4.0 Environmental Impacts of Operation

Environmental issues associated with operation of a nuclear power plant during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).[(a)] The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic.

(2) A single significance level (i.e., SMALL, MODERATE, OR LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter of the supplemental environmental impact statement (SEIS) addresses the issues related to operation during the renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to the Surry Power Station, Units 1 and 2. Section 4.1 addresses issues applicable to the Units 1 and 2 cooling system. Section 4.2 addresses issues related to transmission lines and onsite land use. Section 4.3 addresses the radiological impacts of normal operation, and Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Section 4.5 addresses issues related to groundwater use and quality, while Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses new information that was raised during the scoping period. The results of the evaluation of environmental issues

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

related to operation during the renewal term are summarized in Section 4.8. Finally, Section 4.9 lists the references for Chapter 4. Category 1 and Category 2 issues that are not applicable to Surry Units 1 and 2 because they are related to plant design features or site characteristics not found there are listed in Appendix F.

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to the Surry Power Station cooling system operation during the renewal term are listed in Table 4-1. The Virginia Electric and Power Company (VEPCo) stated in its Environmental Report (ER; VEPCo 2001b) that it is not aware of any new and significant information associated with the renewal of the Surry Units 1 and 2 operating licenses (OLs). The staff has not identified any significant new information during its independent review of the ER, the site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of the issues, the GEIS concluded that the impacts are small, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-1. Category 1 Issues Applicable to the Operation of the Surry Power Station Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.1; 4.3.2.2; 4.4.2
Altered salinity gradients	4.2.1.2
Temperature effects on sediment transport capacity	4.2.1.2.3; 4.4.2.2
Scouring caused by discharged cooling water	4.4.1.2.3; 4.4.2.2
Eutrophication	4.2.1.2.3; 4.4.2.2
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2
Discharge of other metals in wastewater	4.2.1.2.4; 4.3.2.2; 4.4.2.2
Water use conflicts (plants with once-through cooling systems)	4.2.1.2.4
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.3.3; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.3.3; 4.4.3
Cold shock	4.2.2.1.5; 4.3.3; 4.4.3
Thermal plume barrier to migrating fish	4.2.2.1.6; 4.4.3

Table 4-1. (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Distribution of aquatic organisms	4.2.2.1.6; 4.4.3
Premature emergence of aquatic insects	4.2.2.1.7; 4.4.3
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.3.3; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
Stimulation of nuisance organisms	4.2.2.1.11; 4.4.3
HUMAN HEALTH	
Noise	4.3.7

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Altered current patterns at intake and discharge structures. Based on information in the GEIS, the Commission found that

  > Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS.

- Altered salinity gradients. Based on information in the GEIS, the Commission found that

  > Salinity gradients have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff

concludes that there are no impacts related to these issues beyond those discussed in the GEIS.

- Temperature effects on sediment transport capacity. Based on information in the GEIS, the Commission found that

  > Temperature effects on sediment transport capacity have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS.

- Scouring caused by discharged cooling water. Based on information in the GEIS, the Commission found that

  > Scouring has not been found to be a problem at most operating nuclear power plants and has caused only localized effects at a few plants. It is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, its review of monitoring programs, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of scouring during the renewal term beyond those discussed in the GEIS.

- Eutrophication. Based on information in the GEIS, the Commission found that

  > Eutrophication has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS.

- Discharge of chlorine or other biocides. Based on information in the GEIS, the Commission found that

> Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, its evaluation of other available information, including the National Pollutant Discharge Elimination System (NPDES) permit for Surry Power Station (Permit No. VA0004090; Virginia Department of Environmental Quality [VDEQ] 2001), or consultation with the NPDES compliance office. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS.

- Discharge of sanitary wastes and minor chemical spills. Based on information in the GEIS, the Commission found that

> Effects are readily controlled through NPDES permit and periodic modifications, if needed, and are not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, its evaluation of other available information, including the NPDES permit for Surry Power Station (Permit No. VA0004090; VDEQ 2001) or consultation with the NPDES compliance office. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS.

- Discharge of other metals in wastewater. Based on information in the GEIS, the Commission found that

> These discharges have not been found to be a problem at operating nuclear power plants with cooling-tower-based heat dissipation systems and have been satisfactorily mitigated at other plants. They are not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information, including the NPDES permit for Surry Power Station (Permit No. VA0004090; VDEQ 2001), or consultation with the NPDES compliance office. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS.

- Water-use conflicts (plants with once-through cooling systems). Based on information in the GEIS, the Commission found that

> These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems.

The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS.

- Accumulation of contaminants in sediments or biota. Based on information in the GEIS, the Commission found that

> Accumulation of contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. It is not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of accumulation of contaminants in sediments or biota during the renewal term beyond those discussed in the GEIS.

- Entrainment of phytoplankton and zooplankton. Based on information in the GEIS, the Commission found that

> Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of entrainment of phytoplankton and zooplankton during the renewal term beyond those discussed in the GEIS.

- Cold shock. Based on information in the GEIS, the Commission found that

> Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of cold shock during the renewal term beyond those discussed in the GEIS.

- Thermal plume barrier to migrating fish. Based on information in the GEIS, the Commission found that

  > Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of thermal plumes on migrating fish during the renewal term beyond those discussed in the GEIS.

- Distribution of aquatic organisms. Based on information in the GEIS, the Commission found that

  > Thermal discharge may have localized effects but is not expected to effect the larger geographical distribution of aquatic organisms.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of thermal discharge on aquatic organisms during the renewal term beyond those discussed in the GEIS.

- Premature emergence of aquatic insects. Based on information in the GEIS, the Commission found that

  > Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts concerning premature emergence of aquatic insects during the renewal term beyond those discussed in the GEIS.

- Gas supersaturation (gas bubble disease). Based on information in the GEIS, the Commission found that

  > Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been satisfactorily mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of gas supersaturation during the renewal term beyond those discussed in the GEIS.

- Low dissolved oxygen in the discharge. Based on information in the GEIS, the Commission found that

  > Low dissolved oxygen has been a concern at one nuclear power plant with a once-through cooling system but has been effectively mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

- Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses. Based on information in the GEIS, the Commission found that

  > These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses during the renewal term beyond those discussed in the GEIS.

- Stimulation of nuisance organisms. Based on information in the GEIS, the Commission found that

  > Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts involving the stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

- Noise. Based on information in the GEIS, the Commission found that

  > Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of noise during the renewal term beyond those discussed in the GEIS.

The Category 2 issues related to cooling system operation during the renewal term that are applicable to Surry Units 1 and 2 are listed in Table 4-2 and are discussed below in Sections 4.1.1, 4.1.2, and 4.1.3.

Table 4-2. Category 2 Issues Applicable to the Operation of the Surry Power Station Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING POND HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.3.3	B	4.1.1
Impingement of fish and shellfish	4.2.2.1.3; 4.3.3	B	4.1.2
Heat shock	4.2.2.1.4; 4.3.3	B	4.1.3

4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

For plants with once-through cooling systems, entrainment of fish and shellfish in early life stages into cooling-water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment prior to license renewal. The staff independently reviewed the VEPCo ER (VEPCo 2001b), visited the site, and reviewed the NPDES Permit No. VA0004090, issued by the Virginia Department of Environmental Quality (VDEQ) on November 2, 2001, that expires November 1, 2006 (VDEQ 2001).

In response to requirements set by the Virginia State Water Control Board, VEPCo submitted a Clean Water Act (CWA) Section 316(b) demonstration for Surry Power Station on November 1, 1980 (VEPCo 1980).

Fish egg and larval entrainment studies were conducted by the Virginia Institute of Marine Sciences (VIMS) for VEPCo from April 1975 through December 1978, although the first year was devoted primarily to investigating appropriate sampling gear and standardizing sampling techniques. Studies were designed to assess the species and quantities of ichthyoplankton entrained into the intake cooling-water flow and passed through the power station. Samples were collected at surface, midwater, and bottom depths in the low-level intake forebay, and at mid-channel in the discharge canal.

