical habitat for endangered species exist at FNP or adjacent to associated transmission lines. However, these lines do cross Elmodel Wildlife Management Area in western Georgia and the Lake Seminole Wildlife Management Area in southwestern Georgia. The lines do not cross any other state or federal parks, wildlife refuges, or wildlife management areas. Widening the existing corridor to Webb Station, as described in Section 9.3.3.1.1, would not result in the crossing of any additional state or federal lands or managed areas.

Fourteen federally-listed threatened or endangered terrestrial species are known to occur in the vicinity of FNP or its transmission lines: the endangered gray bat (*Myotis grisescens*), the endangered Indiana Bat (*Myotis sodalis*), the threatened bald eagle (*Haliaeetus leucocephalus*), the endangered wood stork (*Mycteria americana*), the endangered red-cockaded woodpecker (*Picoides borealis*), the threatened (due to similarity of appearance) American alligator (*Alligator mississippiensis*), the threatened Eastern indigo snake (*Drymarchon corais couperi*), the endangered flatwoods salamander (*Ambystoma cingulatum*), the threatened crystal lake nailwort (*Paronychia chartacea minima*), the endangered chaffseed (*Schwalbea americana*), the endangered gringed campion (*Silene polypetala*), the endangered gentian pinkroot (*Spigelia genianoides*), the endangered Florida torreya (*Torreya taxifolia*), and the endangered relict trillium (*Trillium reliquum*).

The only land disturbance required to site the proposed project at FNP would take place in Houston County (on the plant site and along the existing transmission corridor to Webb Substation). Three Federally-listed species are known to occur in Houston County: the bald eagle, the Eastern indigo snake, and the flatwoods salamander. A bald eagle was observed at FNP during a 2001 survey. A single adult eagle was observed along the Chattahoochee River opposite the FNP site. It is unlikely that any eagle nests occur at the site, but bald eagles undoubtedly forage, at least occasionally, on the Chattahoochee River in the vicinity of FNP. In addition, habitat suitable for the Eastern indigo snake exists at FNP. Habitat preferred by the flatwoods salamander does not exist at the FNP site or along the Webb transmission corridor. With the exception of the bald eagle and the Eastern indigo snake, it is unlikely that any other federally-listed wildlife species occur at FNP or along the Farley-Webb transmission corridor.

During construction of the proposed project at FNP, wildlife would be temporarily displaced from 550 acres and permanently displaced from 300 acres dedicated to the proposed project, their supporting facilities, and construction facilities. However, approximately 800 acres of wildlife preserve would remain at FNP and would continue to support terrestrial habitat at the site. The potential exists for the presence of the endangered Eastern indigo snake at FNP. Prior to construction activities, SNC would be required to perform a detailed survey to ensure protection of the endangered Eastern indigo snake. Construction impacts on terrestrial resources (including threatened or endangered species) would be SMALL because mitigation would be performed. Impacts of operation of the proposed project would also be SMALL because sufficient habitat would remain at FNP to support existing wildlife.

9.3.3.1.5 Aquatic Resources Including Protected Species

FNP is located on the west (Alabama) bank of the lower Chattahoochee River at approximately River Mile 43.5. The Chattahoochee River rises in the Blue Ridge Mountains of northeast Georgia and flows south along the entire length of the state for approximately 430 miles before it merges with the Flint River (at Lake Seminole) to form the Apalachicola River. From Lake

Seminole, the Apalachicola River flows south for 106 miles across the Florida Panhandle and ultimately empties into Apalachicola Bay, which is part of the Gulf of Mexico.

Flows in the lower Chattahoochee River (the portion of the river between Walter F. George Reservoir and the Chattahoochee-Flint confluence) are influenced by a series of locks and dams built in the 1950s for flow regulation, hydroelectric power generation, and improved navigation. Historically, the lower Chattahoochee River was subject to extreme seasonal fluctuations in flow and was navigable only at certain times of the year. After the three locks and dams were completed, it was possible for large vessels to move from the Gulf of Mexico to Columbus, Georgia, via a 9-foot-deep and 100-foot-wide channel maintained by the U.S. Army Corps of Engineers. Columbus, Georgia is approximately 75 miles north of FNP.

The aquatic communities of the lower Chattahoochee River in the vicinity of FNP have not been the subject of recent scientific study. The most comprehensive source of information on the local aquatic communities is the Cooling Water Intake Study 316(b) Demonstration for Farley Units 1 and 2, which contains detailed information on phytoplankton, zooplankton, and fish populations. A survey of the freshwater mussels in the Chattahoochee River below FNP was recently conducted **(Yokley 2004).**

The fish community of the Chattahoochee River in the vicinity of FNP is diverse, composed of a mix of common southeastern stream species (many of which adapt well to reservoir conditions), species typically found in swamps and backwaters of rivers, and a small number of migratory and semi-migratory species. Approximately 92 known fish species occur in the Chattahoochee River system **(Mettee et al. 1996)** and perhaps two thirds of these species are found in the lower Chattahoochee. **(NRC 2005)**

Stream fishes commonly observed and occasionally collected in the lower Chattahoochee River near FNP include longnose gar (*Lepisosteus osseus*), redfin pickerel (*Esox americanus*), river redhorse (*Moxostoma crinatum*), greater jumprock (*M. lachneri*), green sunfish (*Lepomis cyanellus*), redbreast sunfish (*L. auritus*), channel catfish (*Ictalurus punctatus*), and several common minnow species (e.g. longnose shiner [*N. longirostris*] and weed shiner [*N. taxanus*]) as well as bowfin (*Amia calva*), spotted sucker (*Minytrema melanops*), chain pickerel (*Esox niger*), and flier (*Centrarchus macropterus*). A number of other fish species found in the Chattahoochee River in the vicinity of FNP are adapted to a range of environmental conditions and are abundant in rivers, lakes, reservoirs, and swamps across the Southeast. These include the gizzard shad (*Dorosoma cepedianum*), common carp (*Cyprinus carpio*), blacktail shiner (*Cyprinella venusta*), bluegill (*L. machrochirus*), and largemouth bass (*Micropterus salmoides*). **(NRC 2005)**

Three Morone species (striped bass [*M. saxatilis*], white bass [*M. chrysops*], and hybrid bass [e.g., palmetto bass, *M. chrysops x saxatilis*]) are found in the lower Chattahoochee River and are sought by anglers in the spring of the year near George W. Andrews Lock and Dam. In

addition to these, anadromous (e.g., striped bass) and semi-anadromous (e.g., white bass and hybrid bass) populations, small numbers of catadromous American eels (*Anguilla rostrata*) are also found in the lower Chattahoochee. The size and timing of this seasonal movement of eels are not well understood. Small numbers of eels are found year-round in the Chattahoochee River in the vicinity of FNP. **(NRC 2005)**

Benthic macroinvertebrate populations inhabiting the Chattahoochee River in the vicinity of FNP have not been systematically surveyed **(NRC 2005)**. Rapidly shifting bottom sands were noted to prevent the establishment of a diverse benthic community in this area **(AEC 1974)**. Species diversity and abundance of freshwater mussels have declined in the Chattahoochee River since the early part of the 20th century, with dramatic declines over the past decades. These declines have been attributed to erosion and sedimentation (from land clearing and intensive farming in the river basin); dredging, snag removal, and channel modifications (for navigation); the development of impoundments for flood control and hydropower, runoff of agricultural chemicals and animal wastes (chiefly poultry); mining activities in tributary streams; and discharges from wastewater treatment facilities. In addition, the Asiatic clam (*Corbicula fluminea*) invaded the Chattahoochee River system, competing with native mussels for habitat and resources.

Federally-listed species in the vicinity of FNP include the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*), the endangered fat threeridge (*Amblema neislerii*), the threatened Chipola slabshell (*Elliptio chipolaensis*), the threatened purple bankclimber (*Elliptoideus sloatianus*), the endangered shinyrayed pocketbook (*Lampsilis [Villosa] subangulata*), the endangered Gulf moccasinshell (*Medionidus penicillatus*), and the endangered oval pigtoe (*Pleurobema pyriforme*). No designated critical habitat exists for any of the listed species on or in the vicinity of the Farley site or within the ROWs of the associated transmission lines. **(FWS 2004, 2005, 2006)**

Water from the Chattahoochee River is used to for condenser cooling at FNP and would be expected to be used to cool the proposed project constructed at the site. Although aquatic biota, including the common southeastern fishes described previously, would be temporarily displaced during construction of new intake and discharge structures, they would be expected to recolonize the area after construction is complete. Any disturbance to aquatic resources from construction would be localized and of relatively short duration. Any impacts of construction on aquatic resources, including Federally-listed threatened and endangered species would be SMALL.

Withdrawing water from the Chattahoochee River for the proposed project is not expected to result in significant adverse impacts to aquatic environments as a result of impingement and entrainment because the proposed project would utilize cooling towers. In addition, the EPA's recent rulings on cooling water intake structures (40 CFR Part 125), requires cooling water intake facilities to meet certain criteria designed to protect organisms from entrainment and

impingement. The potential for adverse impacts to aquatic resources from the operation of the proposed project at FNP would be SMALL.

9.3.3.1.6 Socioeconomics

This section evaluates the social and economic impacts to the surrounding region as a result of constructing and operating the proposed project at the FNP 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, shock from blasting, and dust emissions. The use of public roadways and waterways would be necessary to transport construction materials and equipment. It is assumed that all construction activities would occur within the existing FNP site. Offsite areas that would support construction activities (for example, borrow pits, quarries, and disposal sites) are expected to be already permitted and operational. Impacts on those facilities from construction of the proposed project 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 project 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, FNP is located in a rural area surrounded by forests and agricultural land, so residents in the area are sparse. Commuter traffic would be controlled by speed limits. Good road conditions and appropriate speed limits would minimize the noise level generated by the workforce commuting to the site.

The proposed project would have standby diesel generators and auxiliary power systems. Permits obtained for these generators would ensure that air emissions comply with regulations. In addition, the generators would be operated on a limited, short-term basis. During normal plant operation, the proposed project would not use a significant quantity of chemicals that could generate odors that exceed odor threshold values. Good access roads and appropriate speed limits would minimize the dust generated by the commuting workforce.

Construction activities would be temporary and would occur mainly within the boundaries of the FNP site. Offsite impacts would represent small incremental changes to offsite services. During station operations, ambient noise levels would be minimal at the site boundary. Air quality permits would be required for the diesel generators, and chemical use would be limited, which would limit odors. Therefore, the physical impacts of construction and operation would be SMALL.

9.3.3.1.6.2 Demography

FNP is in Houston County, Alabama on the Chattahoochee River and approximately 100 miles southeast of Montgomery, Alabama. Geneva, Henry, and Houston Counties, Alabama make up the Dothan Metropolitan Statistical Area **(USCB 2006a)**. Geneva County had a 2000 population of 25,764, Henry County had a 2000 population of 16,310, and Houston County had a 2000 population of 88,787 **(USCB 2000a)**. The 2000 population within 50 miles of the site was 393,639 people (50 persons per square mile). The City of Dothan, located 17 miles from FNP, had a 2000 population of 57,737 **(USCB 2000a)**. The 2000 population within 20 miles of the site was 93,120 people (74 persons per square mile). Applying the NUREG-1437 sparseness and proximity matrix, FNP is located in a medium population area.

Based on the analysis in Section 4.4.2.1, SNC assumes that construction of the proposed project at FNP would increase the population in the 50-mile region by 7,200 people. The majority of the current HNP workforce lives in Houston County (77 percent) the remaining employee residences are distributed across 22 counties in Alabama, Georgia, and Florida, mostly within 50 miles of the site. SNC assumes that the residential distribution of the construction workforce would resemble the residential distribution of the current FNP workforce. Therefore SNC anticipates that 5,544 people (77 percent of 7,200) or 6.2 percent of the 2000 population would settle in Houston County. Overall, the population increase from in-migration of construction workers constitutes 1.8 percent of the 2000 population of the 50-mile region. SNC 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 MODERATE if growth is between 5 and 20 percent. Therefore, SNC concludes that the impacts of plant construction on increases in population would be MODERATE in Houston County and SMALL in the remainder of the 50-mile region.

