

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 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 Fort Calhoun Station, Unit 1. Section 4.1 addresses issues applicable to the cooling system. Section 4.2 addresses issues related to the transmission line and onsite land use. Section 4.3 addresses the radiological impacts of normal operation. Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Table 4-7 lists the Category 2 socioeconomic issues, which require plant-specific analysis, and environmental justice, which was not addressed in the GEIS. Section 4.5 addresses issues related to groundwater use and quality. Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses new information that was raised

(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.

during the scoping period. The results of the evaluation of environmental issues 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 Fort Calhoun Station because they are related to plant design features or site characteristics not found at Fort Calhoun Station 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 Fort Calhoun Station cooling-system operation during the renewal term are listed in Table 4-1. The Omaha Public Power District (OPPD) stated in its Environmental Report (ER; OPPD 2002) that it is not aware of any new and significant information associated with the renewal of the Fort Calhoun Station, Unit 1 operating license (OL). The staff has not identified any significant new information during its independent review of the OPPD ER (OPPD 2002), 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 the issues, the GEIS concluded that the impacts are SMALL, and additional plant-specific mitigation measures beyond those already in place at Fort Calhoun Station are not likely to be sufficiently beneficial to be warranted.

Table 4-1. Category 1 Issues Applicable to the Operation of the Fort Calhoun Station, Unit 1 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	4.2.1.2.1
Temperature effects on sediment transport capacity	4.2.4.2.3; 4.3.2.2
Scouring caused by discharged cooling water	4.2.1.2.3
Eutrophication	4.2.1.2.3
Discharge of chlorine or other biocides	4.2.1.2.4; 4.3.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.3.2.2
Discharge of other metals in waste water	4.2.1.2.4; 4.3.2.2
Water use conflicts (plants with once-through cooling systems)	4.2.1.3; 4.3.2.1
AQUATIC ECOLOGY (FOR ALL PLANTS)	
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

Table 4-1 (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
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
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 (e.g., shipworms)	4.2.2.1.11; 4.4.3
HUMAN HEALTH	
Microbiological organisms (occupational health)	4.3.6
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 OPPD 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 of altered current patterns at intake and discharge structures during the renewal term beyond those discussed in the GEIS.

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

These effects 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 OPPD 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 of temperature effects on sediment transport capacity during the renewal term 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 OPPD 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 of scouring caused by discharged cooling water 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 OPPD ER; the staff's site visit; the scoping process; or its evaluation of other available information, including plant monitoring data and technical reports. Therefore, the staff concludes that there are no impacts of eutrophication during the renewal term 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 OPPD ER; the staff's site visit; the scoping process; or its evaluation of other available information, including the National Pollutant Discharge Elimination System (NPDES) permit for Fort Calhoun Station, Unit 1. Therefore, the staff concludes that there are no impacts of discharge of chlorine or other biocides during the renewal term 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 OPPD ER; the staff's site visit; the scoping process; or its evaluation of other available information, including the NPDES permit for Fort Calhoun Station, Unit 1. Therefore, the staff concludes that there are no impacts of discharges of sanitary wastes and minor chemical spills during the renewal term beyond those discussed in the GEIS.

- Discharge of other metals in waste water. 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 OPPD ER; the staff's site visit; the scoping process; or its evaluation of other available information, including the NPDES permit for Fort Calhoun Station, Unit 1. Therefore, the staff concludes that there are no impacts of discharges of other metals in waste water during the renewal term beyond those discussed in the GEIS.

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- 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 water supplied by the Missouri River for the cooling system is ample, and changes in river management in both wet and dry years are not expected to result in significant supply issues for cooling waters. The staff has not identified any significant new information during its independent review of the OPPD 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 of water-use conflicts associated with the once-through cooling system during the renewal term 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.

Fort Calhoun Station monitors discharges of metals under NPDES Permit NE0000418 and has not identified concerns with metal loadings. Further, the staff has not identified any significant new information during its independent review of the OPPD ER, the staff's site visit, the scoping process, or its evaluation of 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 OPPD 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 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 OPPD 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 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 OPPD 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 of thermal plume barriers to 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 affect the larger geographical distribution of aquatic organisms.