The tidal James River contains meroplanktonic forms of marine, estuarine, and freshwater fish and shellfish species. Relatively few fish eggs and larvae, however, are found in the vicinity of Surry Power Station. True estuarine species generally spawn in waters with a salinity greater than 5 ppt, while freshwater forms generally spawn in waters less than 0.5 ppt (VEPCo 1977). Salinities in the vicinity of Surry Power Station are usually between these two values, although they can vary from 0 ppt to 17 ppt. Freshwater inflow and tidal action, however, result in the presence of limited numbers of both estuarine and freshwater eggs and larvae in this transition zone. Of those found, numbers and individuals of species are generally at their highest during late summer and early fall. Shellfish, including the American oyster *(Crassostrea virginica)* and hard clam *(Mercenaria mercenaria),* occur primarily in higher saline areas downstream of Surry Power Station. Larval stages of these species may be transported by tidal action to the transition zone in the vicinity of Surry Power Station, but this represents a very limited number of organisms (VEPCo 1977). Freshwater inflow may also contribute limited numbers of the introduced Asiatic clam *(Corbicula* sp.) to the transition zone. The indigenous brackish water clam *(Rangia cuneata)* does spawn in the transition zone, with egg and larval stages tending to cluster within the zone of salinity tolerance, which ranges between 0 and 5 ppt (VEPCo 1977). *R. cuneata* dominate the benthic community in the vicinity of Surry Power Station, indicating that their population is not severely impacted by entrainment of larval forms.

During the 3-year sampling period, a total of 45 ichthyoplankton taxa were sampled, with 38 identified to species. No threatened or endangered species were recorded (VEPCo 1980). The greatest concentrations of both eggs and larvae were recorded at midwater and bottom depths. Egg and larvae of the bay anchovy *(Anchoa mitchilli)* and larvae of the naked goby *(Gobiosoma bosci)* were the most abundant ichthyoplankton in the vicinity of Surry Power Station, comprising 64.5 percent and 26.6 percent respectively, of all samples collected between 1976 and 1978. Both species have centers of abundance downstream of Surry Power Station. Other species collected regularly in entrainment samples include the Atlantic croaker *(Micropogon undulatus)*, spot *(Leiostomus xanthurus),* Atlantic menhaden *(Brevoortia tyrannus),* Atlantic silverside *(Menidia menidia)*, inland silverside *(M. beryllina)*, rough silverside *(Membras marinica),* striped bass *(Morone saxatilis)*, and white perch *(M. americana)*. Generally, ichthyoplankton entrainment by the Surry Power Station cooling-water intake system was determined to be seasonal. Maximum concentrations of eggs were collected between mid-May and late July. Maximum concentrations of larvae were collected between late July and mid-August. Bay anchovy eggs were collected at a mean maximum concentration of 62.6/m^3 (1.8/ft^3) during the 3-year study, while the mean maximum larval concentration was 7/m^3 (0.2/ft^3). The mean maximum naked goby larval concentration during the study period was 25.7/m^3 (0.7/ft^3). Other regularly collected species did not occur in concentrations approaching those of the bay anchovy and naked goby. In general, most other species were captured in concentrations less than 2/m^3 (0.06/ft^3).

To put the entrainment of these species in perspective, it is important to note that most of the species entrained spawn well outside the region associated with the Surry Power Station cooling-water intake system. For example, bay anchovy exhibit peak spawning activity at salinities between 10 and 20 ppt and have little spawning success at salinities less than 5 ppt (Wang and Kernehan 1979). During the primary spawning season at Surry Power Station, salinities were typically well below 10 ppt. This indicates that the major spawning ground of the bay anchovy lies well downstream of Surry Power Station, and the Surry cooling-water intake system should have little effect on the mortality of bay anchovy eggs. The same is true for naked goby spawning areas. Thus, even though eggs and larvae were entrained at Surry Power Station, the ichthyoplankton likely did not originate from the primary spawning areas and represented a very small portion of the James River population as a whole. In addition, the low salinities in the vicinity of the Surry Power Station cooling-water intake may even indicate that many of the eggs entrained were already dead or would soon have died (VEPCo 1980). Overall, based on supplementary data (monthly haul seine, monthly otter trawl, and special haul seine studies) on James River fish populations, any losses due to entrainment have resulted in no detectable effect on juvenile and adult fish populations in the vicinity of Surry Power Station (VEPCo 1980).

The staff has reviewed the available information and, based on the results of entrainment studies and operating history of the Surry Power Station intake, the staff concludes that the

potential impacts of the cooling-water intake system's entrainment of fish and shellfish in the early life stages are SMALL and mitigation is not warranted.

4.1.2 Impingement of Fish and Shellfish

For plants with once-through cooling systems, impingement of fish and shellfish on debris screens of cooling-water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment.

The staff independently reviewed the VEPCo ER (VEPCo 2001b), visited the site, and reviewed NPDES Permit No. VA0004090 (VDEQ 2001).

In 1974, approximately 2 years after Unit 1 came on line, VEPCo upgraded its traveling screen system at Surry to incorporate specially designed Ristroph traveling screens. Each of the eight low-level bays, located at the shoreline (western) end of the dredged intake channel, is equipped with a Ristroph screen that consists of 47 panels. Each panel is 4.5 m by 0.6 m (15 ft by 2 ft) and has a rectangular screen mesh size of 0.5 cm by 1.3 cm (3/16 in. by 1/2 in.) (VEPCo 1980, VEPCo 2002). The Ristroph screens rotate continuously at a speed of 3 m/min (10 ft/min). A low-pressure spray system gently washes fish from the screen into an underwater pipe, through which they are returned to the river. Thus, impinged fish and shellfish are quickly removed and mortality is reduced. All of the original carbon steel trash racks have been replaced with stainless steel units with fiberglass buckets. All eight screen structures are being refurbished to incorporate new fish deflectors and troughs to update the system to the current best technology to minimize adverse environmental impacts (VEPCo 2001b).

Studies regarding potential impacts from operation of the Surry Power Station cooling-water intake system were conducted between 1970 and 1978 as required for submission of the CWA Section 316(b) demonstration that was submitted by VEPCo to the Virginia State Water Control Board in 1980 and approved based on issuance of the Surry Power Station NPDES permit (VDEQ 2001). Studies were conducted by academic and private research organizations, as well as by in-house scientific staff. Research focused on ichthyofauna of the James River in the vicinity of Surry Power Station and included monthly haul seine, monthly otter trawl, special haul seine, impingement, and entrainment programs. Specifically, the impingement program provided almost daily sampling data from May 1974 through December 1978 and characterized the number, biomass, and diversity of the finfishes, principally young-of-the-year, impinged by the Surry cooling-water intake structure. The impingement studies indicated that approximately 94 percent of all finfishes impinged on the Ristroph traveling screens were returned alive to the James River (VEPCo 1980). Only five species displayed survival rates of less than 80 percent, and none of these species occurred with any regularity in the study area (VEPCo 1980). Five species were most commonly impinged and accounted for 70 percent of all fish impinged between 1974 and 1978. These five species included the spot *(Leiostomus xanthurus)*

(21.8 percent of the estimated total fish sampled), Atlantic menhaden *(Brevoortia tyrannus)* (18.7 percent), blueback herring *(Alosa aestivalis)* (11.1 percent), threadfin shad *(Dorosoma petenense)* (11.0 percent), and bay anchovy *(Anchoa mitchilli)* (7.4 percent). An additional 68 species made up the remaining 30 percent of fish sampled. The five major species exhibited a 91.9-percent survival rate, but also accounted for a total of 79.1 percent of all dead fish collected at the low-level intake structure. Some species were obviously hardier than others when subjected to impingement. Delayed mortality was studied (with recovery periods up to 96 hours) and found not to be significant (VEPCo 1980). No threatened or endangered species were collected from the low-level intake structure between 1974 and 1978 (VEPCo 1980).

To assess the impact of impingement mortality by the Surry cooling-water intake system, impingement losses were related to known fish population data and commercial stock data (VEPCo 1980). Specifically, relative losses of three of the five major species (blueback herring, Atlantic menhaden, and spot) were investigated. The other two species are not of commercial value and sufficient data were not available to analyze the impact of their impingement losses. It was estimated that Surry Power Station accounted for a loss of 0.0033 percent of the James River standing crop of blueback herring in 1975, 0.0003 percent of the total Virginia commercial landings of Atlantic menhaden in 1976, and 0.1 percent of total Virginia commercial landings of spot in 1976. While the loss of any fish is undesirable, the loss of these three most numerous species can be considered of minimal significance to the overall James River fishery.

After nearly 5 years of impingement sampling at Surry Power Station, no consistent seasonal and/or annual trend in the number of fish impinged was evident. Natural population fluctuations, as reported in the impingement and other fish-sampling studies, are to be expected and are characteristic of the natural variability inherent in this transitional area and in the occurring species.

VIMS researcher, J. Olney, reported that Army Corps of Engineers data collected during a study at Goose Hill Channel in 2000 were consistent with VIMS data (1996-2000) regarding the distribution and abundance of fish in the vicinity of the Surry Power Station. He did not consider impingement of fishes to be a significant issue at the Surry Power Station (VEPCo 2001b).