Based on the analysis in Section 5.8.2.1, SNC assumes that operation of the proposed project at FNP would increase the population in the 50-mile region by 1,750 people. Approximately 77 percent would settle in Houston County. The addition of the new employees and their families would equate to a 1.5 percent increase for Houston County. Overall, the potential increases in population would represent a SMALL increase in the total population.

9.3.3.1.6.3 Economy

The southeast Alabama region has experienced a reduction in labor force due to numerous industrial plant closings in the past 8 years. These closings primarily affected low-skill textile workers who did not possess the skills required to obtain new jobs. The district was also negatively impacted by the General Agreement on Tariffs and Trade (GATT) which increased competition in the peanut industry with importation of foreign peanuts into the U.S. Layoffs, downsizing, and closures have eliminated thousands of jobs. **(SEARP&DC 2003)**

Houston County's economy has seen a major shift from manufacturing to services and retail trade. The service sector comprises a much larger percentage of the County's earnings than does manufacturing. The County remains a regional retail and medical services center. **(SEARP&DC 2003)**

Henry County has shown strong growth in employment and earnings attributable to manufacturing. While the percentage of employees in the manufacturing sector has decreased, the number employed has increased. Income earnings from farming continue to decrease. **(SEARP 2003)**

Geneva County's earnings from farming have been increasing, with the exception of year 2000. Poultry production is generating significant income to help the County's overall economy. Government is the highest income producer in the county, with farm income being second. Employment has continued to grow in the services and government sectors, while declining in manufacturing, farming, and retail trade sectors. **(SEARP&DC 2003)**

The unemployment rate in the State of Alabama for 2002 was 5.9 percent, compared with 4.3 percent for Houston County, 6.7 percent for Henry County, and 5.7 percent for Geneva County **(SEARP&DC 2003)**. The total number of employees in 2000 for Houston County was almost 60,000. Henry and Geneva Counties had 6,822 and 9,606, respectively **(SEARP&DC 2003)**.

The economic impacts would be spread across the 50-mile region, but would be greatest in Houston County. Impacts are defined as SMALL if plant-related employment is less than 5 percent of the study area's total employment and MODERATE if employment is between 5 and 10 percent. SNC concludes that the impacts of construction on the economy of the region would be beneficial and temporary, and would therefore be SMALL.

The wages and salaries of the operating 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. SNC 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 within the 50-mile region and particularly in Henry County. SNC anticipates that most of the indirect jobs created by the operations workforce would be filled by unemployed workers in the region. Expenditures made by the direct and indirect workforce would strengthen the regional economy.

SNC concludes that the impacts of station operation on the economy would be beneficial and SMALL everywhere in the region except Henry County, where the impacts would be MODERATE and beneficial, and that mitigation would not be warranted.

9.3.3.1.6.4 Taxes

Taxes collected as a result of constructing and operating the proposed project at FNP would be of benefit to the State and local jurisdictions that collected and spent them. Corporate and personal income taxes and sales and use taxes would be collected during both the construction and operation of a new unit at FNP. SNC anticipates that FNP would pay annual property taxes to Houston County, even during construction of the proposed project. Alabama assesses property at 30% of its value. Assuming a 40-year operational life, property taxes to Houston County are estimated to be between $15,000,000 and $21,500,000 annually for the first decade of operations and between $3,000,000 and $4,000,000 for the last decade of operations. For the years 1995 through 2002, FNP property taxes provided between 31 and 39 percent of Houston County's total property tax revenues **(NRC 2005)**. The benefits of taxes are defined as large when new tax payments represent more than 20 percent of total revenues for local jurisdictions. Therefore, SNC concludes that the potential beneficial impacts of taxes collected during construction and operation of the proposed project would be LARGE in Houston County and SMALL in the remainder of the 50-mile region.

9.3.3.1.6.5 Transportation

Road access to FNP is via State Road 95, a two-lane paved road with a north-south orientation. State Road 95 passes through the Towns of Columbia to the north and Gordon to the south. Employees traveling from Dothan, Alabama use either U.S. 84 or State Road 52. U.S. 84 is a four-lane highway that intersects with State Road 95 near Gordon. State Road 52 crosses State Road 95 southwest of Columbia. The Alabama Department of Transportation does not maintain level-of-service designation for roadways in the State. However, a daily average of 870 cars traveled State Road 95 near FNP in 2004 **(ALDOT 2006)**. Assuming construction shifts as discussed in Section 4.4.2.2.4 an additional 2,200 cars could be on the two-lane highway during shift change, causing potential congestion. Also, the traffic of hauling construction materials (100 trucks per day) to the site could bring additional congestion to State Road 95, and State Road 52 and U.S. Route 84 from Dothan during certain times of the day. Transportation impacts are considered small when increases in traffic do not result in delays or other operational problems, moderate when increases in traffic begins to cause delays or other operational problems. Therefore, SNC concludes that impacts of construction on transportation would be MODERATE and some mitigating actions might need to be undertaken.

With respect to the operations of the facility, adding an additional 600 cars (during afternoon shift change) to the existing 870 cars per day on the road would not materially congest the highway. Shift changes for the current units and the proposed project at FNP could be staggered so that the traffic increase would not cause congestion. Impacts of the operations workforce on transportation would be SMALL to MODERATE and mitigation would not be warranted.

9.3.3.1.6.6 Aesthetics and Recreation

The developed areas at FNP are primarily located on a plateau approximately one-half mile west of the Chattahoochee River, with the area immediately adjacent to the river mostly undeveloped. The remainder of the site consists of forested areas, ponds, wetlands, and open fields. There are two major topographical subdivisions at the site: (1) gently rolling upland west of the Chattahoochee River Valley and (2) the river terraces and floodplain of the Chattahoochee River. Habitats at the FNP consist of river bluff, forest, ravine forest, floodplain forest, pine-mixed hardwood forest, pine forest, non-floodplain wetlands, and mechanically-maintained grassy areas. **(NRC 2005)**

The construction of the proposed project at FNP could be viewed from offsite at certain locations, but the addition of another facility would not substantially change the view of the current units. There could be a need to construct cooling-water intake and discharge structures at the site. Additional mechanical or natural draft cooling towers would be required. The operation of a new nuclear unit would have visual impacts similar to those of the existing FNP units, with the addition of more visible plumes from cooling towers. Impacts on aesthetic resources are considered to be small if there are no complaints about diminution in the enjoyment of the physical environment and no measurable impact on socioeconomic institutions and processes. Therefore, impacts of construction and operation of the proposed project on aesthetics would be SMALL and would not warrant mitigation.

There are three U.S. Army Corps of Engineers reservoirs in the vicinity of FNP: Walter F. George Lake, George W. Andrews Lake, and Lake Seminole. All have recreational uses in including camping, boat ramps, marinas, picnic areas, playgrounds, swimming areas, and trails **(USACE 2006)**. Walter F. George Lake and George W. Andrews Lake are located over 30 miles upstream of FNP in Henry and Barbour Counties, Alabama, and Clay, Quitman, and Stewart Counties, Georgia. Seminole Lake is located almost 25 miles downstream of FNP on the border of Georgia and Florida, in Jackson County, Florida and Seminole and Decatur Counties, Georgia. Impacts on tourism and recreation are considered small if current facilities are adequate to handle local levels of demand. Construction and operation of the proposed project at FNP would not impact these recreation areas because of their distance from FNP. Therefore, the impacts of facility construction and operation would be SMALL.

9.3.3.1.6.7 Housing

In 2000 Houston County, had 39,571 housing units, of which 3,737 were vacant (9.4 percent). Henry County had 8,037 housing units, of which 1,512 were vacant (18.8 percent), and Geneva County had 12,115 housing units with 1,638 vacant (13.5 percent) **(USCB 2000b)**.

Based on the analysis in Section 4.4.2.2.5, approximately 3,400 construction workers would in-migrate to the 50-mile region. Of these, approximately 2,700 would purchase or rent permanent housing. The 680 temporary workers would rent temporary (e.g., hotels, motels, rooms in

private home) or permanent housing, or bring their own housing in the form of campers and mobile homes. Currently, available housing in the three-county area is adequate to accommodate the expected influx of workers. Workers could also find housing in other parts of the 50-mile region or construct new housing. Given this increased demand for housing, prices of existing housing could rise. Houston County (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. SNC concludes that the potential impacts of construction on housing could be MODERATE in Houston County 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 impacts would occur as developers and builders anticipated the increased population and built homes to meet their needs. Additional mitigation would not be warranted.

SNC assumes that operation of the proposed project at FNP would increase the population in the 50-mile region by 1,750 people. Approximately 77 percent would settle in Houston County. While there is currently enough housing to accommodate all the new families expected in Houston County, not all housing may be the type sought by the new workforce. The average income of the new workforce would be expected to be higher than the medium or average income in these counties, therefore, the new workforce could exhaust the high-end housing market and some new construction could result.

SNC concludes that the potential impacts of operations on housing in Houston County would be and SMALL to 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.

9.3.3.1.6.8 Public Services

Public services include water supply and waste water treatment facilities; police, fire and medical facilities; and social services. New construction or operations employees relocating from outside the region would most likely live in residentially-developed areas. It is not expected that public services would be materially impacted by these workers. 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 project on public services would be SMALL and mitigation would not be warranted.

9.3.3.1.6.9 Education

Based on the analysis in Section 4.4.2.8, SNC assumes that construction of the proposed project at FNP would increase the school-aged population in the 50-mile region by 1,900 people. Approximately 77 percent would settle in Houston County. Moderate Impacts on local school systems are generally associated with 4 to 8 percent increases in enrollment. The Houston County student population would increase by 7.8 percent, constituting a MODERATE impact on its education systems and mitigation would be warranted.

Based on the analysis in Section 5.8.2.2.7, SNC assumes that operation of the proposed project at FNP would increase the school-aged population in the 50-mile region by 464 people. Approximately 77 percent would settle in Houston County. The Houston County student population would increase by 1.9 percent, constituting a SMALL impact on its education systems and mitigation would not be warranted.

9.3.3.1.7 Historic and Cultural Resources

The National Register of Historic Places lists seven locations in Houston County, Alabama, two sites in Henry County, Alabama, and seven sites in Early County, Georgia **(NPS 2006a)**. Two of these fall within 6 miles of FNP. The Purcell-Killingsworth House, a Victorian mansion in Houston County, was completed in 1890 and was the boyhood home of Bishop Clare Purcell **(HCC 2006)**. The house is currently a bed and breakfast with a historical marker **(BB Online 2006)**. Coheelee Creek Bridge in Early County, built in 1891, is the southernmost covered bridge in the United States **(GDOT 2002)**.

NRC conducted an archaeological records search at the Alabama State Site Files during the license renewal application process. The record searches identified 14 archaeological sites recorded on Farley property, as part of three separate surveys of varying levels of intensity. In 1947, archeologists from the University of Alabama documented five sites. Surveys in 1975, also by the University of Alabama, documented six sites, including one documented in 1947 and re-recorded with a new number. This site, a Late Woodland and early Mississippian period village with an earthen burial mound, was originally partially excavated in 1905 by pioneering Southeastern archaeologist, Clarence Bloomfield Moore. Surveys conducted in 1982 by archaeologists from the Cleveland Museum of Natural History documented four sites. In addition, a previously unrecorded archaeological site, a small chert quarry was discovered in 2004 by archaeologists during NRC field checks in support of license renewal. These 15 sites have not been evaluated for potential eligibility to the National Register of Historic Places. However, several of the sites have been heavily impacted by historic agriculture and two

possibly by early construction activities connected with FNP. These sites could lack the integrity necessary for inclusion on the National Register of Historic Places. **(NRC 2005)**

While there are no structures or buildings at FNP that are 50 years in age or older, there is a small historic cemetery containing approximately 25 graves with associated grave markers ranging in date for 1917 to 1969. The cemetery is still occasionally visited by family members. FNP conducts yearly maintenance at the location **(NRC 2005)**.

Siting the proposed project at FNP would require that a formal cultural resources survey be conducted so that no archeological or historic resources would be damaged during construction of the proposed project. Mitigative measures would be performed to prevent permanent damage and ensure that any impacts to cultural resources from construction or operation at FNP would be SMALL.