The staff has not identified any significant new information during its independent review of the OPPD 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 on the distribution of aquatic organisms during the renewal term beyond those discussed in the GEIS.

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- 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 OPPD 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 of 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 OPPD 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 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 OPPD 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 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 OPPD 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 of losses from predation, parasitism, and disease among organisms exposed to sublethal stresses during the renewal term beyond those discussed in the GEIS.

- Stimulation of nuisance organisms (e.g., shipworms). 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 OPPD 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 of stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

- Microbiological organisms (occupational health). Based on information in the GEIS, the Commission found that

Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures.

The staff has not identified any significant new information during its independent review of the OPPD 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 of microbiological organisms on occupational health during the renewal term beyond those discussed in the GEIS.

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- 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 OPPD 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 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 Fort Calhoun Station are discussed in the section that follows and are listed in Table 4-2.

Table 4-2. Category 2 Issues Applicable to the Operation of the Fort Calhoun Station, Unit 1 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 ONCE-THROUGH AND 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
HUMAN HEALTH			
Microbiological organisms (public health)(plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	4.3.6	G	4.1.4

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 before license renewal. To perform this evaluation, the staff reviewed the Fort Calhoun Station ER (OPPD 2002); visited Fort Calhoun Station; and reviewed the applicant's State of Nebraska NPDES Permit NE0000418, issued on December 27, 1974, and in force until March 31, 2006.

Section 316(b) of the Clean Water Act (CWA) requires that the location, design, construction, and capacity of cooling-water-intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). Entrainment of fish and shellfish in the early life stages into the condenser cooling system is a potential adverse environmental impact that can be minimized by the best available technology. The OPPD submitted an intake-monitoring plan to the Nebraska Department of Environmental Control (NDEC), the predecessor agency to the Nebraska Department of Environmental Quality (NDEQ), on February 24, 1975. The NDEC approved the OPPD intake-monitoring plan on March 25, 1975, concluding that the plan fulfilled the requirements of the CWA Section 316(b) guidelines (Lessig 1975), and the OPPD implemented the plan through 1977. The plan continued the ongoing OPPD intake-monitoring program, which was being conducted in accordance with the Fort Calhoun Station OL. The program monitored fish impingement on Fort Calhoun Station traveling screens, fish larvae in the ambient Missouri River, and fish larvae entrained into the plant cooling-water systems. The OPPD also submitted a comprehensive CWA Section 316(b) demonstration to the NDEC in July 1, 1976, in accordance with the "Special Conditions: Environmental Studies" provision of the NPDES Permit NE0000418, issued December 27, 1974, and in force until March 31, 2006.

The report included results from the OPPD monitoring of fish larvae in 1974 and 1975, as well as an assessment of entrainment impacts. Based on the small percentage of fish larvae entrained, the fish taxa collected, and the high natural mortality of fish during early life stages, the study concluded that entrainment at Fort Calhoun Station would have minimal adverse effects on the fish populations in the stretch of the Missouri River near the Fort Calhoun Station. The NDEC reviewed and approved this report on January 19, 1977, concluding that losses due to entrainment at Fort Calhoun Station were within the acceptable range. When approving the *Fort Calhoun Station Intake-Monitoring Report*, the NDEC indicated its interest in any additional information the OPPD might develop concerning larval-fish entrainment and other topics related to assessing associated impacts. The OPPD continued to conduct fish-larvae-entrainment studies at Fort Calhoun Station through 1977 and summarized the results of the entire program, which spanned the period from 1973 to 1977, in a comprehensive report. These results were also reported in the context of a more general assessment of entrainment effects that included monitoring results for both Fort Calhoun Station and Cooper Nuclear Station.

The OPPD has neither conducted entrainment studies nor been required to carry out such activities since 1977. Subsequent NPDES permits and modifications, which constitute the Fort Calhoun Station CWA 316(b) determination, have not required any further entrainment studies. In compliance with the provisions of the CWA, Nebraska issued the current NPDES permit.