Several crab and shrimp species may be found in the vicinity of the Surry Power Station cooling- water intake structure; however, they occur only sporadically in the transition zone, with populations concentrated downstream in more saline waters. Thus, it is unlikely that individuals impinged on the intake screens constitute a significant portion of the population.

The staff has reviewed the available information relative to potential impacts of the cooling-water intake on the impingement of fish and shellfish, and based on these data, concludes that the potential impacts are SMALL and mitigation is not warranted.

4.1.3 Heat Shock

For plants with once-through cooling systems, the effects of heat shock are listed as a Category 2 issue and require plant-specific evaluation.

The staff independently reviewed the VEPCo ER (VEPCo 2001b), visited the site, and reviewed NPDES Permit No. VA0004090 (VDEQ 2001). This permit limits the amount of waste heat discharged to the James River by Surry Power Station to 12.6×10^9 Btu/hr, but does not require reporting of discharge temperatures. The maximum temperature elevation of the water as a result of passing through the condensers is approximately 7.8°C (14°F) (VEPCo 1980). Upon discharge, the heated water mixes with river water in a 335-m (1100-ft) discharge canal lined with concrete and surrounded by a rock-filled groin with a reduced-size exit that guarantees the water will be discharged with a jetting action of 1.8 m/s (5.9 ft/s) at the end of the rock groin. The CWA Section 316(a) report produced by VEPCo in 1977 stated the highest temperature recorded in the Surry Power Station discharge canal was 37.7°C (99.9°F). Temperatures between 33.8° and 37.7°C (92.8° and 99.9°F) are considered typical of those observed in the discharge canal in summer (June through September) when Surry Power Station is running at or near full power. Outside the discharge canal, however, the effluent loses approximately 0.5° to 1.0°C (1° to 2°F) every 305 m (1000 ft) away from the mouth of the discharge canal, with thermal plume patterns dependent on the current flow regime of the estuary, and the associated water densities and temperature, wind velocity, ambient air temperature, and relative humidity.

VEPCo submitted a CWA Section 316(a) demonstration for Surry Power Station to the Virginia State Water Control Board on September 1, 1977 (VEPCo 1977). Part I.C.16 of the current Surry Power Station NPDES (VDEQ 2001) permit refers to this submittal, indicating effluent limitations that are "more stringent than the thermal limitations included in the permit are not necessary to assure the protection and propagation of a balanced indigenous community of shellfish, fish, and wildlife in the James River."

The site layout for Surry Power Station is different from that of other nuclear plants with once-through cooling systems. At Surry Power Station, the heated water effluent is discharged approximately 10 km (6 mi) upstream of the cooling-water intake structure. This design was implemented to protect oyster beds, located downstream from the current intake structure and in more saline water, from being affected by the thermal plume.

Surry Power Station began preoperational field studies in 1969 to examine fish populations, benthic communities, fouling organisms, zooplankton, and phytoplankton. The studies continued through several years of station operation (startup in 1972), with sample frequency ranging from daily to annually, based on the trophic level investigated. The studies were designed to indicate if the thermal effluent from Surry Power Station caused appreciable harm

to the fish, shellfish, and wildlife in the James River. Fish were sampled using beach seines and otter trawls on a monthly basis during preoperational monitoring. Postoperative studies also sampled fish at the low-level cooling-water intake screens, usually 5 days per week between 1972 and 1976. Benthic macroinvertebrates, including shellfish, were sampled using a Van Veen grab.

In addition, a comprehensive, 5-year study (2 years preoperational and 3 years operational) was conducted by VIMS to document the thermal effects of Surry Power Station (Fang and Parker 1976). Temperature distribution in the James River in the vicinity of Surry Power Station was measured with stationary recorders affixed to towers or buoys in the river and by a monthly boat survey that measured water temperatures just downstream of the intake to the vicinity of Jamestown Island, located upstream of the discharge. The results indicated that the thermal plume stays close to shore and extends around Hog Point on an ebb tide, and moves upstream and offshore on flood tide (Fang and Parker 1976). Excess temperatures always covered less than 30 percent of the river surface in the survey area adjacent to the discharge point. All excess temperatures (defined as 2.8°C [5°F] or more above ambient) decreased rapidly with increased distance from the outfall, and temperatures outside the mixing zone (914 m [3000 ft] from the outfall) were rarely greater than this limit (Fang and Parker 1976).

The fisheries research conducted by VIMS concluded that the fish community around Surry Power Station is diverse and dynamic, changing monthly and seasonally between species and sizes of individuals within species (VEPCo 1977). A nonparametric comparison between preoperational and postoperational diversity indices showed either no significant difference in the means or that preoperational means were significantly ($p < 0.05$) less than postoperational means. Over an extended period of time, natural and man-made disturbances resulted in relatively short-term changes to fish populations in the transition zone around Surry Power Station, and the young fish population has remained relatively diverse and stable. Thus, it was concluded that the operation of Surry Power Station, in particular the discharge of heated effluent, caused no appreciable harm to the fish community in the area.

Based on the results of post-operational studies, the noncommercial clam *(Rangia cuneata)* was found in abundance in the James River near Surry Power Station. The American oyster *(Crassostrea virginica)* was found downstream of the site in more saline waters, and the blue crab *(Callinectes sapidus)* occurred only sporadically in the vicinity of the site. Consequently, these species were not significantly affected by thermal discharges resulting from operation of Surry Units 1 and 2. Studies by VIMS (Jordan et al. 1976, 1977) concluded that *R. cuneata* showed no preference or avoidance of the cooling water discharge region, but instead revealed a preference for silty-clay substrates (VEPCo 1977).

The staff concludes that the potential heat shock impacts resulting from operation of the plant's cooling-water discharge system to the aquatic environment on or in the vicinity of the site are SMALL and that mitigation is not warranted.

4.2 Transmission Lines

VEPCo's ER (VEPCo 2001b) discussed nine transmission lines with a total length of 480 km (300 mi) that connect Surry Power Station to eight substations within the local transmission system. These lines are located on 270 km (170 mi) of corridor on approximately 1900 ha (5000 ac). Transmission corridor rights-of-way are generally maintained on a 3-year cycle. Mechanical mowing and selective herbicide application are the standard methods of corridor maintenance. Hand-cutting and/or nonrestricted-use herbicides are used in areas where mowing is impractical or undesirable (e.g., wetlands and densely vegetated areas). However, herbicides are not used in corridors crossing the Great Dismal Swamp National Wildlife Refuge or the Ragged Island Wildlife Management Area. VEPCo cooperates with the Virginia Department of Conservation and Recreation's Natural Heritage Program to identify rare and sensitive plant species along the transmission corridors so that adverse impacts to these may be avoided during corridor maintenance (VEPCo 2001b).

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to the Surry transmission lines are listed in Table 4-3. VEPCo stated in its ER that it is not aware of any new and significant information associated with the renewal of the Surry Units 1 and 2 OLs. The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Power line right-of-way management (cutting and herbicide application). Based on information in the GEIS, the Commission found that

  > The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, discussions with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS), or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of power line right-of-way management during the renewal term beyond those discussed in the GEIS.

Table 4-3. Category 1 Issues Applicable to the Surry Power Station Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
TERRESTRIAL RESOURCES	
Power line right-of-way management (cutting and herbicide application)	4.5.6.1
Bird collisions with power lines	4.5.6.2
Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	4.5.6.3
Flood plains and wetland on power line right-of-way	4.5.7
AIR QUALITY	
Air-quality effects of transmission lines	4.5.2
LAND USE	
Onsite land use	4.5.3
Power line right-of-way	4.5.3

- Bird collisions with power lines. Based on information in the GEIS, the Commission found that

  > Impacts are expected to be of small significance at all sites.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of bird collisions with power lines during the renewal term beyond those discussed in the GEIS.

- Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock). Based on information in the GEIS, the Commission found that

  > No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of

electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

- Flood plains and wetlands on power line right-of-way. Based on information in the GEIS, the Commission found that

  > Periodic vegetation control is necessary in forested wetlands underneath power lines and can be achieved with minimal damage to the wetland. No significant impact is expected at any nuclear power plant during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, discussions with FWS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on flood plains and wetland on the power line right-of-way during the renewal term beyond those discussed in the GEIS.

- Air-quality effects of transmission lines. Based on the information in the GEIS, the Commission found that

  > Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no air-quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

- Onsite land use. Based on the information in the GEIS, the Commission found that

  > Projected onsite land use changes required during ... the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no onsite land-use impacts during the renewal term beyond those discussed in the GEIS.

- Power line right-of-way (land use). Based on information in the GEIS, the Commission found that

Ongoing use of power line right of ways would continue with no change in restrictions. The effects of these restrictions are of small significance.