9.3.3.1.8 Environmental Justice

The 2000 Census data and block groups were used for ascertaining minority and low-income populations in the area. Minority populations exist in the vicinity of FNP, including block groups with significant Black races and Hispanic Ethnicity populations. Low income populations also exist in the 50-mile radius. In Houston County, the Black Races and low-income minority populations exist in the City of Dothan, approximately 17 miles west of FNP. Black and low-income minority populations also exist in Early County, Georgia, bordering FNP to the east across the Chattahoochee River. The only block group with a significant Hispanic Ethnicity minority population is located in Gadsden County, Florida, approximately 50 miles from FNP. No significant minority or low-income populations exist within 6 miles of FNP. Construction activities (noise, fugitive dust, air emissions, traffic, impacts to housing or public services) would not disproportionately adversely affect minority populations because of their distance from FNP. In fact, minority and low-income populations would most likely benefit from construction activities through an increase in construction-related jobs. These benefits would be SMALL.

Operation of the proposed project at FNP is also unlikely to have a disproportionate adverse impact on minority or low-income populations. No unusual resource dependencies, such as subsistence agriculture, hunting, or fishing were identified during the license renewal process for FNP **(NRC 2005)**. Offsite impacts from operation of the proposed project at FNP to minority and low-income populations would be SMALL, and no special mitigation actions would be warranted.

9.3.3.2 Evaluation of the Edwin I. Hatch Nuclear Plant

Hatch Nuclear Plant (HNP) is located in Appling and Toombs Counties, Georgia, southeast of where U.S. Highway 1 crosses the Altamaha River (Figure 9.3-2). It is approximately 11 miles north of Baxley, 98 miles southeast of Macon, 73 miles northwest of Brunswick, and 67 miles southwest of Savannah, Georgia, in a sparsely populated, largely rural area. The Altamaha

River flows in a west-to-east direction through the site, serving as the boundary between Toombs County (to the north) and Appling County (to the south). Water is diverted to HNP from the Altamaha River for use as service and make-up water for the facility. Four cooling towers (one counter-flow and three cross-flow) per unit are used to dissipate heat from each closed-loop circulating water system. A portion of the circulating water flow is returned to the Altamaha River.

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

The HNP site encompasses approximately 2,240 acres and is characterized by low, rolling sandy hills that are predominantly forested. The site is divided by the Altamaha River, and includes 900 acres north of the river in southern Toombs County and 1,340 acres south of the river in northern Appling County. All industrial facilities associated with the site are located in Appling County. The area comprising the reactors, containment buildings, switchyard, cooling tower area and associated facilities, to which access is restricted, is approximately 300 acres. Approximately 350 acres of the site are composed of wetlands and transmission corridors, and approximately 1,600 acres are managed for timber production and wildlife habitat. Controlled areas available for use with prior permission include 75 acres of wetlands east of the restricted area and a 100-acre tract of land west of U.S. Highway 1 that is a Boy Scout Camp. Uncontrolled access areas available to the public include a wayside park, a recreation area, and a Visitors Center.

The land in the site region is rural. About 71 percent of the land in the five surrounding counties of Appling, Jeff Davis, Montgomery, Tattnall, and Toombs is wooded, with about 15 percent farmed. **(UGA 2006)**

No land would be acquired for additional facilities at HNP. The footprint of a new plant would be approximately 300 acres and an additional 250 acres would be required for temporary facilities and laydown yards. The proposed project could be configured to fit within the existing, previously disturbed area of the HNP site. Land-use impacts associated with site-preparation, construction, and operation of the proposed project at HNP would be SMALL.

There are six transmission lines connecting HNP to the transmission system, which occupy four transmission line corridors. These include approximately 340 miles of lines that occupy approximately 7,200 acres of corridor. The corridors pass through rolling hills that are primarily a mixture of cultivated land, grazing land, and managed timberlands (paper and pulp stock). The areas are mostly remote with low population densities. It is assumed that the proposed project would necessitate the addition of one 500-kilovolt transmission lines, requiring a 200-foot wide transmission corridor. The additional transmission line could be installed via expansion of an existing right-of-way, or it could follow a new right-of-way. The procedures for adding new transmission lines to connect the proposed project at HNP to the transmission grid are similar to those described in Section 4.1.2. Assuming that any transmission system modifications would

be a combination of new right-of-way and expanding existing right-of-way, the land-use impacts associated with the addition of one 500-kilovolt transmission lines would be SMALL to MODERATE.

The HNP site is not subject to the Georgia Coastal Zone Management Act because the plant is not located within one of the designated Georgia coastal zone counties. However, two of the transmission corridors interconnecting with HNP run through Georgia's coastal zone. The Thalmann line (distinct from the VEGP line known as the Thalmann [McIntosh] line) extends 65 miles southeast from HNP to a substation near Thalmann, Georgia in Wayne County; and the Duval line extends 87 miles south from HNP through Charlton County, Georgia, to the Florida state line. Because they are located in coastal zone counties, expanding these transmission corridors to accommodate new lines would require review and certification under the Georgia Coastal Zone Management Act.

9.3.3.2.2 Air Quality

The counties in which HNP is located, Appling and Toombs, are designated as being unclassified or in attainment of the National Air Quality Standards (NAAQS). The nearest non-attainment area is Henry County, Georgia, which is approximately 140 miles northwest of HNP. Henry County, a southeastern suburb of Atlanta, is in non-attainment for ozone and particulate matter with an aerodynamic diameter of 2.5 microns or less (PM2.5) (40 CFR 81. 311). The closest areas to HNP that are designated in 40 CFR 81.408 as mandatory Class I Federal areas, in which visibility is an important value, are the Okefenokee and Wolf Island wilderness areas. These areas are more than 50 miles south and southeast, respectively, from the site.

Air quality impacts from construction and operation of the proposed project at HNP would be similar to those at the VEGP site. Construction impacts would be temporary, and would be similar to any large-scale construction project. Construction emissions would include dust from disturbed land, roads, and construction activities and emissions from construction equipment. Mitigation measures similar to those described for the VEGP site would be taken. During station operation, standby diesel generators would be used for auxiliary power. It is expected that these generators would see limited use and, when used, they would operate for short time periods. Therefore, air pollutant emissions from the standby diesel generators are expected to be minimal. As with the existing units, the proposed project would be subject to a Synthetic Minor Operating Permit to ensure that the operation of the proposed project would not interfere with attaining or maintaining National Primary Ambient Air Quality Standards and National Secondary Ambient Air Quality Standards as established by the Clean Air Act.

Because there are no mandatory Class I Federal areas or NAAQS non-attainment areas within 50 miles of HNP, and air pollutant emissions are expected to be minimal, the air quality impacts from construction and operation of the proposed project at HNP would be SMALL.

9.3.3.2.3 Hydrology, Water Use, and Water Quality

The Altamaha River (a relatively small river with average flow of 11,300 cfs) is the major source of water for HNP. Water is withdrawn from the river to provide cooling for certain once-through loads and makeup water to the cooling towers. Cooling tower blowdown is returned to the Altamaha River. HNP withdraws groundwater for potable and process use. HNP also discharges service water (composed of surface water and groundwater) to the Altamaha River. It is assumed that the proposed project at HNP would withdraw water from the Altamaha River and pump groundwater to support operation of the proposed project.

SNC assumed that the proposed project at HNP would withdraw make-up water from the Altamaha River. The average withdrawal rate for the existing units is 39,708 gpm (88.5 cfs) **(NRC 2001)**. HNP returns water to the Altamaha at a rate of 19,388 gpm (43.2 cfs) **(NRC 2001)** for a net loss to the Altamaha River of 20,320 gpm (45.3 cfs). The cooling tower evaporation rate for the proposed project would be approximately 28,880 gpm (64 cfs). This would cause a cumulative net loss to the Altamaha River of 109 cfs. For water years 1949-2004, the annual mean and lowest annual mean flows for the Altamaha River near Baxley, Georgia (Station 02225000) were 11,320 cfs and 3,762 cfs, respectively **(USGS 2005)**. The cumulative evaporative loss for the proposed project and existing units would represent 1.0 percent of the annual mean flow and 2.9 percent of the lowest annual mean flow for the Altamaha River. Therefore, impacts of surface water use would be SMALL.

HNP withdraws groundwater for potable and process use from the Floridan aquifer, one of the most productive groundwater reservoirs in the United States. Wells in the Floridan aquifer typically yield 1,000 to 5,000 gpm **(GDNR 2003**). HNP is currently permitted to withdraw a monthly average of 764 gpm. HNP currently uses an average of 126 gpm for approximately 950 employees **(NRC 2001)**. Assuming that groundwater use is proportional to the number of employees at the plant, 660 additional employees would require an additional 88 gpm, for a cumulative groundwater withdrawal rate of 214 gpm.

A major water quantity issue facing Georgia relates to the overuse of water from the Floridan aquifer along the coast, resulting in saltwater intrusions in the Savannah, Georgia - Hilton Head Island, South Carolina, area and in Brunswick, Georgia. To protect the Floridan aquifer from saltwater Intrusion, Georgia is developing policies for groundwater use in 24 coastal counties, including Appling and Toombs, that would promote water conservation and reuse, and require withdrawal permit applicants to provide a justification of need for water use **(GDNR 2005)**.

Well surveys have shown that municipalities and industries near the site do not require or use large amounts of groundwater. As a result, no significant cones of depression exist in the area surrounding the site **(GDNR 2005)**. An additional groundwater withdrawal of 88 gpm would have little effect on the Floridan aquifer, therefore impacts as a result of operation would be SMALL. However, because groundwater availability is an issue in coastal Georgia, siting additional units at HNP may cause public concern with respect to groundwater availability.

HNP currently operates under a NPDES permit issued by the Georgia Department of Natural Resources (GDNR). 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 hurt water quality or human health. Any releases of contaminants to Altamaha River (or other Georgia waters) as result of construction or operation of the proposed project at HNP would be regulated by the GDNR through the NPDES permit process to ensure that water quality is protected. Therefore, impacts to water quality would be SMALL.

9.3.3.2.4 Terrestrial Resources Including Protected Species

The HNP site consists of approximately 900 acres immediately north of the Altamaha River in Toombs County and 1,340 acres immediately south of the Altamaha River in Appling County. Of the 2,240 acres that make up the site, approximately 300 acres are committed to generation facilities, parking lots, laydown areas, roads, and maintenance facilities. It is assumed that structures required for the construction of the proposed project at HNP would be situated in abandoned fields or developed areas of the existing plant site, and would avoid sensitive areas such as wetlands and mature forests.

The HNP site includes four basic ecological community types: wetlands, deciduous floodplain forests, upland areas, and pine plantations. Approximately 350 acres are comprised of wetlands and transmission corridors. Deciduous floodplain forests of the HNP site include approximately 700 acres of blackgum, cypress, oaks, and hickories in the floodplain of the Altamaha River. Upland areas include old fields and pine forests in various stages of succession, most of which are former agricultural lands and areas disturbed by construction activities in the 1960s and 1970s. Planted pines occupy roughly 400 acres of the HNP site, mostly south and southwest of the generating facilities. Approximately 1,600 acres of the HNP site are actively managed for wildlife and timber production. One state-listed species, the gopher tortoise, is known to occur in undeveloped portions of the HNP property.

Six transmission lines, within four transmission corridors and encompassing approximately 7,200 acres, makeup the transmission system connected to the HNP site. These lines traverse a variety of land use areas including urban and suburban, agricultural, forested, sandhills, floodplains, and abandoned fields. The lines cross three designated Wildlife Management Areas: Ocmulgee, Paulk's Pasture, and the Little Satilla. Otherwise, the lines do not cross any state or federal parks, wildlife refuges, or wildlife management areas. The lines do not cross any "critical habitats" as defined in Section 7 of the Endangered Species Act.