Fort Calhoun Station is sited, designed, and operated so as to minimize entrainment impacts. The maximum water intake at Fort Calhoun Station during normal plant operations is 23 m³/s

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(827 ft³/s). Under low-river-flow conditions (January), the water intake by Fort Calhoun Station, represents approximately 3.9 percent of the average and a maximum 7 percent of the minimum river flow during this winter month (OPPD 2002). This occurs during a time when fish eggs and larvae are rare. During high-river-flow conditions when spawning is more likely to occur (summer), this maximum water intake represents approximately 2 percent of the monthly average and 2.8 percent of the minimum river flow (August) (OPPD 2002).

The staff has reviewed the available information provided by the OPPD in the OPPD ER and related to the CWA 316(b) demonstration. Based on the results of past entrainment studies and the operating history of the Fort Calhoun Station intake structure, the staff concludes that the potential impacts of entrainment of fish and shellfish in the early life stages into the cooling water intake system are SMALL. Therefore, new mitigation measures are 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 before license renewal. To perform this evaluation, the staff reviewed the Fort Calhoun Station ER (OPPD 2002); visited Fort Calhoun Station; met with Federal and State resource agencies; and reviewed the applicant's State of Nebraska NPDES Permit NE0000418, issued on December 27, 1974, and in force until March 31, 2006.

Section 316(b) of the CWA requires that any standard established pursuant to Sections 301 or 306 of the CWA shall require that the location, design, construction, and capacity of cooling-water-intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). Impingement of fish and shellfish on the debris screens of the cooling system is a potential adverse environmental impact that can be minimized by the best available technology. The OPPD submitted an intake-monitoring plan to the NDEC, the predecessor agency to the NDEQ, on February 24, 1975. The NDEC approved the OPPD intake-monitoring plan on March 25, 1975, concluding that the plan fulfilled the requirements of the CWA Section 316(b) guidelines (Lessig 1975), and the OPPD implemented the plan through 1977. The plan continued the ongoing OPPD intake-monitoring program, which was being conducted in accordance with the Fort Calhoun Station, Unit 1 OL. The program monitored fish impingement on Fort Calhoun Station traveling screens, fish larvae in the ambient Missouri River, and fish larvae entrained into the plant cooling-water systems. The OPPD also submitted a comprehensive CWA Section 316(b) demonstration to the NDEC in July 1, 1976, in accordance with the "Special Conditions: Environmental Studies" provision of the NPDES Permit NE0000418, issued on December 27, 1974, and in force until March 31, 2006.

The report included results from the OPPD monitoring of fish impingement from May 1973 through December 1975, as well as an assessment of impingement impacts. Because impingement involved few adult fish and because most of the small fish that were impinged would have been lost as a result of natural mortality, the study concluded that the overall effect of impingement on fish populations in the vicinity of Fort Calhoun Station appeared to be minimal. The NDEC reviewed and approved this report on January 19, 1977, concluding that losses due to impingement at Fort Calhoun Station were within the acceptable range.

When approving the *Fort Calhoun Station Intake-Monitoring Report*, the NDEC indicated its interest in any additional information the OPPD might develop concerning compensatory mechanisms and fish recruitment potential in the Missouri River. The OPPD continued to monitor fish impingement at Fort Calhoun Station, as well as juvenile and adult fish at nearby sampling locations in the Missouri River, through 1977. The results of these programs, which spanned the period from 1973 to 1977, were summarized in a comprehensive report (OPPD 1978, Section IV). These results were also reported in the context of a more general assessment of power-station impacts on Missouri River fish populations that included impingement-monitoring results for both Fort Calhoun Station and Cooper Nuclear Station (Hesse 1982, Chapter 9).

The OPPD has neither conducted impingement studies nor been required to carry out such activities since 1977. Subsequent NPDES permits and modifications, which constitute the Fort Calhoun Station CWA 316(b) determination, have not required any further impingement studies. In compliance with the provisions of the CWA, Nebraska issued the current NPDES permit.