The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of restriction on use of power line rights-of-way during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to transmission lines, and another issue related to transmission lines is being treated as a Category 2 issue. These issues are listed in Table 4-4 and are discussed in Sections 4.2.1 and 4.2.2.

Table 4-4. Category 2 and Uncategorized Issues Applicable to the Surry Power Station Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
HUMAN HEALTH			
Electromagnetic fields, acute effects (electric shock)	4.5.4.1	H	4.2.1
Electromagnetic fields, chronic effects	4.5.4.2	NA	4.2.2

4.2.1 Electromagnetic Fields—Acute Effects

In the GEIS (NRC 1996), the staff found that without a review of the conformance of each nuclear plant transmission line with National Electrical Safety Code (NESC 1997) criteria, it is not possible to determine the significance of the electric shock potential. Evaluation of individual plant transmission lines is necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed, or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), an applicant must provide an assessment of the potential shock hazard if the transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

There are nine transmission lines that were built to connect Surry Power Station to the transmission system. Six of these lines are 230-kV transmission lines, and the remaining three lines are 500-kV transmission lines. The current NESC (1997) requires that transmission lines be designed to limit the steady-state current due to electrostatic effects to 5 mA root mean square (rms). At the time they were constructed, the lines were designed in accordance with

the 6th edition of the National Electric Safety Code (NESC 1961). Therefore, to check compliance with NESC 1997, VEPCo calculated the field strength and induced current for the limiting case for each transmission line. Finding the limiting case involved consideration of rights-of-way, number of lines at each location, and ground clearance.

For each line, VEPCo calculated the field strength and induced current for the limiting case using a computer code called ENG01814, developed by Cincinnati Gas and Electric Company (1991). For five of the transmission lines, the limiting-case induced currents listed in the ER (VEPCo 2001b) were within the 5-mA rms limit of the current NESC. The calculated induced currents for the remaining four lines reported in the ER were 5.07 mA. All of these calculations were made assuming voltages 5 percent above the nominal value. When the nominal voltages are assumed, all limiting-case induced currents are within the 5-mA rms limit of the current NESC.

The staff notes that the industry standard setting for ground-fault circuit interrupters is 6 mA and that the uncertainty in the calculated currents is larger than the amount by which the limiting-case induced currents exceed the NESC limits. Therefore, the staff concludes that the impact of the potential for electric shock is SMALL, and mitigation is not warranted.

4.2.2 Electromagnetic Fields—Chronic Effects

In the GEIS, the chronic effects of 60-Hz electromagnetic fields from power lines were not designated as Category 1 or 2, and will not be until a scientific consensus is reached on the health implications of these fields.

The potential for chronic effects from these fields continues to be studied and is not known at this time. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the U.S. Department of Energy (DOE). A recent report (NIEHS 1999) contains the following conclusion:

> The NIEHS concludes that ELF-EMF [extremely low frequency electromagnetic field] exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

This statement is not sufficient to cause the staff to change its position with respect to the chronic effects of electromagnetic fields. The staff considers the GEIS finding of "not applicable" still appropriate and will continue to follow developments on this issue.

4.3 Radiological Impacts of Normal Operations

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to Surry Units 1 and 2 with regard to radiological impacts are listed in Table 4-5. VEPCo stated in its ER (VEPCo 2001b) that it is not aware of any new and significant information associated with the renewal of the Surry OLs. No significant new information has been identified by the staff during its independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-5. Category 1 Issues Applicable to Radiological Impacts of Normal Operations During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
HUMAN HEALTH	
Radiation exposures to public (license renewal term)	4.6.2
Occupational radiation exposures (license renewal term)	4.6.3

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Radiation exposures to public (license renewal term). Based on information in the GEIS, the Commission found that

  > Radiation doses to the public will continue at current levels associated with normal operations.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

- Occupational radiation exposures (license renewal term). Based on information in the GEIS, the Commission found that

  > Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages, and would be well below regulatory limits.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to radiological impacts of routine operations.

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Term

Category 1 socioeconomic issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 during the renewal term are listed in Table 4-6. These do not require further analysis of impacts unless significant new information is developed about them. VEPCo stated in its ER (VEPCo 2001b) that it is not aware of any new and significant information associated with the renewal of Surry Units 1 and 2. The staff in their independent review has identified no significant new information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-6. Category 1 Socioeconomic Issues Applicable to the Operation of the Surry Power Station During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
Public services, public safety, social services, and tourism and recreation	4.7.3; 4.7.3.3; 4.7.3.4; 4.7.3.6
Public services, education (license renewal term)	4.7.3.1
Aesthetic impacts (license renewal term)	4.7.6
Aesthetic impacts of transmission lines (license renewal term)	4.5.8

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Public services-public safety, social services, and tourism and recreation. Based on information in the GEIS, the Commission found that

  > Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on public safety, social services, and tourism and recreation during the renewal term beyond those discussed in the GEIS.

- Public services-education (license renewal term). Based on information in the GEIS, the Commission found that

  > Only impacts of small significance are expected.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on education during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts (license renewal term). Based on information in the GEIS, the Commission found that

  > No significant impacts are expected during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts of transmission lines (license renewal term). Based on information in the GEIS, the Commission found that

  > No significant impacts are expected during the license renewal term.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of

other available information. Therefore, the staff concludes that there are no aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4-7 lists the Category 2 socioeconomic issues, which require an analysis of potential plant-specific impacts and an analysis of environmental justice, which was not addressed in the GEIS.

Table 4-7. Environmental Justice and Category 2 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
Housing impacts	4.7.1	I	4.4.1
Public service, public utilities	4.7.3.5	I	4.4.2
Offsite land use (license renewal term)	4.7.4	I	4.4.3
Public services, transportation	4.7.3.2	J	4.4.4
Historic and archaeological resources	4.7.7	K	4.4.5
Environmental justice	Not addressed	Not applicable	4.4.6

4.4.1 Housing Impacts During Operations

10 CFR Part 51, Subpart A, Appendix B, Table B-1, states that impacts on housing availability are expected to be of small significance at plants located in a high-population area where growth-control measures are not in effect. SMALL impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion is required to meet new demand (NRC 1996). Increases in rental rates or housing values in these areas would be expected to equal or slightly exceed the statewide inflation rate. No extraordinary construction or conversion of housing would occur where SMALL impacts are foreseen.

The impacts on housing are considered to be of MODERATE significance when there is a discernible, but short-lived, reduction in available housing units because of project-induced in-migration. The impacts on housing are considered to be of LARGE significance when project-related demand for housing units would result in very limited housing availability and would increase rental rates and housing values well above normal inflationary increases in the state. MODERATE and LARGE impacts are possible at sites located in rural and remote areas, at sites located in areas that have experienced extremely slow population growth (and thus slow

or no growth in housing), or where growth control measures that limit housing development are in existence or have been recently lifted. Because impact significance depends on local conditions, housing is a Category 2 issue (NRC 1996).

The NRC has developed a method of characterizing population that is based on two factors: sparseness and proximity (NRC 1996, Section C.1.4). Sparseness measures population density and city size within 32 km (20 mi) of the site. Proximity measures population density and city size within 80 km (50 mi) of the site. In these calculations, the density is averaged over the land area covered by the ring; large water bodies are excluded. Each factor has categories of density and size (NRC 1996, Table C.1), and a matrix is used to rank the population category as low, medium, or high (NRC 1996, Figure C.1).

When the ER was prepared by VEPCo, the 2000 census data were not yet published, so 1990 data was used to determine demographic characteristics in the vicinity of Surry Power Station. The Census 2000 PL-94 and SF-1 general population characteristics data have become available since publication of the ER, and the staff has used these data in its analysis. Income data are still not available for the 2000 census, so 1990 census data were used.

An analysis of the 2000 census data[(a)] indicates that 416,284 people live within a 32-km (20-mi) radius of Surry Power Station, with an average population density of 171 persons per km^2 (442 persons per mi^2). There are also two communities of 25,000 or more in this area. This population density and number of cities corresponds to sparseness Category 4, "least sparse." An analysis of the 2000 census data also indicates that 2,183,481 people live within 80 km (50 mi) of Surry Power Station, with an average population density of 143 persons per km^2 (371 persons per mi^2). There are six cities with populations of 100,000 or more in this area. This population density and number of cities correspond to proximity Category 4, "in close proximity." According to the GEIS (NRC 1996), these sparseness and proximity scores indicate that the Surry Power Station is located in a high-population area. In addition, neither Surry County nor the surrounding counties (Isle of Wight and James City) nor the city of Newport News are subject to growth-control measures that would limit housing development. Based on these factors, the NRC staff would expect the housing impacts to be SMALL during continued operation.