During endangered and threatened species surveys conducted in 1998 and 1999, several state- and federally-listed species were observed (or evidence of these species was found) in or

adjacent to existing transmission line corridors. The shed skin of an Eastern indigo snake (listed as "threatened" by USFWS and GADNR), was found in the North Tifton corridor. American alligators (listed as "threatened due to similarity of appearance" by USFWS), were observed at survey locations in three transmission corridors. Red-cockaded woodpeckers (listed as "endangered" by USFWS and GADNR) were observed at two locations adjacent to the Florida transmission corridor. Bachman's sparrows (listed as "rare" by GADNR) were observed in the Florida and Thalmann corridors. Two Federally-listed species not observed in the 1998-1999 surveys, the threatened bald eagle and endangered wood stork, have been observed by GPC biologists and natural resources managers in the general area of HNP, but neither species is believed to nest in the vicinity of the plant. Bald eagles have been seen foraging along the Altamaha River upstream and downstream of HNP, and wood storks have been observed in a beaver pond wetland just east of the HNP cooling towers. No federally-listed plants were found during the 1998-1999 surveys of the HNP site and associated transmission line corridors, but one state-listed plant species (yellow pitcher plant, listed as "unusual" by GADNR) was found on the HNP site, and five state-listed species were identified on the transmission corridors. These consisted of the parrot pitcher plant (threatened), purple honeycomb head (rare), cutleaf beardtongue (rare), yellow pitcher plant (unusual), and hooded pitcher plant (unusual).

Land clearing associated with construction of the plant and transmission lines would be conducted according to Federal and state regulations, permit conditions, existing SNC procedures, good construction practices, and established Best Management Practices. With this in mind, and because the proposed project and any new transmission line would not require extensive land clearing, impacts to terrestrial resources, including endangered and threatened species, from construction and operation of the proposed project at the HNP site would be SMALL.

9.3.3.2.5 Aquatic Resources Including Protected Species

The Altamaha River is formed by the confluence of the Ocmulgee and Oconee Rivers 137 miles above the mouth and flows in a southeasterly direction until it empties into the Atlantic Ocean near Darien, Georgia. Several smaller streams contribute to the flow, but the major volume of water entering the Altamaha basin is via the Ocmulgee and Oconee River basins **(GDNR 2003)**.

The Altamaha River watershed ranks among the most biologically diverse river systems along the Atlantic seaboard. The river supports 11 imperiled pearly mussel species, 7 of which are found nowhere else in the world. At least 120 species of rare or endangered plants and animals are found in the Altamaha River watershed, the largest documented cluster of globally imperiled plants and animals of any watershed in Georgia **(TNC 2006)**. A 1998 survey of the freshwater mussel community in a 12-mile reach of the Altamaha River in the vicinity of HNP documented viable populations of 12 mussel species. Collections were dominated by species that are endemic to the Altamaha River system and species that are considered "Species of Concern"

by the USFWS and GDNR because the status of their populations is not known. None of the mussel species collected was state or Federally-listed.

The Altamaha River is one of Georgia's few remaining free flowing streams and contains excellent habitat for numerous freshwater fish species. The diverse fish fauna of the Altamaha River basin includes 74 species representing 25 different families **(GDNR 2003)**. The largest group of species in the Altamaha River basin belongs to the sunfish family (*Centrarchidae*). Other families with large numbers of species are the sucker family (*Cyprinidae*) and the catfish family (*Ictaluridae*).

In addition to resident freshwater species, a number of anadromous fish species are also found within the Altamaha River. American shad, hickory shad, blueback herring, Atlantic sturgeon, and shortnose sturgeon all ascend the river in the spring to spawn **(GDNR 2003)**. American shad are commercially important species and the Altamaha River supports the largest commercial shad harvest of Georgia's rivers. Historically, Atlantic and shortnose sturgeon were also harvested commercially from the Altamaha River. However, the decline in abundance of these two species along the Atlantic coast has led to the listing of the shortnose sturgeon as an endangered species and the closure of the commercial fishery for both species.

The shortnose sturgeon is the only Federally-listed aquatic species known to occur in the Altamaha River in the vicinity of HNP. Shortnose sturgeons were first documented in the Altamaha River in the early 1970s and were the subject of several investigations in the 1980s and 1990s **(NMFS 1998)**. Based on mark-and-recapture studies in the late 1980s and early 1990s, the Altamaha River shortnose sturgeon population was estimated at from 468 to 2,862 individuals and was judged the "largest and most viable" south of Cape Hatteras, North Carolina **(NMFS 1998)**.

GPC evaluated the impact of the existing HNP cooling water intake system on shortnose sturgeon as part of its assessment of the impacts of license renewal and concluded that plant operation would not adversely affect the Altamaha River population. GPC biologists based this on the location and configuration of the cooling water intake, the species' habits and life history, and known spawning locations in the Altamaha River. Because most spawning takes place well downstream of HNP, the potential for entrainment of larvae and impingement of juveniles and adults is greatly reduced. There is a known spawning location in the Ocmulgee River approximately 24 river miles upstream of HNP, but the tendency of demersal sturgeon eggs to sink quickly and adhere to rough substrates and the tendency of larvae to seek cover immediately after hatching suggests that sturgeon spawned in the Ocumulgee would not be vulnerable to impingment and entrainment at HNP.

The construction of a cooling water intake and discharge structure would probably be necessary if a new nuclear unit was sited at HNP. The existing cooling water intake location at HNP has been shown to reduce the potential for entrainment and impingement. The intake structure was

constructed flush with the shallow, southern shoreline of the Altamaha River. The deep river channel hugs the northern bank opposite of the intake structure. Literature indicates that shortnose sturgeon migrate along the bottom of river channels, often seeking the deepest water available. This behavior and the cooling water intake location on the shoreline opposite the river channel should minimize the probability of shortnose sturgeon encountering the intake structure **(NRC 2000)**. It is assumed that the design of a new intake structure would be similar to the current system, thereby reducing the potential impacts to sensitive species.

Based on review of the available information, potential impacts to aquatic resources, including federally and state-listed species, are expected to be SMALL from the construction of a new nuclear unit at the HNP site. A MODERATE impact may be created by the increased volume of water displaced from the river and used for the operation of the new nuclear unit. Additional analysis of river volume withdrawal effects would be required. Consultations would be held with the USFWS and GADNR to determine how to operate new units to create the fewest impacts to aquatic resources.

9.3.3.2.6 Socioeconomics

This section evaluates the social and economic impacts to the surrounding region as a result of constructing and operating the proposed project at the HNP 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, vibration, shock from blasting, and dust emissions. The use of public roadways, railways, and waterways would be necessary to transport construction materials and equipment. However, extensive work is planned on the existing roads to reduce existing bottlenecks in the regional highway system **(GDOT 2006a)**, so physical impacts on the existing road network would be minimal. It is assumed that all construction activities would occur within the existing HNP site. Offsite areas that would support construction activities (for example, borrow pits, quarries, and disposal sites) are expected to be already permitted and operational. Impacts on those facilities from construction of the proposed project 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 project 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, HNP is located in a rural area surrounded by forests and agricultural land, so residents in the area are sparse. Commuter traffic would be controlled by

speed limits. Good road conditions and appropriate speed limits would minimize the noise level generated by the workforce commuting to HNP site.

The proposed project would have standby diesel generators and auxiliary power systems. Permits obtained for these generators would ensure that air emissions comply with regulations. In addition, the generators would be operated on a limited, short-term basis. During normal plant operation, the proposed project would not use a significant quantity of chemicals that could generate odors that exceed threshold values. Good access roads and appropriate speed limits would minimize the dust generated by the commuting workforce.

Construction activities would be temporary and would occur mainly within the boundaries of the HNP site. Offsite impacts would represent small incremental changes to offsite services. During station operations, ambient noise levels would be minimal at the HNP site boundary. Air quality permits would be required for the diesel generators, and chemical use would be limited, which would limit odors. Therefore, the physical impacts of construction and operation would be SMALL.

9.3.3.2.6.2 Demography

The HNP site is located in Appling and Toombs Counties, Georgia. The population distribution around the site is quite low with typical rural characteristics. In the year 2000, Appling County had a population of 17,419 and Toombs County had a population of 26,067 **(USCB 2000c)**. In 2000, the population within 50 miles of the site was 387,582 people (49.4 persons per square mile), and the population within 20 miles of the site was 58,752 people (46.8 persons per square mile). The nearest population center, as defined in 10 CFR 100 is Savannah, Georgia (population approximately 131,510) located approximately 67 miles northeast of HNP **(USCB 2006b)**. Based on the sparseness and proximity matrix in NUREG-1437 HNP is located in a low population area.

Based on the analysis in Section 4.4.2.1, SNC assumes that construction of the proposed project at HNP would increase the population in the 50-mile region by 7,200 people. The majority of the current HNP workforce lives in Appling (30 percent) or Toombs (41 percent), Counties. The remaining employee residences are distributed throughout 28 counties, mostly within 50 miles of the site. SNC assumes that the residential distribution of the construction workforce would resemble the residential distribution of the current HNP workforce. Of the total population increase, 2,160 people (30 percent of 7,200) would settle in Appling County, 2,952 people would settle in Toombs County. These numbers constitute 12.4 percent and 11.3 percent of the 2000 populations of Appling and Toombs Counties, respectively. Impacts are considered to be small if plant-related population growth is less than 5 percent of the study area's total population and moderate if growth is between 5 and 20 percent. The construction employees and their families would represent MODERATE increases to Appling and Toombs Counties' total populations and SMALL increases to the other counties in the 50-mile region.

Based on the analysis in Section 5.8.2.1, SNC assumes that operation of the proposed project at HNP would increase the population in the 50-mile region by 1,750 people. Approximately 30 percent would settle in Appling County and 41 percent would settle in Toombs County. The addition of the new employees and their families would equate to a 3.0 percent increase for Appling County and a 2.8 percent increase for Toombs County. Overall, the potential increases in population would represent a SMALL increase in the total population.

9.3.3.2.6.3 Economy

Based on 2000 census data, within the region surrounding HNP, there are 55,445 persons in the labor force. Appling County's business profile is led by manufacturing (18.4 percent of the county's total employment), followed by educational, health, and social services (17.9 percent), and construction (11.7 percent) **(USCB 2000d)**. The unemployment rate for Appling County in 2004 was 6.1 percent, compared with 4.6 percent for the State of Georgia **(UGA 2006)**.

In neighboring Toombs County, the business profile is led by educational, health, and social services (18.4 percent of the county's total employment), followed by manufacturing (14.9 percent), and retail trade (9.9 percent) **(USCB 2000d)**. The unemployment rate in Toombs County was 6.0 percent in 2004 **(UGA 2006)**.

Economic impacts would be spread across the 50-mile region, but would be greatest in Appling and Toombs Counties. Impacts are small if plant-related employment is less than 5 percent of the study area's total employment and moderate if employment is between 5 and 10 percent. SNC concludes that the impacts of construction on the economy of the region would be beneficial and temporary, and would therefore be SMALL.

The wages and salaries of the operating 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 to get started, and increased job opportunities for local residents. The economic effect on the 50-mile region would be beneficial. SNC 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 within the 50-mile region and particularly in Appling and Toombs Counties. SNC anticipates that most of the indirect jobs created by the operations workforce would be filled by unemployed workers in the region. Expenditures made by the direct and indirect workforce would strengthen the regional economy.

SNC concludes that the impacts of station operation on the economy would be beneficial and SMALL everywhere in the region except Appling and Toombs Counties, where the impacts would be beneficial and MODERATE, and that mitigation would not be warranted.

9.3.3.2.6.4 Taxes

Taxes collected as a result of constructing and operating the proposed project at HNP would be of benefit to the State and local jurisdictions that collected and spent them. Corporate and

personal income taxes and sales and use taxes would be collected during both the construction and operation of a new unit at HNP. SNC anticipates that HNP would pay annual property taxes to Appling County, beginning during construction of the proposed project. Georgia assesses property at 40% of its value. Assuming a 40-year operational life, property taxes to Appling County could average between $20,000,000 and $29,000,000 annually during the first decade of operation and between $3,500,000 and $5,000,000 during the last decade of operation. HNP property taxes provided 68 percent of Appling County's total property tax revenues in 1998 **(NRC 2001)**. The benefits of taxes are large when new tax payments represent more than 20 percent of total revenues for local jurisdictions. Therefore, SNC concludes that the potential beneficial impacts of taxes collected during construction and operation of the proposed project would be LARGE in Appling County and SMALL in the remainder of the 50-mile region.