The staff has reviewed the available information. Based on the results of past impingement studies and the operating history of the Fort Calhoun Station intake structure, the staff concludes that the potential impacts of impingement of fish and shellfish on the debris screens of the cooling-water-intake system are SMALL. Therefore, new mitigation measures are 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 before license renewal. The NRC made impacts on fish and shellfish resources resulting from heat shock a Category 2 issue because of continuing concerns about thermal-discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions (NRC 1996). Information to be ascertained includes (1) type of cooling system (whether once-through or cooling pond) and (2) evidence of a CWA Section 316(a) variance or equivalent State

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documentation. To perform this evaluation, the staff reviewed the Fort Calhoun Station ER (OPPD 2002); visited Fort Calhoun Station; and reviewed the applicant's State of Nebraska NPDES Permit NE0000418, which was issued on December 27, 1974, and is in force until March 31, 2006.

Fort Calhoun Station has a once-through heat dissipation system. The OPPD has consistently operated Fort Calhoun Station in compliance with the thermal-discharge limits established for the plant by either the NDEQ or its predecessor agency, the NDEC. No formal CWA Section 316(a) variance has been needed or sought for the facility. Thermal-discharge limits (the maximum-allowable effluent temperatures), which have been included in the plant's NPDES permit since its initial issue by NDEC on December 27, 1974 (NPDES Permit NE0000418; Drain 1975), have been established based on comprehensive studies of thermal-discharge effects to ensure continued compliance with water-quality standards and an acceptable level of impact to aquatic biota.

The OPPD conducted these studies in response to numerous stakeholder interests, including requirements of the National Environmental Policy Act of 1969 (NEPA) that were associated with the initial licensing of the plant; monitoring requirements established in the OL technical specifications; and NDEC requirements set forth in a State of Nebraska Certificate of Compliance for Fort Calhoun Station, which was issued October 13, 1972, prior to Fort Calhoun Station, Unit 1's initial operation (NDEC 1972). The Certificate of Compliance indicated that there was reasonable assurance that the operation of Fort Calhoun Station would be in compliance with applicable water-quality standards. However, the certificate also required that the OPPD undertake a study to determine the effects of the thermal discharge upon the physical, chemical, and biological aspects of the Missouri River; monitor cooling-water discharge and intake; monitor discharge temperatures; and conduct thermal-plume mapping during the operation of Fort Calhoun Station.

These thermal-effects investigations were conducted in the context of long-term, comprehensive ecological studies to better determine the effects of Fort Calhoun Station and Cooper Nuclear Station on the Missouri River and its associated biota. The Missouri River Study Group, which consisted of the OPPD; the Nebraska Public Power District (NPPD); consultants; academic institutions; and regulators, including the NDEC, performed the studies as a coordinated effort. The Fort Calhoun Station Five-Year Report (OPPD 1978) summarizes the results of these studies, which were conducted in the vicinity of Fort Calhoun Station. These studies included operational-phase monitoring from the plant's initial startup in 1973 through 1977. The Missouri River Study Group described the results of broader studies, which examined power-station effects and monitoring results for both Fort Calhoun Station and Cooper Nuclear Station, in a separate report (Hesse 1982, Chapter 3).

Fort Calhoun Station was initially authorized to operate at a maximum power level of 1420 MW(t). In addition, a maximum daily temperature limit of 40.6 °C (105 °F) was established for the Fort Calhoun Station cooling-water discharge in the initial NPDES permit on the basis of initial operational-monitoring results (NPDES Permit NE0000418; Drain 1975). On August 18, 1980, the NRC amended the Fort Calhoun Station OL to increase the maximum authorized power level to 1500 MW(t) (NRC 1980). This increase was supported by an OPPD environmental assessment report (AEC 1972) that used the results of thermal-plume modelling and monitoring studies and other relevant information presented in the Fort Calhoun Station Five-Year Report (OPPD 1978).

This OPPD environmental assessment report indicated that the thermal-plume dimensions resulting from the anticipated increase in discharge temperature of 2.7 °C (5 °F) would be bounded by projections originally reported by the U.S. Atomic Energy Commission (AEC) in the Final Environmental Statement for the plant (AEC 1972, Part V). The OPPD environmental assessment report also indicated that impacts to aquatic biota would be small. On the basis of its review, the NDEC agreed that the increase in maximum daily discharge temperature to 43.3 °C (110 °F) would not adversely affect the Missouri River and would comply with Nebraska water-quality standards (Drain 1979). On August 28, 1980, the NDEC issued a corresponding modification to the NPDES permit for the plant.