VEPCo (VEPCo 2001b) has made the case for considering only 60 new employees total for both Surry Units 1 and 2 for the license renewal term, rather than the standard GEIS

(a) Using geographic information systems software to identify Block Groups from Census 2000 that are within a radius of 32 km (20 mi) and 80 km (50 mi) of Surry Power Station and dividing the total population in these Block Groups by the land area (major water bodies excluded) in them.

assumption of 60 new employees per unit.[a] Adding full-time employees to the plant workforce for the license renewal operating term would have the potential indirect effect of creating additional jobs and related population growth in the community. VEPCo has used an employment multiplier of 1.9 (VEPCo 2001b) to calculate the total direct and indirect jobs in service industries that would be supported by the spending of the Surry Power Station workforce. The addition of 60 license- renewal employees would generate approximately 54 indirect jobs, assumed for purposes of this analysis to be distributed in the potentially impacted communities of Isle of Wight, James City, and Surry Counties and the City of Newport News. This number was calculated as follows:

60 (additional employees) × 1.9 (regional multiplier) = 114 (total employees). Of these, 60 would be direct employees and 54 would be indirect (VEPCo 2001b). This multiplier was confirmed by the staff as appropriate for the Surry County area.[b]

Surry County has a higher housing unit vacancy rate in every category than surrounding counties, as reported by Census 2000 (USCB 2000), indicating that a modest increase in employment would not negatively impact housing in the area. The assumed population increase associated with license renewal will not create a discernible change in housing availability, change in rental rates or housing values, or spur new construction or conversion. VEPCo concluded that impacts to housing availability resulting from plant-related population growth would be small and would not warrant mitigation (VEPCo 2001b).

The staff reviewed the available information relative to housing impacts and VEPCo's conclusions. Based on this review, the staff concludes that the impact on housing during the license renewal period would be SMALL, and mitigation is not warranted.

(a) VEPCo expects the existing “surge” capabilities for routine activities, such as outages, will enable VEPCo to perform the increased surveillance, (online) monitoring, inspections, testing, trending, and recordkeeping (SMITTR) workload without adding Surry Power Station staff. For the purpose of performing its own analyses in this environmental report, VEPCo is adopting the GEIS approach with one alteration. Plant modifications during license renewal would be SMITTR activities that would be performed mostly during outages, and VEPCo would generally stagger Surry Power Station outage schedules so that both units would not be down at the same time. No plant facility modifications are anticipated. Therefore, VEPCo believes it is unreasonable to assume that each unit would need an additional 60 workers. Instead, VEPCo is assuming that Surry Power Station would require no more than a total of 60 additional permanent workers to perform all license renewal SMITTR activities.

(b) Personal communication with John W. Whaley, Deputy Executive Director—Economics, Hampton Roads Planning District Commission staff, December 2001.

4.4.2 Public Services: Public Utility Impacts During Operations

Impacts on public utility services are considered SMALL if there is little or no change in the ability of the system to respond to the level of demand, and, thus, there is no need to add capital facilities. Impacts are considered MODERATE if overtaxing of service capabilities occurs during periods of peak demand. Impacts are considered LARGE if existing levels of service (e.g., water or sewer services) are substantially degraded and additional capacity is needed to meet ongoing demands for services. The GEIS indicates that, in the absence of new and significant information to the contrary, the only impacts on public utilities that could be significant are impacts on public water supplies (NRC 1996).

Analysis of impacts on the public water supply system considered both plant demand and plant-related population growth. Section 2.2.2 describes the Surry Units 1 and 2 permitted withdrawal rate and actual use of water. Because the Surry Power Station does not use water from a municipal system, VEPCo does not expect it to have an effect on local water supplies. No refurbishment is planned for the Surry Power Station and no refurbishment impacts are, therefore, expected.

VEPCo estimated (VEPCo 2001b) that a potential total increase of 60 license renewal employees could generate 114 new jobs[(a)], and a net overall population increase of 307 as a result of these jobs.[(b)] Using Census 2000 data for persons per household in the counties and independent cities in which Surry Power Station employees live and developing Surry Power Station composite persons per household using the percent of Surry Power Station employees in each jurisdiction, the actual persons per household is 2.58 (rounded to 2.6). The 114 potential new jobs could then mean a total of 296 (rounded to 300) new residents. The plant-related population increase would require an additional 95,000 liters per day (25,000 gpd) of potable water[(c)]. If it were assumed that this increase is distributed across the area of impact and other communities in which Surry Power Station employees live in proportion to current employee trends, the increase in water demand would represent an insignificant percentage of capacity for the water supply systems in these communities (see Section 2.2.8.2). As a result, VEPCo concludes that impacts resulting from plant-related population growth to public water supplies would be SMALL and mitigation measures would not be necessary (VEPCo 2001b).

(a) The VEPCo estimate of 114 housing units is likely to be an “upper bound” estimate. Most of the new jobs would likely be filled by existing area residents, thus creating little net demand for housing.

(b) Calculated assuming that the average number of persons per household is 2.69 (114 jobs × 2.69 = 307).

(c) Calculated assuming the average American uses 80 gallons of water for personal use per day; 307 people × 80 gallons per person/day = 24,560 gpd, or approximately 25,000 gpd.

The staff reviewed the available information relative to public utility impacts and VEPCo's conclusions. Based on this review, the staff concludes that the impact on public utilities during the license renewal period would be SMALL and mitigation is not warranted.

4.4.3 Offsite Land Use During Operations

Offsite land use during the license renewal term is a Category 2 issue (10 CFR 51, Subpart A, Appendix B, Table B-1). Table B-1 of 10 CFR 51 Subpart A, Appendix B, notes that "significant changes in land use may be associated with population and tax revenue changes resulting from license renewal."

Sections 3.7.5 and 4.7.4 of the GEIS define the magnitude of land-use changes as a result of plant operation during the license renewal term as follows:

SMALL – Little new development and minimal changes to an area's land-use pattern.

MODERATE – Considerable new development and some changes to the land-use pattern.

LARGE – Large-scale new development and major changes in the land-use pattern.

Land use and population in the Surry Power Station area of impact (Surry, Isle of Wight, and James City Counties, and the city of Newport News), particularly the areas south of the James River, have not been affected by the Surry Power Station since its installation in 1972. Since the early 1970s, when the Surry Power Station was placed on line, the city of Newport News and James City County, north of the James River, and Isle of Wight County, south of the James River and immediately east of Surry County, have shown positive growth, though at varying rates that more dramatically mirror the Commonwealth of Virginia's growth. Surry, Sussex, South Hampton, and Charles City Counties have shown more inconsistent, even negative growth during this 50-year period. Prince George County has also had both positive and negative growth and is probably influenced more by the development of Petersburg/Colonial Heights/Hopewell than any other influence. Surry Power Station has had no discernable influence on population or population-driven land-use effects in the area.

NRC concludes that all new population-driven land-use changes during the license renewal term at all nuclear plants would be small because population growth caused by license renewal would represent a much smaller percentage of the local area's total population than has operations-related growth (NRC 1996).

Tax revenue can affect land use because it enables local jurisdictions to be able to provide the public services (e.g., transportation and utilities) necessary to support development. Section 4.7.4.1 of the GEIS (NRC 1996) states that the assessment of tax-driven land-use

impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues; (2) the nature of the community's existing land-use pattern; and (3) the extent to which the community already has public services in place to support and guide development.

In general, if the plant's tax payments are projected to be small relative to the community's total revenue, new, tax-driven land-use changes during the license renewal period would be SMALL. If the plant's tax payments are projected to be medium to large relative to the community's total revenue, new tax-driven land-use changes would be MODERATE. If the tax payments are projected to be a dominant source of the community's total revenue, new, tax-driven land-use changes would be LARGE (NRC 1996).

Sections 3.7.3 and 4.7.2.1 of the GEIS (NRC 1996) state that if tax payments by the plant owner are less than 10 percent of the taxing jurisdictions revenue, the significance level would be SMALL, MODERATE if the plant tax payments represent 10 to 20 percent, and LARGE if the payments are over 20 percent of the jurisdiction's revenues.

For the 6-year period from 1995 through 2001, VEPCo's tax payments to Surry County represented nearly 75 percent of the County's annual property tax revenue and approximately 50 percent of Surry County's total annual operating budget. VEPCo does not anticipate refurbishment or construction during the license renewal period, and, therefore, does not anticipate any increase in the assessed value of Surry Power Station due to refurbishment related improvements or any related tax-increase-driven changes to offsite land-use and development patterns.