9.3.3.2.6.5 Transportation

Road access to HNP is via U.S. Highway 1, the major north-south highway route bisecting Appling and Toombs counties. U.S. Highway 1 is a four-lane highway from Baxley past HNP where it enters Toombs County and becomes a two-lane road north of HNP to Interstate 16. Interstate 16 is the major east-west freeway serving the area. In 2004, the annual average daily traffic count for the highway was 5,050 vehicles south of the HNP site and 4,700 vehicles north of the site **(GDOT 2006b)**. The State plans to widen the entire highway to four lanes, which would provide four-lane access from Baxley all the way to Interstate 16 **(GDOT 2006a)**. Right-of-way acquisition for the widening project is anticipated to begin in 2007, and construction would begin after 2008 **(GDOT 2005)**.

Assuming construction ships as described in Section 4.4.2.2.4, an additional 2,200 cars could be on the highway during shift change, causing potential congestion. Also, the traffic of hauling construction materials (100 trucks per day) to the site could cause additional congestion on U.S. Highway 1 during certain times of the day. Heavy congestion and delays could be experienced if planned road improvements on U.S. Highway 1 occur during construction of the proposed project at HNP. Transportation impacts are small when increases in traffic do not result in delays or other operational problems, impacts are MODERATE when increases in traffic begins to cause delays or other operational problems. Overall, impacts of construction on transportation would be moderate and some mitigating actions may need to be undertaken.

With respect to operation of the facility, adding an additional 600 cars (during afternoon shift change) to the existing traffic on the road would not materially congest the highway. Shift changes for the current units and the proposed project at HNP could be staggered so that the traffic increase would not cause congestion. Impacts of the operations workforce on transportation would be SMALL to MODERATE and mitigation would not be warranted.

9.3.3.2.6.6 Aesthetics and Recreation

The HNP site encompasses approximately 2,240 acres and is characterized by low, rolling sandy hills that are predominantly forested. The developed area at HNP is located near the center of a 1,340 acre parcel on the south bank of the Altamaha River. The exisiting facilties at HNP are visible from portions of U.S. Highway 1 and from the adjacent reach of the Altamaha River.

The construction of the proposed project at HNP could be viewed from offsite at certain locations, but the addition of another facility would not substantially change the view which results from the current units. There could be a need to construct cooling-water intake and discharge structures at the site. Additional mechanical or natural draft cooling towers would be required. The operation of a new nuclear unit probably would have visual impacts similar to those of the existing HNP units, with the addition of more visible plumes from cooling towers. Impacts on aesthetic resources are considered to be small if there are no complaints about diminution in the enjoyment of the physical environment and no measurable impact on socioeconomic institutions and processes. Therefore, impacts of construction and operation of the proposed project on aesthetics would be SMALL and would not warrant mitigation.

Recreational facilities located within the boundaries of the HNP site include a 100-acre tract of land west of U.S. Highway 1 used as a Boy Scout Camp, a wayside park, an employee recreation area, and the HNP Visitors Center. Other recreational facilities within 10 miles of HNP include the Altamaha River, the Bullard Creek Wildlife Management Area, Grays Landing, and miscellaneous parks and sports facilities operated by the City of Baxley.

During construction of the proposed project at HNP it is anticipated that access to onsite recreational facilities could be interrupted during periods of peak activity but other recreational facilities in the region could accommodate typical users of the onsite facilities. The attractiveness of the Altamaha River for sport fishing and other recreational uses could be impacted during construction of intake and discharge structures. Other recreational facilities 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 HNP 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.

9.3.3.2.6.7 Housing

In 2,000, Appling County had 7,854 housing units, of which 1,248 units (15.9 percent) were vacant. Toombs County had 11,371 housing units of which 1,494 (13.1 percent) were vacant. Jeff Davis County had 5,581 housing units of which 753 (13.5 percent) were vacant.

Montgomery County had 3,492 housing units of which 573 (16.4 percent) were vacant, and Tattnall County had 8,578 housing units of which 1,521 were vacant (17.7 percent). **(USCB 2000c)**

Based on the analysis in Section 4.4.2.2.5, approximately 3,400 construction workers would in-migrate to the 50-mile region. Of these, approximately 2,700 would purchase or rent permanent housing. The 680 temporary workers would rent temporary (e.g., hotels, motels, rooms in private home) or permanent housing, or bring their own housing in the form of campers and mobile homes. Currently, available housing in the two-county area (Appling and Toombs Counties) is minimally adequate to accommodate the expected influx of workers. Workers could also find housing in other parts of the 50-mile region or construct new housing. Given this increased demand for housing, prices of existing housing could rise. Appling and Toombs 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; 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 its needs.

In summary, the two counties where most of the construction workforce would seek housing have minimally 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. SNC concludes that the potential impacts of construction on housing could be MODERATE in Appling and Toombs 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 impacts would occur as developers and builders anticipated the arrival of the workforce and constructed additional housing. Additional mitigation would not be warranted.

SNC assumes that operation of the proposed project at HNP would increase the population in the 50-mile region by 1,750 people. Approximately 30 percent would settle in Appling County and 41 percent would settle in Toombs County. While there is currently enough housing to accommodate all the new families expected in Appling and Toombs Counties, not all housing may be the type sought by the new workforce. The average income of the new workforce would be expected to be higher than the medium or average income in these counties, therefore, the new workforce could exhaust the high-end housing market and some new construction could result.

SNC concludes that the potential impacts of operations on housing in Appling and Toombs 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, mitigating any housing shortages. Additional mitigation would not be warranted.

9.3.3.2.6.8 Public Services

Public services include water supply and waste water treatment facilities; police, fire and medical facilities; and social services. 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. It is not expected that public services would be materially impacted by the HNP construction or operations workforce. Therefore, impacts of construction and operation on public services would be SMALL and mitigation would not be warranted.

9.3.3.2.6.9 Education

Based on the analysis in Section 4.4.2.8, SNC assumes that construction of the proposed project at HNP would increase the school-aged population in the 50-mile region by 1,900. Approximately 30 percent would settle in Appling County and 41 percent would settle in Toombs County. The Appling County student population would increase by 13.2 percent and the Toombs County student population would increase by 11.6 percent. Large impacts on local school systems are generally associated with project-related enrollment increases above 8 percent. Therefore, the projected increases in the student populations of Appling and Toombs Counties would constitute a LARGE impact on the education systems and mitigation would be warranted.

Based on the analysis in Section 5.8.2.2.7, SNC assumes that operation of the proposed project at HNP would increase the school-aged population in the 50-mile region by 464 people. Approximately 30 percent would settle in Appling County and 41 percent would settle in Toombs County. The Appling County student population would increase by 3.2 percent and the Toombs County student population would increase by 2.8 percent. These increases in student population are below 4 percent of the total student populations in Appling and Toombs counties, hence project-related enrollment increases would constitute a SMALL impact on the education systems and mitigation would not be warranted.

9.3.3.2.7 Historic and Cultural Resources

NRC conducted historical and archaeological records searches at the Georgia Historic Preservation Division, University of Georgia State Archeological Site Files, the National Park Service's National Register Information System, and the National Archeological Database during the license renewal application process. The record searches revealed that no historical or archaeological sites were recorded on lands within the boundaries of HNP, although no cultural resource inventories have been completed for any of the plant site acreage. **(NRC 2001)**

Three archeological surveys have been conducted within a mile of HNP. During a 1977 survey of the lower Ocmulgee River Drainage, four archeological sites were noted in the Altamaha River Park about half a mile west of the HNP boundary. A 1984 survey of the same area identified three additional sites in the same vicinity. The third survey in 1996 included a stretch of U.S. Highway 1 along the site boundary starting northward of the plant entrance. No historical or archaeological sites were noted in Appling County, and 11 historical sites were noted in Toombs County. **(NRC 2001)**

The closest historical sites listed in the National Register of Historic Places (NRHP) include five sites in Appling County and nine sites in Toombs County. In Appling County, four historic sites are located in Baxley and one site is located in Surrency. In Toombs County, six historic sites are located in Vidalia and three sites are located in Lyons. There are no properties listed in the NHRP that are located within a 10-mile radius of HNP. **(NPS 2006b)**

One unrecorded historical site is known to exist on the HNP site. The Bell Cemetery is presently located within the HNP family recreation area, and is fenced and maintained by HNP personnel. **(NRC 2001)**

Siting the proposed project at HNP would require that a formal cultural resources survey be conducted so that no archeological or historic resources would be damaged during construction of the proposed project. Mitigative measures would be performed to prevent permanent damage and ensure that any impacts to cultural resources from construction or operation at HNP would be SMALL.

9.3.3.2.8 Environmental Justice

The 2000 Census and block groups were used for ascertaining minority and low-income populations in the area. There are 337 block groups within a 50 mile radius of HNP. Black minority populations exist in 55 block groups; “Aggregate of Minority Races” populations exist in 63 block groups; “Hispanic Ethnicity” minority populations exist in 5 block groups; and “All Other Single Minorities” exist in 3 block groups. No other minority populations exist in the geographic area. The Census Bureau data characterize 12.64 percent of Georgia households as low-income. Based on the “more than 20 percent” criterion, 41 block groups out of a possible 337 contain a low-income population. There are no minority or low income populations within a 6-mile radius of HNP.

Construction activities (noise, fugitive dust, air emissions, traffic) would not disproportionately adversely affect minority populations because of their distance from HNP. 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 project at HNP is also unlikely to have a disproportionate impact on minority or low-income populations. In the HNP License Renewal Environmental Impact Statement **(NRC 2001)**, NRC noted that no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing through which

the populations could be disproportionately adversely affected have been identified. In addition, no location-dependent disproportionate adverse impacts affecting these minority and low-income populations have been identified or observed **(NRC 2001)**. SNC concludes that environmental justice consequences of the construction and operation of the proposed project at HNP would be SMALL, and that mitigation would not be warranted.

9.3.3.3 Evaluation of the Barton Site

The Barton Site is undeveloped property that was acquired in the 1970's by APC, a wholly-owned subsidiary of Southern Company, for the purpose of constructing a four-unit nuclear generating facility. Approximately 60 acres near the center of the site is owned by others and would need to be acquired before any facilities could be built on the property. The Barton Site is located in south-central Alabama, adjacent to the west bank of the Jordan Reservoir about 14 miles above the Jordan Dam on the Coosa River (Figure 9.3-3). It is about 27 miles north of Montgomery, 44 miles northeast of Selma, 58 miles south of Birmingham, 19 miles northwest of Wetumpka, and 15 miles southeast of Clanton. The site is about equally divided by the county line between Chilton and Elmore Counties and is bordered by Coosa County on its northeastern edge.

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

The Barton Site consists of 2,800 acres on the west bank of Jordan Reservoir between Chestnut Creek to the north and Jake Creek to the south. The undeveloped site is predominantly forested, and is characterized by moderately rolling hills with maximum local relief of about 300 feet occurring between the river and nearby ridge tops.

The land in the site region is rural. About 86 percent of the land in the Coosa River basin is wooded with this wood being used for production of pulpwood and timber. About 12 percent of the land in the basin is used for agricultural purposes, and about one percent is urban.

Construction of the power plant and transmission lines would alter land use at the site from vacant to industrial use. The footprint of a new plant would be approximately 400 acres and an additional 150 acres would be required for temporary facilities and laydown yards. Because the site is undeveloped, additional acreage would be required for roads, parking lots, and a switchyard. The entire 2,800 acres would be excluded from future agricultural and recreational use for the estimated 40-year life of the plant.

State Road 22 passes approximately 3.6 miles north of the Barton Site at its closest point. A 4-mile paved road with a 100-foot right-of-way would be constructed to provide vehicle access from State Road 22 to the Barton Site. Development of the road would require approximately 50 acres. The Louisville & Nashville Railroad passes approximately 5.5 miles southwest of the site at its closest point. A 6-mile connecting rail spur, requiring approximately 120 acres, would also be constructed to transport materials and equipment to the site. Land-use impacts

associated with site-preparation, construction, and operation of the proposed project at the Barton Site would be LARGE.