In accordance with the provisions of the NPDES permit, the NDEQ has established the maximum daily discharge limits for cooling-water discharges from the plant (outfalls 001 and 005) at 43.3 °C (110 °F).

The OPPD is seeking to permanently increase the Fort Calhoun Station NPDES daily maximum-temperature limit to 44.4 °C (112 °F) to better ensure that the plant can operate at full power under unusually high ambient river temperatures, which have been experienced in recent summers. In the interim period until the NDEQ acts on the permit-modification request, the OPPD has entered into a Consent Order with the NDEQ that allows a daily maximum-temperature limitation of 44.4 °C (112 °F). This Consent Order, which is acknowledged by the current NPDES permit, requires that the OPPD submit water-quality information that evaluates the impacts of this temperature increase, thereby enabling the NDEQ to verify that instream water-quality criteria are being met.

The OPPD is participating in a cooperative effort with the U.S. Environmental Protection Agency and the NDEQ to obtain the information required under the terms of the Consent Order. This study, which includes thermal modeling, focuses on power plants and other industries discharging to the lower Missouri River, and addresses the potential effects of historically high, ambient river temperatures. This study is assisting the OPPD and the NDEQ in assessing the implications of reduced river flows in the summer, such as those being considered by the

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USACE in the context of revisions to the *Missouri River Master Water Control Manual* (USACE 1979; 2001) and the associated FWS Biological Opinion (FWS 2000). The study began in the fall of 2001 and the EPA provided the results of the study to the NRC by a letter dated April 10, 2003 (EPA 2003).

The thermal modelling studies performed by EPA, the United States Geological Survey, and the Oregon Graduate Institute, indicate that as temperatures in the Missouri River upstream of Fort Calhoun Station rise above those historically observed toward 31 °C (88 °F), the 32 °C (90 °F) limit of the Nebraska Surface Water Quality Standards (Title 117 Chapter 4.003.01B) at the end of the mixing zone may be exceeded (EPA 2003). The EPA model was based on the highest observed river temperatures (early August 2001), the calculated heat seasons under the 7-day, 10-year low flow conditions (7Q10), both the historical 7Q10 and a modified 7Q10 based on Missouri River Master Water Control Manual revisions alternatives GP 1521 or GP2021, and peak power generation. The EPA models showed that the Fort Calhoun Station is able to meet the current State of Nebraska Water Quality Standard for heat under all the assumptions shown above (EPA 2003). The NDEQ will make the determination to issue or deny the permit modification. The OPPD will continue to comply with the NDEQ thermal-discharge standards through the duration of the current OL and the license renewal term. Based on the recent thermal modelling studies and compliance with the NPDES permit the staff concludes the direct impacts of discharging heated water from the cooling-water-intake-system are SMALL.

On the issue of cumulative impacts on the Missouri River, the major issue related to plant operation is the thermal impact of the cooling system discharges. Fort Calhoun Station is a baseload unit, which means it generally operates at full power. In the short term an increase in power demand will not result in Fort Calhoun Station, Unit 1 increasing its power output because it is already operating at full power.

Power demands are expected to increase with population and growth of industry over the license renewal period, and this may cause the OPPD to seek an increase in the authorized power level for the Fort Calhoun Station, Unit 1. OPPD is required to request an amendment to Fort Calhoun Station, Unit 1 operating license for any increase in the plant's authorized power level. OPPD plans to submit an amendment request to the NRC for a less than 2 percent power uprate by the end of July 2003. The less than 2 percent power increase that OPPD plans to submit in July 2003, could have a minor impact on the modelling results, however, it is unlikely as the maximum discharge temperatures from the Fort Calhoun Station, Unit 1 will continue to be limited by the NPDES permit to 43.3 °C (110 °F) (Permit # NE0000418 or 44.4 °C (112 °F) with the current Consent Order, Case #2206). At this time, the NRC is unaware of any other power uprates for Fort Calhoun Station, Unit 1 beyond the planned July 2003 request. Any power uprates would require a separate review process.