Surry Power Station has been, and will probably continue to be, the dominant source of tax revenue for Surry County. However, despite having this income source since plant construction in 1972, Surry County has not experienced large land-use changes. The Surry Power Station environs have remained largely rural, county population growth rates after Surry Power Station construction have been minimal, and county planners are not projecting large changes. Consequently, VEPCo does not anticipate large land-use changes as a result of these tax revenues (VEPCo 2001b).

The staff reviewed the available information relative to land-use impacts and VEPCo's conclusions. Based on this review, the staff concludes that the impact on land use during the license renewal period would be SMALL, and mitigation is not warranted.

4.4.4 Public Services: Transportation Impacts During Operations

On October 4, 1999, 10 CFR 51.53(c)(3)(ii)(J) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1, were revised to clearly state that "Public Services: Transportation Impacts During

Operations" is a Category 2 issue (see NRC 1999 for more discussion of this clarification). The issue is treated as such in this SEIS.

Access to Surry Power Station is via State Route 650 and State Route 10. The level of service of State Route 650 is characterized as free flow of traffic stream and users are unaffected by the presence of others. At this level, no delays occur and no improvements are needed. A portion of State Route 10 is characterized as having stable flow that marks the beginning of the range of flow in which the operation of individual users is significantly affected by interactions with the traffic stream.

VEPCo projected that up to 60 additional employees might be associated with license renewal for Surry Power Station. This would represent less than a 7 percent increase in the current number of employees. Although the GEIS (NRC 1996) states that a Level of Service C is associated with moderate impacts and upgrades of the roadway or control system may be required, the Virginia Department of Transportation (VDOT) considers that the addition of 60 additional cars daily on State Highways 650 and 10 would not affect the roads' level of service or their operational condition. Consequently, no improvements are needed. In fact, VDOT is initiating a $1.3 million dollar project to widen the lanes and install a left-turn lane at the junction of Highways 10 and 650. In addition, one to two times a year, as many as 700 additional workers join the permanent workforce during periodic refueling. During these times, the meat-packing plants in Smithfield (Isle of Wight County) direct their truck drivers to avoid Highway 10.[(a)]

The staff reviewed VEPCo's assumptions and resulting conclusions. The staff concludes that any impact of Surry Power Station on transportation service degradation is likely to be SMALL and would not require mitigation.

4.4.5 Historic and Archaeological Resources

The National Historic Preservation Act (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties. The historic preservation review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation at 36 CFR Part 800 as amended through 1999. Renewal of an OL could potentially affect historic properties that may be located at the site. Therefore, according to the NHPA, the NRC is required to make a reasonable effort to identify historic properties in the areas of potential effects. If no historic properties are present or affected, the NRC is required to notify the State Historic Preservation Officer (SHPO) before proceeding. If it is determined that historic properties are present, the NRC is required to assess possible adverse

(a) Personal communication with Bill Richardson, Mike Tardy, Ron Pierce, and MacFarland Neiblett, VDOT, September 2001.

effects of the undertaking and consider alternatives to avoid, minimize, or mitigate any adverse effects.

In April 2000, VEPCo wrote to the SHPO with the Virginia Department of Historic Resources (VDHR), requesting their comment on the license renewal process on cultural resources for both the Surry and North Anna Power Stations (VEPCo 2000). Meetings by VEPCo which directly involved VDHR were held during the period of November 2000 through February 2001. On January 11, 2001, VEPCo sent copies of the draft ER to VDHR for review and comment (VEPCo 2001a).

In response, VDHR sent a letter in February 2001 to VEPCo (VDHR 2001). This response letter indicated "there are no recorded historic districts, structures or archaeological sites located within the footprint of either facility." However, the letter also raised several issues of concern to VDHR specific to the Surry Power Station. These issues included a request for more direct involvement by the NRC in the Section 106 consultation process, a request for a more detailed definition of the Area of Potential Effect covered by the license renewal application, the suggestion that a further archaeological survey of the station grounds may be warranted, and the suggestion that a Programmatic Agreement by the NRC would be necessary pursuant to Section 106.

Based on this letter from VDHR, VEPCo authorized a professional cultural resource assessment of Surry Power Station (Louis Berger Group, Inc. 2001). VDHR was invited and accepted an invitation by NRC to join in a tour of Surry Power Station on September 19, 2001. On September 21, 2001, NRC representatives met with Dr. Ethel Eaton, Project Review Team Leader for VDHR, to discuss the concerns of VDHR. On January 3, 2002, NRC sent a formal response letter to VDHR addressing their concerns (NRC 2002a). The staff concluded that while there is a moderate to high potential for intact significant historic and archaeological resources to be present in the undeveloped portions of Surry Power Station, it is unlikely that such resources still exist in the developed portions of Surry Power Station.

In Section 3.2 of the VEPCo ER (VEPCo 2001b), the licensee stated that major refurbishment of Surry Power Station is not required during the license renewal period and that it is anticipated there will be no need to utilize the currently undeveloped portions of Surry Power Station for operations during the renewal period. Continued operation of Surry Power Station would have a beneficial effect on any potential unknown or undiscovered historic or archaeological resources in undisturbed areas for the duration of the license renewal period by protecting the natural landscape and vegetation and by providing restricted access to the plant.

However, care should be taken by the licensee while undertaking normal operational and maintenance activities to ensure that historic properties are not inadvertently impacted. These activities may include not only operation of the plant itself, but also land-management-related actions such as recreation, wildlife habitat enhancement, or maintaining/upgrading plant access

roads through the plant site. The environmental impacts on historic and archaeological resources of activities undertaken by VEPCo are managed through a Station Administrative Procedure on notifications and reports and through several General Maintenance Procedures (GMP).[a] In addition, pre-job briefings include specific discussion of actions that the workers should take if they inadvertently discover historic or archaeological resources.

Based on the staff's cultural resources analysis and VEPCo's conclusion that major refurbishment activities are not needed to support the renewal of Surry Units 1 and 2 OLs and that operation will continue within the bounds of plant operations as evaluated in the Final Environmental Statements (AEC 1972a, 1972b), the staff concludes that the potential impacts on historic and archaeological resources are expected to be SMALL, and mitigation is not warranted. The staff also concludes that it is unnecessary at this time to enter into a cultural resources programmatic agreement to protect cultural resources (NRC 2002a).

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy requiring that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its actions on minority[b] or low-income populations. The memorandum accompanying Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act of 1969 (NEPA). The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice issues (CEQ 1997). Although the Executive Order is not mandatory for independent agencies, the NRC has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in the NRC Office of Nuclear Reactor Regulation Office Instruction LIC-203, "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues" (NRC 2001).

For the purpose of the staff's review, a minority population is defined to exist if the percentage of each minority or aggregated minority category within the census block groups[c] potentially

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(a) Three GMP, covering roadway maintenance, excavation, and grading, specifically state that "IF there is inadvertent discovery of archaeological, historic, or other cultural resource, THEN STOP work and notify Environmental Compliance Coordinator or designee."

(b) The NRC guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native; Asian; Native Hawaiian or other Pacific Islander; or Black races; or Hispanic ethnicity. "Other" races and multi-racial individuals may be considered as separate minority categories. (NRC 2001).

(c) A census block group is a combination of census blocks, which are statistical subdivisions of a census tract. A census block is the smallest geographic entity for which the Census Bureau collects and tabulates decennial census information. A census tract is a small, relatively permanent statistical subdivision of counties delineated by local committees of census data

affected by the license renewal of Surry Units 1 and 2 exceeds the corresponding percentage of minorities in a comparison area by 20 percentage points, or if the corresponding percentage of minorities within the census block group is at least 50 percent. By convention, the comparison area is the State. A low-income population is defined to exist if the percentage of low-income population within a census block group exceeds the corresponding percentage of low-income population in the comparison area by 20 percentage points, or if the corresponding percentage of low-income population within a census block group is at least 50 percent.

Figure 4-1 shows the distribution of minority populations (shaded areas) within the 80-km (50-mi) radius based on Census 2000 data at the census block group level. Figure 4-2 shows the distribution of low-income populations by Census 1990 block groups within the 80-km (50-mi) radius of Surry Power Station.[(a)]

With the locations of minority and low-income populations identified, the staff proceeded to evaluate whether any of the environmental impacts of the proposed action could affect these populations in a disproportionately high and adverse manner. Based on staff guidance (NRC 2001), air, land, and water resources within about 80 km (50 mi) of the Surry Power Station site were examined. Within that area, potential environmental impacts that could affect human populations were evaluated. All of these were considered SMALL for the general population.

The pathways through which the environmental impacts associated with Surry Units 1 and 2 license renewal can affect human populations are discussed in each associated section (e.g., Section 4.4.3 for offsite land use). The staff evaluated whether minority and low-income populations could be disproportionately affected by these impacts.