SNC assumed that two 500-kilovolt transmission lines requiring a 300-foot wide transmission corridor would be needed to connect the proposed project to APC's transmission system. It is assumed that the lines would connect to the substation at the Gaston Generating Plant, which is approximately 35 miles north of the Barton Site near Wilsonville, Alabama. Routing the new transmission lines to the Gaston Generating Plant would require about 1273 acres of transmission corridor. Although the most direct route would, in general, be used between terminations, consideration would also be given to avoiding possible conflicts with any natural or man-made areas where important environmental resources are located. Route selection would also avoid populated areas and residences to the extent possible. The use of lands which are currently used for forests or timber production would be altered. Trees would be replaced by grasses and other low-growing types of ground cover. The new transmission corridor would not be expected to permanently affect agricultural areas, but has the potential to affect residents along the right-of-way. For this reason, impacts to land use along the rights-of-way would be MODERATE.

The region surrounding the Barton Site is not within the Alabama Coastal Zone (Code of Alabama 1975, Section 9-7-15). It is assumed that transmission lines to connect the proposed project at the Barton Site to APC's transmission system would be routed to the substation at the Gaston Generating Plant. The route for the new transmission lines would not pass through any portion of the Alabama Coastal Zone.

9.3.3.3.2 Air Quality

The four counties surrounding the Barton Site, Chilton, Elmore, Coosa, and Autauga, are designated as being unclassified or in attainment of the National Air Quality Standards (NAAQS). The nearest non-attainment area is Shelby County, Alabama, which is approximately 25 miles northwest of the site. Shelby County, a southeastern suburb of Birmingham, is in non-attainment for ozone and PM2.5 (40 CFR 81.301).

Air pollutant emissions from construction and operation of the proposed project at the Barton Site would be similar to those at the VEGP site. Construction impacts would be temporary, and would be 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 for the VEGP site 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 NAAQS.

During station operation, standby diesel generators would be used for auxiliary power. It is expected that these generators would see limited use and, when used, they would operate for short time periods. The proposed project would be subject to a Synthetic Minor Operating Permit to ensure that the facility operations would not interfere with attaining or maintaining Primary and Secondary NAAQS **(ADEM 2005)**. Therefore, air pollutant emissions from the standby diesel generators are expected to be minimal and would not result in any violation of NAAQS.

The closest area to the Barton Site that is designated in 40 CFR 81.408 as a mandatory Class I Federal area, in which visibility is an important value, is the Sipsey Wilderness Area. The Sipsey Wilderness Area is approximately 145 miles northwest of the site. Because there are no mandatory Class I Federal areas within 50 miles of the site, any potential visibility impacts from the proposed units on Class I areas would be negligible.

The air quality impacts from construction and operation of the proposed project at the Barton Site would be SMALL.

9.3.3.3.3 Hydrology, Water Use, and Water Quality

The Barton Site is located within the Piedmont Province. The Piedmont Province is underlain by a two-component aquifer system that is composed of a fractured, crystalline-rock aquifer characterized by little or no primary porosity or permeability; and the overlying regolith, which generally behaves as a porous-media aquifer. Rock type, structural features, and regolith thickness vary locally and affect the storage capacity and hydraulic conductivity of an aquifer. The volume of water in storage is controlled by the porosity of the regolith and to a lesser degree by the amount of fracturing of the rock. Because of the limited storage in fractures, water levels in these aquifers respond rapidly to pumping and seasonal changes in rainfall. Yields from wells completed in fractured crystalline-rock aquifers generally range from 1 to 25 gpm. **(Robinson et al. 1996)**

Groundwater at the Barton Site is typical of the Piedmont region. It is present in open fractures of gneissic bedrock and in the interstices of the saprolite in the overlying regolith. Permeability values in the bedrock and overlying regolith are low, and water levels respond rapidly to pumping and rainfall. Inspection of the topography, geology, stream patterns, and water table contour maps show that the water underlying the site flows either directly to the Coosa River, or indirectly to the river, first discharging into tributary streams that act as interceptor drains to groundwater flow. Thus, all groundwater underlying the site eventually reaches the Coosa River.

As discussed above, the aquifer underlying the site has low permeability; wells developed on the property would have low yields. Therefore, SNC assumed that all water needed to support the proposed project at the Barton Site would be withdrawn from the Jordan Reservoir. Jordan Reservoir is located on the Coosa River and extends approximately 18 miles upstream from

Jordan Dam to Mitchell Dam through Chilton, Coosa, and Elmore Counties. Jordan Reservoir has a surface area of 5,880 acres at a normal water surface elevation of 252 feet msl. The Bouldin development, located on a man-made canal off the Coosa River, also receives flow from Jordan Reservoir and discharges into the Coosa River. Including the Bouldin forebay, the lake has 118 miles of shoreline and a surface area of 6,800 acres. The reservoir is used for hydroelectric generation, limited storage for power generation, navigation flow augmentation, maintenance of downstream water quality, industrial and municipal water supply, irrigation, recreational opportunities and serves as habitat for fish and wildlife. There is no flood control storage in Jordan Reservoir, including the Bouldin forebay; rather the reservoir is operated in an approximate run-of-river mode, with daily inflow basically equaling outflow.

The cooling tower evaporation rate for the proposed project would be 28,880 gpm (64 cfs). It is assumed that an additional 90 gpm (0.2 cfs) would be needed for domestic purposes. For water years 1913-2004, the annual mean and lowest annual mean flows for the Coosa River at Jordan Dam near Wetumpka, Alabama (Station 02411000) were 16,230 cfs and 5,402 cfs, respectively **(Psinakis et al. 2005)**. The total loss attributable to the proposed project would represent 0.4 percent of the annual mean flow and 1.2 percent of the lowest annual mean flow for the Coosa River.

Although the water withdrawal from the Jordan Reservoir would represent a small percentage of the Coosa River flow, increased water use could cause controversy in the area due to recent water use conflicts between Alabama, Georgia, and Florida. Demand for Coosa River water from upstream users has increased dramatically in recent years. The headwaters of the Basin are in northern Georgia where expanding urban areas are placing increased demands on the water resources that, in turn, reduce available water resources downstream in Alabama. Between 1970 and 1990, water used for public supply in the portion of the Alabama-Coosa-Tallapoosa (ACT) Basin increased 44 percent to almost 185 million gallons per day. Total water use in the Alabama portion of the ACT Basin increased about 7 percent **(USGS 2006)**. Increased water withdrawal reduces flows downstream, affecting the amount of water available for downstream users, water quality, ecological habitats, navigation, and recreation **(Lipford 2004)**. The amount of water from the Coosa River that would be required by the proposed project is small compared with major users of the resource, and impacts to Coosa River as a result would be SMALL. However, any increase in water withdrawal from the Coosa River would be scrutinized by neighboring states.

The Barton Site would operate under a NPDES permit issued by the ADEM. 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 hurt water quality or human health. Any releases of contaminants to

Jordan Reservoir (or other Alabama waters) as result of construction or operation of the proposed project at the Barton Site would be regulated by the ADEM through the NPDES permit process to ensure that water quality is protected. Therefore, impacts to water quality would be SMALL.

9.3.3.3.4 Terrestrial Resources Including Protected Species

The plant site is located approximately 15 miles southeast of Clanton, Alabama, along the west side of the Jordan Reservoir, which is an impoundment of the Coosa River. The site encompasses approximately 2,800 acres, and is situated along the Chilton-Elmore county line, directly across the river from Coosa County. The terrain is moderately rolling, with a maximum relief of 300 feet between the Jordan Reservoir (elevation 252-feet msl) and nearby ridge tops. Most of the site is forested, and consists of hardwoods, pines, and mixed hardwood/pine. Based on TerraServer imagery from 1998 **(TerraServer 2005)**, forested habitats occupy the area for about two miles surrounding the site, and land beyond two miles of the site is predominately a mixture of forest and agriculture. Animal species that occur on the Barton Site are those typically found in similar habitats in central Alabama, such as the opossum, eastern cottontail, gray squirrel, raccoon, white-tailed deer, and various reptiles, amphibians, and birds. Since most the Barton Site is forested, it is assumed that at least 550 acres (see Section 9.3.3.3.1) of forest would have to be cleared for the construction of the Barton Nuclear Plant and associated facilities.

SNC is not aware of any known occurrences of federally listed threatened or endangered species on the Barton Site, but formal surveys of the site have not been conducted. Table 9.3-1 indicates federally-listed plant and animal species recorded in Chilton, Coosa, Elmore, and Talledega Counties, which are the counties through which transmission lines from the Barton Site would presumably pass (See Section 9.3.3.3.1). Terrestrial species in Table 9.3-1 consist of the bald eagle, red-cockaded woodpecker, wood stork, Georgia rockcress, and Alabama canebrake pitcher plant. Red-cockaded woodpeckers would not exist at the site due to the absence of habitat for this species (mature pines with minimal hardwoods). Field surveys would be conducted for federally-listed and state protected species as part of the permitting process prior to any clearing or construction activities at the site or along associated transmission corridors.

As mentioned in Section 9.3.3.3.1, it is assumed that two 500-kilovolt transmission lines requiring a 300-foot wide transmission corridor would be needed to connect the proposed project to APC's transmission system. The new lines would most likely connect to the substation at the Gaston Generating Plant, which is approximately 35 miles north of the Barton Site near Wilsonville, Alabama. Routing the new transmission lines to the Gaston Generating Plant would require about 1273 acres of transmission corridor. Although the most direct route would generally be used between terminations, consideration would also be given to avoiding possible conflicts with natural areas where important environmental resources are located.

Land clearing associated with construction of the plant and transmission lines would be conducted according to Federal and state regulations, permit conditions, existing SNC 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 the Barton plant would probably be SMALL. However, due to the uncertainty associated with route selection and clearing of the Barton Site and transmission corridors, impacts to terrestrial resources could be MODERATE.

9.3.3.3.5 Aquatic Resources Including Endangered Species

The Jordan Reservoir (also known as Jordan Lake) was formed by Jordan Dam and Walter Bouldin Dam. The Jordan Dam is on the Coosa River, while the Walter Bouldin Dam is located on a man-made canal off the Coosa River and discharges into the Coosa River at the confluence of the Coosa and Tallapoosa Rivers. Jordan Reservoir extends 18 miles upstream from the Jordan Dam to the Mitchell Dam and has a surface area of 5,880 acres at a normal water surface elevation of 252 ft msl. Including the Bouldin forebay, the lake has 118 miles of shoreline and a surface area of 6,800 acres. The maximum depth of the lake is 110 ft. The lake has a 10,165 sq mi drainage area and is used for hydroelectric generation, navigation flow augmentation, maintenance of downstream water quality, industrial and municipal water supply, irrigation, recreation, and as habitat for fish and wildlife. The Jordan Reservoir is about 890 feet wide at the Barton Site with a maximum depth of 45 feet. Common sport fish species include largemouth bass, bluegill, warmouth, green sunfish, redear sunfish, crappie, blue catfish, and channel catfish.

Water from the Jordan Reservoir would be expected to cool the proposed project constructed at the Barton Site. Although recreational sport fish and other aquatic species would be temporarily displaced during construction, they would be expected to recolonize the area after construction is complete. Federally-listed aquatic species known to occur in Chilton, Coosa, Elmore, and Talledega Counties consist of one fish (blue shiner), one plant (Kral's water-plantain) and eight mussels and snails (Table 9.3-1). APC cooperates with the U.S. Fish and Wildlife Service in protecting these and other rare species and in developing Biological Assessments as part of various hydroelectric projects. Field surveys would be conducted for federally-listed and state protected aquatic species as part of the permitting process prior to any clearing or construction activities at the site or along associated transmission corridors. Because of this, and since land clearing associated with construction of the plant and transmission lines would be conducted according to Federal and state regulations, permit conditions, existing APC procedures, good construction practices, and established Best Management Practices, impacts to aquatic resources, including endangered and threatened species, from construction of the Barton plant would probably be SMALL.