In reviewing the scientific literature on thermal regimes in the Missouri River, a recent study performed by scientists from the University of Iowa was identified (Wright et al., 1999). The study utilized available temperature data and a dynamic river flow and mixing model (CHARIMA) to examine the thermal regime in the Missouri from Gavins Point Dam down to Rulo, Nebraska (near the Kansas border). There are at least five power plants along this reach which discharge into the River, two of which (Omaha Units and Council Bluffs) lie between Fort Calhoun Station, Unit 1 and the confluence of the Platte and Missouri Rivers. This investigation established that, relative to other discharges to the Missouri, the total impact of Fort Calhoun Station, Unit 1 discharge on the thermal regime of the Missouri is minor (Wright et al., 1999). This study examined a number of different scenarios beyond those that could result from proposals in the Missouri River Main Stem Reservoir System Master Manual, projecting the thermal regime 40 years into the future. The most extreme simulation assumed all the power plants on the reach were operating at maximum capacity, a summer low-flow regime, and an increase in ambient temperature due to global warming. Even under these most extreme conditions, while a cumulative warming effect was demonstrated, water temperatures did not exceed the 90 °F (32 °C) maximum limit of Title 117 of the Nebraska Surface Water Quality Standards (Title 117 Chapter 4.003.01B). Also under those extreme conditions, average river temperature for the month of August (an indicative summer month) were less than 79 °F (26 °C). It is the conclusion of NRC staff that based on these conservative analyses that the cumulative impacts of the operation of Fort Calhoun Station, Unit 1 through 2033 on the thermal regime of the Missouri River will be SMALL.

The staff has reviewed the available information and, on the basis of the conditions of the NPDES permit, the recent thermal studies, and the operating history of the Fort Calhoun Station discharge, concludes that the direct and potential cumulative impacts of discharging heated water from the cooling-water-intake system are SMALL. Therefore, new mitigation measures are not warranted.

4.1.4 Microbiological Organisms (Public Health)

For plants discharging cooling water to cooling ponds, lakes, canals, or small rivers with annual average flow rates less than $9 \times 10^{10} \text{ m}^3/\text{yr}$ ($3.15 \times 10^{12} \text{ ft}^3/\text{yr}$), the effects of microbiological organisms on human health are listed as a Category 2 issue and require plant-specific evaluation before license renewal. Because the annual average flow rate for the Missouri River in the vicinity of Fort Calhoun Station is approximately $3.4 \times 10^{10} \text{ m}^3/\text{yr}$ ($1.2 \times 10^{12} \text{ ft}^3/\text{yr}$), the effects of its discharge on microbiological organisms must be addressed.

The Category 2 designation is based on the magnitude of the potential public-health impacts associated with thermal enhancement of *Naegleria fowleri* (a pathogenic amoeba) that could not be determined generically. The NRC noted that impacts of nuclear-plant cooling towers and

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thermal discharges are considered to be of small significance if they do not enhance the presence of microorganisms that are detrimental to water quality and public health (NRC 1999). The assessment criteria relate to thermal-discharge temperature, thermal characteristics, thermal conditions for the enhancement of *N. fowleri*, and impact to public health. Populations of *N. fowleri* can be enhanced in thermally altered water bodies at temperatures ranging from 35 to 41 °C (95 to 106 °F), but this organism is rarely found in water that is cooler than 35 °C (95 °F) (OPPD 2002).

The staff independently reviewed the Fort Calhoun Station ER (OPPD 2002); visited the site; and reviewed the applicant's State of Nebraska NPDES Permit NE0000418, which was issued on December 27, 1974, and is in force until March 31, 2006.

Based on Fort Calhoun Station discharge-monitoring data for the period from December 1997 to March 2001, the mean monthly average temperature of the discharge at the outfall was 24.9 °C (76.8 °F), and the maximum daily temperature was 41.7 °C (107 °F). Monthly average discharge temperatures at or above 35 °C (95 °F) occurred during this time period only in the months of July and August, with the exception of September 1998. The ambient temperatures of the Missouri River near Fort Calhoun Station vary from freezing, approximately 0 °C (32 °F), in the winter to 29 °C (85 °F) in the summer (OPPD 2002).