The staff found no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing, through which the minority and low-income populations could experience disproportionately high and adverse impacts. In addition, the staff did not identify any location-dependent disproportionately high and adverse impacts affecting these minority and low-income populations. The staff concludes that offsite impacts from Surry Units 1 and 2 to minority and low-income populations would be SMALL, and no special mitigation actions are warranted.

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users in accordance with Census Bureau guidelines for the purpose of collecting and presenting decennial census data. Census block groups are subsets of census tracts.

(a) Census 2000 general demographic data, including ethnicity, were used to produce Figure 4-1. However, at the time this SEIS was prepared, income data for the 2000 data were not yet available; so 1990 data were used to produce Figure 4-2.

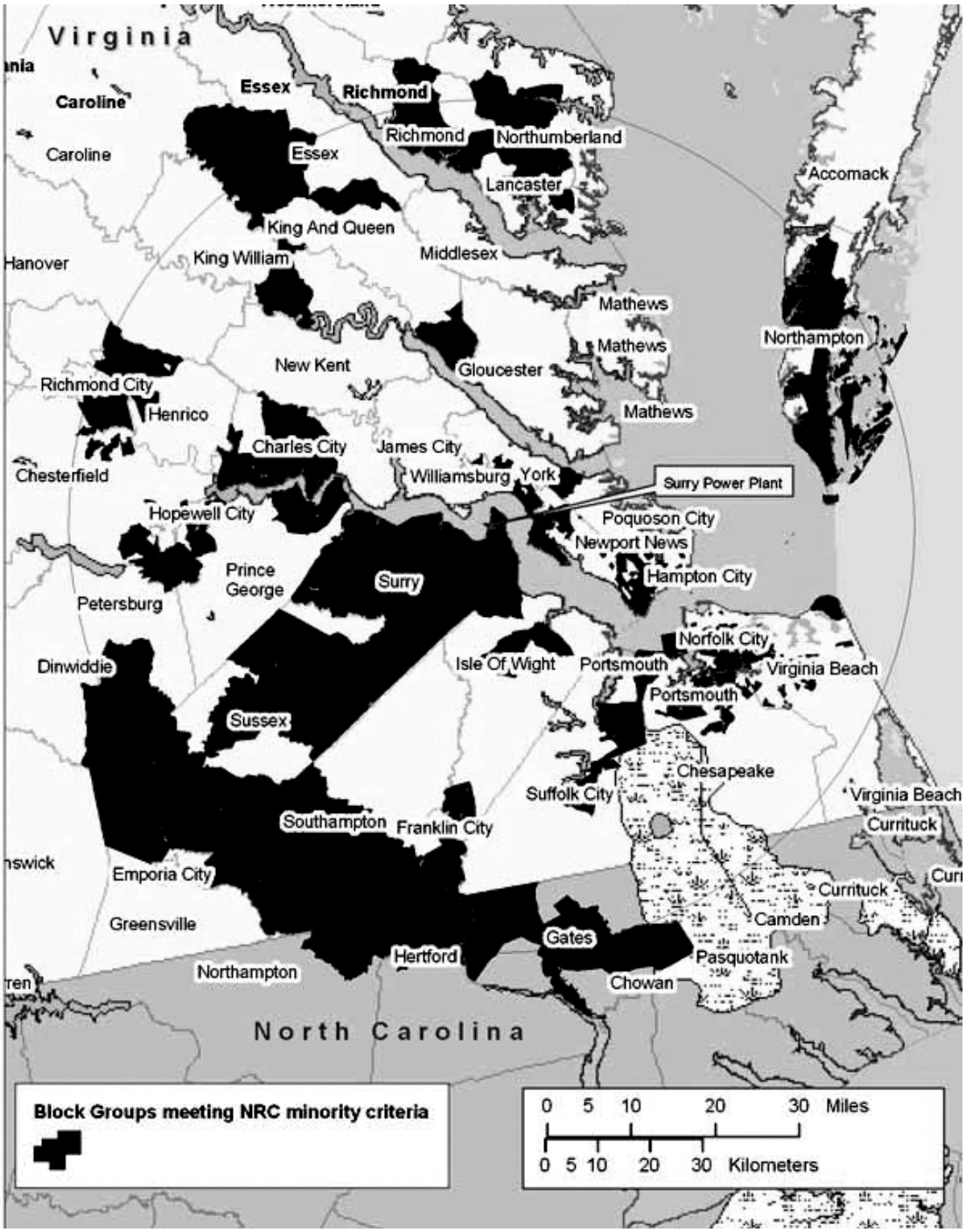

Figure 4-1. Census 2000 Block Groups Identified as Meeting NRC Criteria for Minority Status in an 80-km (50-mi) Area Around Surry Power Station

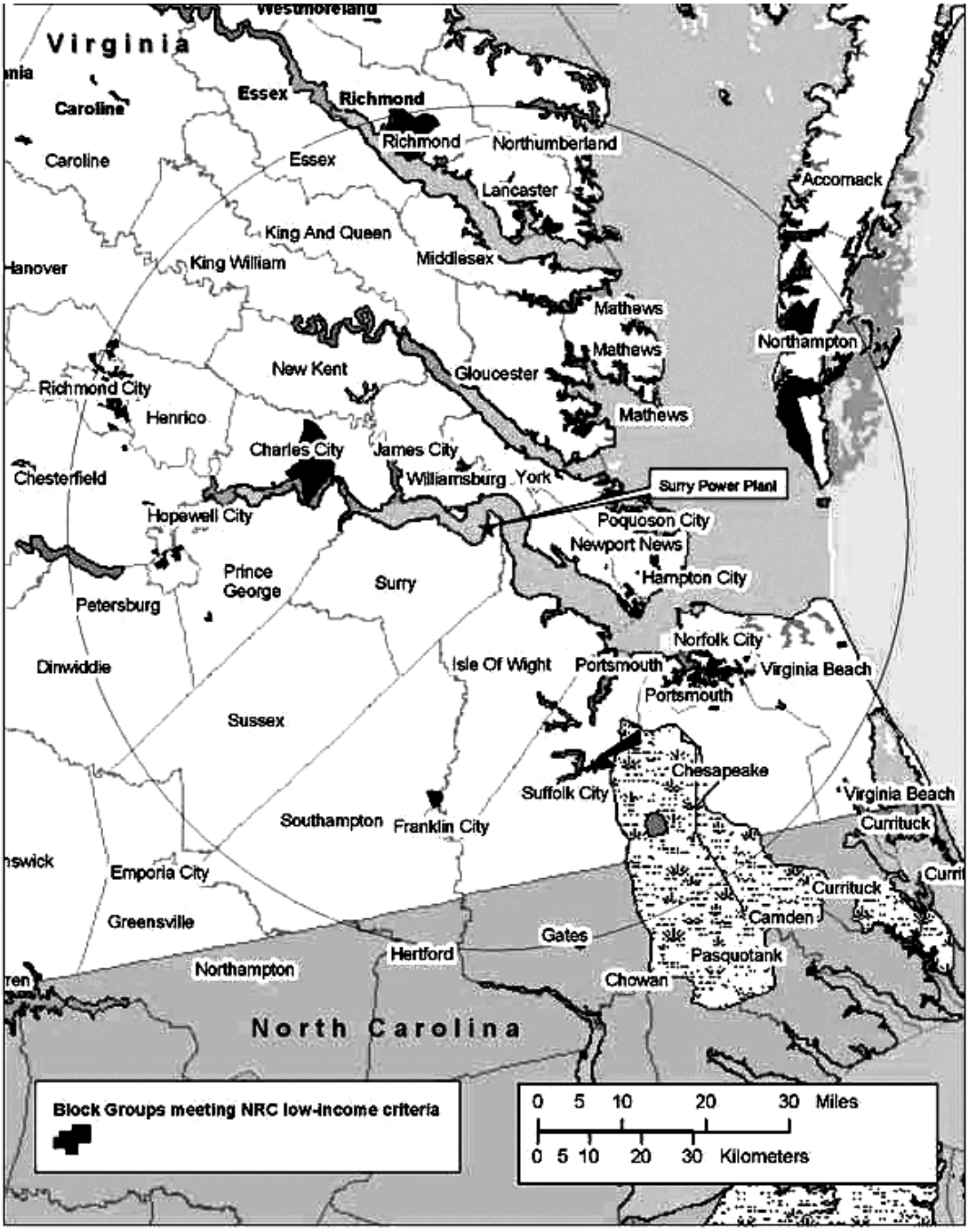

Figure 4-2. Census 1990 Block Groups Identified as Meeting NRC Criteria for Low-Income Status in an 80-km (50-mi) Area Around Surry Power Station

4.5 Groundwater Use and Quality

One Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that is applicable to Surry Power Station groundwater use and quality is listed in Table 4-8. VEPCo stated in its ER (VEPCo 2001b) that it is not aware of any new and significant information associated with the renewal of the Surry Units 1 and 2 OLs. The staff has not identified any significant new information during its independent review of the VEPCo ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS. For this issue, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-8. Category 1 Issue Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
GROUNDWATER USE AND QUALITY	
Groundwater quality degradation (saltwater intrusion)	4.8.2.1

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, 10 CFR Part 51, follows:

- Groundwater quality degradation (saltwater intrusion). Based on information in the GEIS, the Commission found that

  > Nuclear power plants do not contribute significantly to saltwater intrusion.