The most likely aquatic impact from operations of the Barton plant would be entrainment and impingement of aquatic organisms in the Jordan Reservoir. Because the EPA requires facilities to meet criteria designed to protect organisms from entrainment and impingement, the potential for environmental impacts to aquatic resources, including endangered and threatened species, from operation of the Barton plant would probably be SMALL.

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 project at the Barton 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, vibration, shock from blasting, and dust emissions. The use of public roadways, and railways would be necessary to transport construction materials and equipment. The majority of construction activities would occur within the boundaries of the Barton Site. However, an access road and a connecting rail spur (requiring about 170 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 and operational. Impacts on those facilities from construction of the proposed project 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 project 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 Barton Site is located in a rural area surrounded by forests and agricultural land, with few residents in the area. Commuter traffic would be controlled by speed limits. Good road conditions and appropriate speed limits would minimize the noise level generated by the workforce commuting to the site.

The proposed project would have standby diesel generators and auxiliary power systems. Permits obtained for these generators would ensure that air emissions comply with regulations. In addition, the generators would be operated on a limited, short-term basis. During normal plant operation, the proposed project would not use a significant quantity of chemicals that could generate odors that exceed odor threshold values. Good access roads and appropriate speed limits would minimize the dust generated by the commuting workforce.

Construction activities would be temporary and would occur mainly within the boundaries of the Barton 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. Air quality permits would be required for the diesel generators, and chemical use would be limited, which should limit odors. Therefore, the physical impacts of construction and operation would be SMALL.

9.3.3.3.6.2 Demography

The Barton Site is located in Chilton and Elmore Counties, Alabama. The site currently meets the population requirements of 10 CFR 100. The population distribution around the site is quite low with typical rural characteristics. The total population of the four counties in the site region is 161,340 persons as of the 2000 Census. Population within the counties were 43,671 in Autauga County, 39,593 in Chilton County, 12,202 in Coosa County, and 65,874 in Elmore County **(USCB 2000e)**. The population within 50 miles of the site was 735,226 people (93.74 persons per square mile), and the population within 20 miles of the site was 90,677 people (72.26 persons per square mile). The nearest population center, as defined in 10 CFR 100 is Montgomery, Alabama (population approximately 201,568) located approximately 27 miles south of the site **(USCB 2006c)**. Based on the sparseness and proximity matrix in NUREG-1437 the Barton Site is located in a medium population area.

Due to the proximity of the Barton Site to the Birmingham and Montgomery metropolitan areas, the most populous metropolitan areas in Alabama, it is expected the majority of construction workers would come from within the region. Workers coming from outside the region would probably commute to the construction site, stay for the week, and go back to their permanent residence on weekends. Any construction employees relocating to the region would most likely be scattered throughout the counties in the region. Should a larger number than expected of construction workers relocate to the region, there would not be a noticeable increase in population for the most impacted counties. If 20 percent of the peak construction workforce, about 880 workers and their families, decided to relocate the population in the region would increase by 2,332 people, (assuming an average household size of 2.65 people). Based on 2000 census data, the addition of the new employees and their families would equate to a 5.9 percent increase for Chilton County and a 3.5 percent increase for Elmore County (assuming that all 2,332 people located to one county or the other). Impacts are considered to be small if plant-related population growth is less than 5 percent of the study area's total population. Therefore, the potential increases in population during construction would represent a SMALL to MODERATE increase in the total population for the most impacted counties.

Approximately 800 workers (660 operations personnel plus 140 security personnel) would be required for the operation of new generating units at the Barton Site. Most of these workers would be expected to come from within the region. Any employees relocating to the region would most likely be scattered throughout the counties in the region. If all 800 employees and their families were to come from outside the region, the potential increase in population in the most impacted counties would not be substantial. For example, the 800 employees would

translate into an additional 2,120 people. The addition of the new employees and their families would equate to a 5.3 percent increase for Chilton County and a 3.2 percent increase for Elmore County (assuming that all 2,120 people located to one county or the other). Overall, the potential increases in population would represent a SMALL increase in the total population for the most impacted counties.

9.3.3.3.6.3 Economy

Based on 2000 census data, within the four counties surrounding the Barton Site, there are 74,683 persons in the labor force. Of those persons in the labor force, 98.4 percent are in the civilian labor force and 1.6 percent in the armed forces. Of the civilian labor force, 95.1 percent are employed and 4.9 percent are unemployed. The overall unemployment rate for the region is lower than that of the State, which is 6.2 percent. **(USCB 2000f)**

Elmore County's business profile is led by educational, health, and social services (16.8 percent of the county's total employment), followed by manufacturing (14.5 percent), and retail trade (12.0 percent). The unemployment rate for Elmore County in 2000 was 5.0 percent. **(USCB 2000f)**

In neighboring Chilton County, the business profile is led by manufacturing (16.9 percent of the county's total employment), followed by educational, health, and social services (14.7 percent), and construction (13.1 percent). The unemployment rate in Chilton County was 4.3 percent in 2000. **(USCB 2000f)**

Elmore and Chilton Counties, where the magnitude of the economic impacts would be diffused within the larger economic base, would most likely be the main beneficiaries of construction and operation of the proposed project at the Barton Site. Impacts are defined as small if plant-related employment is less than 5 percent of the study area's total employment and moderate if employment is between 5 and 10 percent. SNC concludes that the impacts of construction on the economy of the region would be beneficial and temporary, and would therefore be SMALL.

The wages and salaries of the operating 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. SNC 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 within the 50-mile region and particularly in Elmore and Chilton Counties. SNC anticipates that most of the indirect jobs created by the operations workforce would be filled by unemployed workers in the region. Expenditures made by the direct and indirect workforce would strengthen the regional economy.

SNC concludes that the impacts of station operation on the economy would be beneficial and small everywhere in the region except Elmore and Chilton Counties, where the impacts would be beneficial MODERATE, and that mitigation would not be warranted.

9.3.3.3.6.4 Taxes

Taxes collected as a result of constructing and operating the proposed project at the Barton Site would be of benefit to the State and local jurisdictions that collected and spent them. Corporate and personal income taxes and sales and use taxes would be collected during both the construction and operation of the proposed project at the Barton Site. SNC anticipates that the Barton Site would pay annual property taxes to Chilton and Elmore Counties, beginning during construction of the proposed project. Alabama assesses property at 30% of its value. Assuming a 40-year operational life, property taxes that would be split between Chilton and Elmore Counties could average between $15,000,000 and $21,500,000 annually for the first decade of operations and between $3,000,000 and $4,000,000 for the last decade of operations. Chilton and Elmore counties have experienced rapid growth over the past few years, consequently it is difficult to predict the degree of impact on the tax base for these counties that Barton Site property taxes have. Assuming that the valuation of the proposed project at the Barton Site would be similar to the Farley Nuclear Plant in Houston County, tax payments for the site could represent 20 to 30 percent of the tax revenue for these counties. The benefits of taxes are considered moderate when new tax payments by the nuclear plant constitute 10 to 20 percent of total revenues for local jurisdictions and large when new tax payments represent more than 20 percent of total revenues. Therefore, SNC concludes that the potential beneficial impacts of taxes collected during construction and operation of the proposed project would be MODERATE to LARGE in Chilton and Elmore Counties and SMALL in the remainder of the 50-mile region.

9.3.3.3.6.5 Transportation

Road access to the Barton Site would be via State Road 22, which has an east-west orientation. State Road 22 passes through the town of Rockford to the east and merges with U.S. Highway 31 about one mile north of the town of Verbena. Employees traveling from Birmingham and other towns north of the site would access State Road 22 from U.S. Highway 31. Employees traveling from Montgomery and other towns south of the site would access State Road 22 from U.S. Highway 31 via State Road 111 or State Road 143. All roads on these travel routes are two-lane paved roads. The Alabama Department of Transportation does not maintain level-of-service designation for roadways in the State. However, a daily average of 1580 cars traveled State Road 22 near the Barton Site in 2004 **(ALDOT 2006)**. Assuming construction shifts as described in Section 4.4.2.2.4, an additional 2,200 cars could be on a two-lane highway during shift changes, causing potential congestion. Also, the traffic of hauling construction materials (100 trucks per day) to the site could bring additional congestion to State Road 22, U.S. Highway 31 and State Roads 111 and 143 during certain times of the day. Transportation

impacts are small when increases in traffic do not result in delays or other operational problems; impacts are MODERATE when increases in traffic begins to cause delays or other operational problems. Impacts of construction on transportation would be MODERATE and some mitigating actions may be needed.

With respect to the operations of the facility, adding at most an additional 800 cars (assuming a single occupant per car) to the existing 1,580 cars per day on the road would not materially congest the highway. Shift changes for the proposed project at the Barton Site could be staggered so that the traffic increase would not cause congestion. Impacts of the operations workforce on transportation would be SMALL and mitigation would not be warranted.

9.3.3.1.6.6 Aesthetics and Recreation

The Barton Site is currently undeveloped and is a popular area for hunters. The construction and operation of the proposed project on the site would exclude the entire 2,800 acres from hunting and other recreational use for the estimated 40-year life of the plant.

The developed areas at the Barton Site would be located near the center of the property, with the area immediately adjacent to the Jordan Reservoir mostly undeveloped. The remainder of the site would consist of forested areas, ponds, and open fields. The Jordan Reservoir is relatively undeveloped, particularly in the upper half of the reservoir, where the Barton Site is located. The reservoir offers excellent opportunities for wildlife viewing, camping, boating, fishing, and other recreation.

The construction and operation of the proposed project at the Barton Site would have minimal impacts on aesthetic and scenic resources. With the exception of the intake and outfall structures, which would be located on the west bank of the Jordan Reservoir, all facility structures would be built near the center of the site. From Jordan Reservoir, the plant may be visible from certain angles, although from most points the structures would be hidden by elevated terrain, trees, and other foliage. The intake and outfall will be visible from portions of the reservoir that are near the site. The upper portions of facility structures may 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 within 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 project on aesthetics would be MODERATE and could warrant mitigation.

There are two APC reservoirs in the vicinity of the Barton Site in addition to the Jordan Reservoir and Bouldin Lake: Lay Lake, and Mitchell Lake. Both reservoirs have recreational uses in including camping, boat ramps, marinas, picnic areas, playgrounds, swimming areas, and trails. Mitchell Lake is located about 4.5 miles upstream of the Barton Site in Chilton and Coosa Counties, Alabama. The upper portions of facility structures and occasional plumes from the cooling towers may be visible from elevated areas near Mitchell Dam. No other impacts on Mitchell Lake's recreation areas would be expected. Lay Lake is located over 18 miles upstream of the Barton Site in Chilton, Coosa, and Shelby Counties, Alabama. Construction and operation of the proposed project at the Barton Site would not impact recreation areas on Lay Lake because of its distance from the Barton Site. 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 would be SMALL.

9.3.3.3.6.7 Housing

In 2000 in Chilton County, there were 17,651 housing units, of which 2,364 were vacant (13.4 percent). Elmore County had 8,037 housing units, of which 1,512 were vacant (18.8 percent), Autauga County had 17,660 housing units with 1,659 vacant (9.4 percent), and Coosa County had 6,142 housing units with 1,460 vacant (23.8 percent) **(USCB 2000f)**. Assuming that the construction workforce would commute from the area within a 50-mile radius of the Barton Site, which has a population of 735,226, there would be few discernible impacts on housing availability, rental rates or housing values, or housing construction or conversion. Those who chose to relocate to the region would find adequate housing available. Impacts on housing are considered to be small when a small and not easily discernable change in housing availability occurs. Therefore, impacts of construction on housing would be SMALL and mitigation would not be necessary. Impacts on housing during the operating period would be SMALL for the same reasons.

9.3.3.3.6.8 Public Services

Public services include water supply and waste water treatment facilities; police, fire and medical facilities; and social services. Both construction and station operating personnel are expected to come from within the region. Construction workers living outside the region would most likely commute to the job site from their residences. Any construction employees relocating to the region would most likely be dispersed throughout the region where there is available housing. New operations employees relocating from outside the region would most likely live in residentially developed areas. It is not expected that public services would be materially impacted by these workers. 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 project on public services would be SMALL and mitigation would not be warranted.