  The staff has not identified any significant new information during its independent review of the VEPCo ER (VEPCo 2001b), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no groundwater quality degradation impacts associated with saltwater intrusion during the renewal term beyond those discussed in the GEIS.

| The Category 2 issue related to groundwater use and quality that is applicable to Surry Power Station is discussed in the section that follows. This issue, listed in Table 4-9, requires plant-specific analysis.

Table 4-9. Category 2 Issue Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
GROUNDWATER USE AND QUALITY			
Groundwater-use conflicts (potable and service water; plants that use > 100 gpm)	4.8.1.1 4.8.2.1	C	4.5.1

4.5.1 Groundwater Use Conflicts (Plants that Use >100 gpm)

The Surry Power Station has seven wells that provide water for a variety of plant uses. There are an additional three wells at the site that provide water for the Gravel Neck Combustion Turbines Station. These wells, which vary in depth from about 120 to 130 m (396 to 420 ft) and draw water from the upper zone of the Potomac aquifer, are permitted by VDEQ (Permit No. GW0003900; VDEQ 1999). The water permit limits total water withdrawal to 585,600 m^3/yr (154.7 million gal/yr) or about 18.6 L/s (294 gpm) with a maximum of 60,200 m^3 (15.89 million gal) in a calendar month or an average of about 23.2 L/s (368 gpm). According to the ER (VEPCo 2001b), no single site well is capable of pumping at these rates. Three of the Surry Power Station wells are capable of pumping at 13.9 L/s (220 gpm), and another well is capable of pumping 6.3 L/s (100 gpm). The remaining wells are less productive. For the 8-year period from 1992 through 1999, the average withdrawal for the site was about 13.9 L/s (221 gpm).

Existing wells near the site have relatively small yields, about 2.2 L/s (35 gpm), and are thought to pump from Aquia aquifer. The Hog Island Wildlife Management Area to the north and south of the Surry Power Station site and the Chippokes Plantation State Park to the southwest of the site will limit development and water usage in the area adjacent to Surry Power Station. The Town of Surry has the closest municipal water system that uses wells. Its wells have a maximum yield of about 4.4 L/s (69 gpm) and an average yield of about 1.8 L/s (28 gpm).

The VEPCo ER (VEPCo 2001b) contains an assessment of the impacts of withdrawal at the annual average permitted rate on water levels at the site boundary and at the nearest offsite wells. In this assessment, all of the water was assumed to be withdrawn from the onsite well closest to the two nearest offsite wells. The maximum drawdown at the northern site boundary was calculated to be less than 1.2 m (3.8 ft); the drawdown at the closest well to the north, which provides domestic water for the facilities in the wildlife management area, was calculated to be less than 0.43 m (1.4 ft). Similarly, the drawdown at the southwest site boundary was calculated to be about 1.1 m (3.5 ft), and the drawdown at the closest well to the southwest, at a vacation cottage, was calculated to be less than 0.15 m (0.5 ft). Calculations made assuming

the maximum pumping capacity of any well resulted in smaller drawdowns. With this assumption, the calculated drawdowns at the nearest offsite wells were less than 0.3 m (1 ft) for the well to the north and less than 0.15 m (0.5 ft) for the well to the southwest. The impact of Surry Power Station groundwater use on the Town of Surry water system would be smaller than the impacts calculated for the nearest wells.

The groundwater withdrawal permit requires VEPCo to determine whether impacts to preexisting users exist and to mitigate these if possible. It also requires VEPCo to develop a water-conservation and management plan, to use water-saving processes, and to initiate a water-loss reduction program. VEPCo plans to submit these studies to VDEQ as part of the groundwater withdrawal permit-renewal process in 2009.

Based on the above considerations, the staff concludes that the impact of Surry Power Station ground waste water usage is SMALL and that no mitigation is warranted.

4.6 Threatened or Endangered Species

Threatened or endangered species are listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue is listed in Table 4-10.

Table 4-10. Category 2 Issue Applicable to Threatened or Endangered Species During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)			
Threatened or endangered species	4.1	E	4.6

This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected.

4.6.1 Aquatic Species

VEPCo initiated correspondence with FWS, NMFS, and the Virginia Department of Game and Inland Fisheries (VDGIF) regarding the potential effects of renewing the Surry licenses on Federal- and Commonwealth-listed species. The FWS and NMFS responses to VEPCo are compiled in Appendix C of the ER (VEPCo 2001b).

NMFS responded to VEPCo's request in a letter dated March 23, 2001, stating that ". . . no federally listed or proposed threatened or endangered species and/or designated critical habitat

for listed species under the jurisdiction of the National Marine Fisheries Service are known to exist in the project area. No further consultation pursuant to Section 7 of the Endangered Species Act of 1973, as amended, is required."

The NRC initiated consultation with FWS under Section 7 of the Endangered Species Act by letter dated January 24, 2002, with a request for information concerning species potentially occurring near the Surry Power Station site and related transmission corridors (NRC 2002b). A copy of the NRC's letter is provided in Appendix E.

The FWS Virginia Field Office responded in a letter dated May 22, 2002 (FWS 2002), by providing a table of Federally-listed or proposed endangered or threatened species and designated critical habitat that are documented or may occur in the vicinity of the Surry Power Station or in the counties through which the related transmission corridors pass. No Federally-listed threatened or endangered aquatic species or associated critical habitats were identified. VDGIF did not respond individually to VEPCo's request for information, but was provided with a copy of the letter from FWS.

Based on these considerations, the staff has determined that the continued operation of Surry Power Station and the continued maintenance of transmission lines will not adversely affect Federally-listed aquatic species.

4.6.2 Terrestrial Species

With the exception of the bald eagle, no other threatened or endangered species are currently known to occur at the Surry Power Station site or along the related transmission corridors. Based on a review of the applicant's report and its independent analysis, the NRC staff has concluded that continued operation of the Surry Power Station and related transmission corridors during the license renewal period will not impact the bald eagle population. This conclusion is based on the continued compliance of plant operations with the Bald Eagle Protection Guidelines of Virginia (FWS and VDGIF 2000). The NRC staff documented the basis for its conclusion in a biological assessment dated November 6, 2002. An informal consultation with FWS on this issue is ongoing. If FWS provides any additional comments, they will be resolved as operating plant issues because any impacts to the bald eagles that may occur as a result of plant and transmission line operation in the period of extended operation are also occurring now.

Plant species identified by the FWS as potentially occurring in the transmission corridors have not been found in these areas. Furthermore, maintenance practices using spot herbicide applications will not adversely affect these species should they invade the area.

Therefore, it is the staff's determination that the impact on Federally-listed threatened or endangered terrestrial species of an additional 20 years of operation of Surry Power Station and maintenance activities for the transmission lines would be SMALL, and that further mitigation is not warranted.

4.7 Evaluation of Potential New and Significant Information on Impacts of Operations During the Renewal Term

The staff has not identified new and significant information on environmental issues listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, related to operation during the renewal term. The staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the GEIS and the licensee's program for determining new and significant impacts and conducted its own independent review, including public scoping meetings, to identify issues with significant new information. Processes for identification and evaluation of new information are described in Chapter 1 under "License Renewal Evaluation Process."

4.8 Summary of Impacts of Operations During the Renewal Term

Neither VEPCo nor the staff is aware of information that is both new and significant related to any of the applicable Category 1 issues associated with the Surry Power Station operation during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concluded that the impacts would be SMALL and that plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for 11 Category 2 issues applicable to Surry Power Station operation during the renewal term, and for environmental justice and chronic effects of electro-magnetic fields. For the 11 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of Surry Power Station would be of SMALL significance in the context of the standards set forth in the GEIS and that further mitigation would not be warranted. In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies regarding chronic adverse effects from electromagnetic fields. Therefore, no evaluation of this issue is required.

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