9.3.3.3.6.9 Education

The majority of construction workers would be expected to come from the region, with little in-migration of workers from outside the region. Workers living outside the region would most likely commute to the job site from their residences. Therefore, there would be minimal impact from additional children being placed in the school systems within the region.

The majority of the operations workforce would come from within the region where their educational requirements are already being met. As such, the school systems in these areas would not experience any major influx of students because of the operation of the proposed project at the Barton Site. The majority of workers relocating to the region would likely move to the more populous area in the surrounding communities, having access to the more developed public services. For example, workers with school-aged children would be interested in communities with good school districts.

Impacts of construction and operation of the proposed project on education would be SMALL and mitigation would not be warranted.

9.3.3.3.7 Historic and Cultural Resources

SNC conducted historical and archaeological records searches on the National Park Service's National Register Information System and the Alabama Register of Landmarks and Heritage (ARLH), and reviewed information on historic and archeological sites provided in APC's Environmental Assessment for the Coosa River Project.

Two archaeological or cultural resources surveys have been conducted on lands adjacent to the Jordan Reservoir. These surveys noted 13 archaeological sites within or adjacent to the Jordan development, but their locations are not identified. None of the sites are listed on or currently eligible for listing on the NRHP.

The NRHP includes 5 sites in Autauga County, 3 sites in Chilton County, 1 site in Coosa County, and 10 sites in Elmore County. The Verbena historic district, is located about 7 miles west of the Barton Site and is composed of 57 predominantly frame 1-story structures. Notable structures include the Verbena Baptist Church, the multi-gabled Gibson house, the hip-on-hip Brooks-Wingate house, and the Greek Revival Brooks-De Ramus store. The town was first developed as summer resort in late 1880's. It later evolved as a permanent settlement following a resort hotel fire in 1922 and construction of the Mitchell Dam. There are no other properties listed in the NHRP that are located within a 10-mile radius of the Barton Site. **(NPS 2006c)**

The ARLH includes 10 sites in Autauga County, 9 sites in Chilton County, 5 sites in Coosa County, and 39 sites in Elmore County that are not included in the NHRP. The Confederate Memorial Cemetery is located about 6.5 miles southwest of the Barton Site. The Titus historic district and the Gantt Dogtrot House are located about 4.5 southwest of the site. There are no

other properties listed in the ARLH that are located within a 10-mile radius of the Barton Site. **(AHC 2003)**

Siting the proposed project at the Barton Site would require a formal cultural resources survey be conducted so that no archeological or historic resources would be damaged during construction of the proposed project. Mitigative measures would be performed to prevent permanent damage and ensure that any impacts to cultural resources from construction or operation at the Barton Site would be SMALL.

9.3.3.3.8 Environmental Justice

The 2000 Census and block groups were used for ascertaining minority and low-income in the area. There are 577 block groups within a 50 mile radius of the Barton Site. Black minority populations exist in 207 block groups; and "Aggregate of Minority Races" populations exist in 200 block groups. No other minority populations exist in the geographic area. The Census Bureau data characterize 16.67 percent of Alabama households as low-income. Based on the "more than 20 percent" criterion, 59 block groups out of a possible 577 contain a low-income population. There are no minority or low income populations within a 6-mile radius of the Barton Site.

Construction activities (noise, fugitive dust, air emissions, traffic) would not disproportionately impact minority populations because of their distance from the Barton 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 project at the Barton Site is also unlikely to have a disproportionate impact on minority or low-income populations. A review of environmental assessments and planning documents for projects in the Coosa River basin and adjacent lands identified no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing through which the populations could be disproportionately affected. In addition, no location-dependent disproportionate impacts affecting these minority and low-income populations have been identified **(USACE 1998, Delaney 2005)**. SNC concludes that environmental justice consequences of the construction and operation of the proposed project at the Barton Site would be SMALL, and that mitigation would not be warranted.

9.3.4 Summary and Conclusions

The decision to co-locate the new nuclear power facility at VEGP near Waynesboro, Georgia was based on a comparison of the three nuclear sites (e.g., VEGP, FNP near Dothan Alabama, and HNP near Baxley, Georgia) that supply electric power to Southern Company's customers and a greenfield site (Barton Site, near Clanton, Alabama) that had previously been proposed for a four-unit nuclear but never developed. The existing VEGP facility currently operates under an NRC license, and the proposed location has already been found acceptable under the

requirements for that license. Further, operational experience at the existing facility has shown that the environmental impacts are SMALL, and operation of a new facility at the site should have essentially the same environmental impacts.

SNC's evaluation of alternative sites focused on whether there are any sites that are obviously superior to the VEGP site. The review process was consistent with the special case noted in NUREG-1555, ESRP, Section 9.3(III)(8), and took into account the advantages already present at existing nuclear facilities within the region of influence. Initially, candidate sites within the region of influence were identified and screened. During initial review, SNC determined that the advantages of co-locating the new facility with an existing nuclear power facility outweighed the advantages of any other probable siting alternative. Therefore, consideration of alternative sites within the relevant service area focused primarily on sites with an existing nuclear power facility. The Barton Site was included in the evaluation to determine if greenfield sites are obviously superior to an existing nuclear site.

Tables 9.3-2 and 9.3-3 compare the environmental impacts of construction and operation of the proposed project at each of the alternative sites with impacts at the VEGP site. This site-by-site comparison did not result in identification of a site obviously superior to the VEGP ESP Site

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Table 9.3-1. Federally-Listed Species Recorded in Chilton, Coosa, Elmore, and Talledega Counties, Alabama[a]

Scientific Name	Common Name	Federal Status[b]	Alabama Counties
Birds			
Haliaeetus leucocephalus	Bald eagle	T	Chilton, Coosa, Elmore
Picoides borealis	Red-cockaded woodpecker	E	Chilton, Coosa, Talledega
Mycteria americana	Wood stork	E	Chilton
Fish			
Cyprinella caerulea	Blue shiner	T	Coosa
Invetebrates			
Elimia crenatella	Lacy elimia snail	T	Talladega
Leptoxis taeniata	Painted rocksnail	T	Chilton, Talledega
Lampsilis altilis	Fine-lined pocketbook mussel	T	Chilton, Coosa, Elmore, Talledega
Medionidus parvulus	Coosa moccasinshell mussel	E	Talladega
Pleurobema decisum	Southern clubshell mussel	E	Talladega
Ptychobranchus greenii	Triangular kidneyshell mussel	E	Talladega
Tulotoma magnifica	Tulotoma snail	E	Coosa
Pleurobema georgianum	Southern pigtoe mussel	E	Coosa, Talledega
Plants			
Sagittaria secundifolia	Kral's water-plantain	T	Coosa
Arabis georgiana	Georgia rockcress	C	Elmore
Sarracenia rubra alabamensis	Alabama canebrake pitcher plant	E	Chilton, Elmore

a Source of county occurrence: **FWS 2005**.
b E = Endangered, T = Threatened, C = Candidate for federal listing.

Table 9.3-2 Characterization of Construction Impacts at the Vogtle and Alternative ESP Sites

Category	Vogtle	Farley	Hatch	Barton
Land Use Impacts				
The Site and Vicinity	SMALL	SMALL	SMALL	MODERATE
Transmission rights-of-way	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	MODERATE
Air Quality	SMALL	SMALL	SMALL	SMALL
Water Related Impacts				
Water Use	SMALL	SMALL	SMALL	SMALL
Water Quality	SMALL	SMALL	SMALL	SMALL
Ecological Impacts				
Terrestrial Ecosystems	SMALL	SMALL	SMALL	SMALL to MODERATE[e]
Aquatic Ecosystems	SMALL	SMALL	SMALL	SMALL
Threatened and Endangered Species	SMALL	SMALL	SMALL	SMALL
Socioeconomic Impacts				
Physical Impacts	SMALL	SMALL	SMALL	SMALL
Demography	SMALL	SMALL to MODERATE[b]	SMALL to MODERATE[c]	SMALL
Economy	SMALL (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)	SMALL (Beneficial)
Taxes	SMALL to LARGE[a] (Beneficial)	SMALL to LARGE[b] (Beneficial)	SMALL to LARGE[d] (Beneficial)	SMALL to LARGE[f] (Beneficial)
Transportation	MODERATE	MODERATE	MODERATE	MODERATE
Aesthetics	SMALL	SMALL	SMALL	MODERATE
Recreation	SMALL	SMALL	SMALL	SMALL to MODERATE
Housing	SMALL to MODERATE[a]	SMALL to MODERATE[b]	SMALL to MODERATE[c]	SMALL
Public and Social Services	SMALL	SMALL	SMALL	SMALL

Table 9.3-2 (cont'd) Characterization of construction Impacts at the Vogtle and Alternative ESP Sites

Category	Vogtle	Farley	Hatch	Barton
Education	SMALL to MODERATE[a]	SMALL to MODERATE[a]	SMALL to LARGE[a]	SMALL
Historic and Cultural Resources	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL	SMALL	SMALL

a Impacts in 50-mile radius would be SMALL. Impacts to Burke County would be greater.
b Impacts in 50-mile radius would be SMALL. Impacts to Houston County would be greater.
c Impacts in 50-mile radius would be SMALL. Impacts to Appling and Toombs Counties would be greater.
d Impacts in 50-mile radius would be SMALL. Impacts to Appling County would be LARGE.
e Impacts at plant site would be SMALL, but transmission line impacts could be MODERATE depending on the route.
f Impacts in 50-mile radius would be SMALL. Impacts to Chilton and Elmore Counties would be MODERATE to LARGE.

Table 9.3-3 Characterization of Operation Impacts at the Vogtle and Alternative ESP Sites

Category	Vogtle	Farley	Hatch	Barton
Land Use Impacts				
The Site and Vicinity	SMALL	SMALL	SMALL	SMALL
Transmission rights-of-way	SMALL	SMALL	SMALL	SMALL
Air Quality	SMALL	SMALL	SMALL	SMALL
Water Related Impacts				
Water Use	SMALL	SMALL	SMALL	SMALL
Water Quality	SMALL	SMALL	SMALL	SMALL
Ecological Impacts				
Terrestrial Ecosystems	SMALL	SMALL	SMALL	SMALL
Aquatic Ecosystems	SMALL	SMALL	SMALL	SMALL
Threatened and Endangered Species	SMALL	SMALL	SMALL	SMALL
Socioeconomic Impacts				
Physical Impacts	SMALL	SMALL	SMALL	SMALL
Demography	SMALL	SMALL	SMALL to MODERATE[c]	SMALL
Economy	SMALL to MODERATE[a]	SMALL to MODERATE[b]	SMALL to MODERATE[d]	SMALL to MODERATE[e]
Taxes	SMALL to MODERATE[a]	SMALL to MODERATE[b]	SMALL to MODERATE[d]	SMALL to MODERATE[e]
Transportation	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL
Aesthetics	SMALL	SMALL	SMALL	MODERATE
Recreation	SMALL	SMALL	SMALL	SMALL
Housing	SMALL	SMALL	SMALL	SMALL
Public and Social Services	SMALL	SMALL	SMALL	SMALL

Table 9.3-3 Characterization of Operation Impacts at the Vogtle and Alternative ESP Sites (Cont.)

Category	Vogtle	Farley	Hatch	Barton
Education	SMALL to MODERATE[a]	SMALL to MODERATE[b]	SMALL to MODERATE[d]	SMALL
Historic and Cultural Resources	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL	SMALL	SMALL

a Impacts in 50-mile radius would be SMALL. Impacts to Burke County would be greater.
b Impacts in 50-mile radius would be SMALL. Impacts to Houston County would be greater.
c Impacts in 50-mile radius would be SMALL. Impacts to Appling and Toombs Counties would be MODERATE.
d Impacts in 50-mile radius would be SMALL. Impacts to Appling County would be LARGE.
e Impacts in 50-mile radius would be SMALL. Impacts to Chilton and Elmore Counties would be would be greater.

Figure 9.3-1 Farley 50-Mile Vicinity

Figure 9.3-2 Hatch 50-Mile Vicinity

Figure 9.3-3 Barton 50-Mile Vicinity

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