Thermophilic organisms occurring in the water column, if any, that might be of concern are expected to be limited to those entrained into the condenser cooling water. These organisms would be subjected to a rapid temperature rise through the condenser followed by relatively rapid cooling as the discharge plume mixes with the ambient river water. Residence time in those areas of the plume with temperatures greater than 35 °C (95 °F) would be short because of mixing in the plume and river flow.

The Missouri River in the vicinity of Fort Calhoun Station is confined to a sinuous artificial channel. Water flow is regulated to meet the needs of barge traffic, flood control, irrigation, and pollution control. Based on river traffic, currents, and shoreline characteristics, swimming in the vicinity of Fort Calhoun Station is unlikely. However, recreational use (e.g., boating, fishing) may occur, and sampling in the river by OPPD employees may be performed, thereby creating the potential for human exposure.

The OPPD has initiated contacts with the Nebraska Department of Public Health and Human Services and the Iowa Department of Public Safety regarding the Fort Calhoun Station license renewal. There has been no known impact from operation of Fort Calhoun Station on public health related to thermophilic microorganisms. Because of this, the impact of deleterious microbiological organisms during the continued operation of Fort Calhoun Station during the renewal term is low.

Based on its review of the above information, the staff concludes that the potential impacts to public health from microbiological organisms resulting from operation of the Fort Calhoun Station cooling-water discharge system to the aquatic environment on or in the vicinity of the site area are SMALL, and additional mitigation is not warranted.

4.2 Transmission Line

The corridor for the transmission line originally constructed in connection with Fort Calhoun Station (Line 74S/74) covers approximately 33 ha (82 ac) over a total corridor length of approximately 11 km (7 mi; Figure 2-5 and Table 2-1). The OPPD conducts annual flight inspections of its transmission line right-of-way to ensure nonencroachment by vegetation. Vegetation control within the transmission line right-of-way is performed every three years to ensure the continued reliability of the line. Vegetation control includes removing or trimming woody vegetation to ensure adequate line clearance and to allow vehicular access along the right-of-way. Large, woody vegetation that can interfere with conductors are mechanically trimmed or removed, and stumps are treated with approved herbicides. Small, woody vegetation is manually removed or controlled by basally applying approved herbicides. Low-growing, woody vegetation, including sumac, chokecherry, and wild plum, that is important wildlife food is only trimmed or removed if needed for vehicular access. The OPPD does not mow vegetation or use broadcast herbicides. The OPPD also does not use herbicides in or near wetlands or stream crossings. All OPPD herbicide applicators must be certified in accordance with Nebraska Pesticide Regulations in the Nebraska Administrative Code, Title 25, Chapter 2.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to the transmission line from Fort Calhoun Station, Unit 1 are listed in Table 4-3. The OPPD stated in its ER that it is not aware of any new and significant information associated with the renewal of the Fort Calhoun Station OL. The staff has not identified any significant new information during its independent review of the OPPD ER (OPPD 2002), 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 staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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Table 4-3. Category 1 Issues Applicable to the Transmission Line 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 collision 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
Floodplains 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

A brief description of the staff's review and GEIS conclusions, as codified in Table B-1 of the GEIS, 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 OPPD ER, the staff's site visit, the scoping process, consultation with the FWS, or its evaluation of other 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.

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

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

During an independent review of the OPPD ER, the staff's site visit, the scoping process, consultation with the FWS, and the staff's evaluation of other information, the staff has not identified any significant new information that indicates that Line 74S/74 has resulted in bird

mortality or represents a hazard to birds. 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 OPPD ER, the staff's site visit, the scoping process, or its evaluation of other 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.

- Floodplains 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 OPPD ER, the staff's site visit, the scoping process, consultation with the FWS, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power-line right-of-way on floodplains and wetlands 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 OPPD ER, the staff's site visit, the scoping process, or its evaluation of other 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.

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- Onsite land use. Based on 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 OPPD ER, the staff's site visit, the scoping process, or its evaluation of other 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. 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 OPPD ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power-line right-of-way on land use during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue and one uncategorized issue related to the transmission line. 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 Transmission Line 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 (Electric Shock)

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) criteria (NESC 1997), it was 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), the 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.

The main connection of Fort Calhoun Station with the power grid is a 345-kV line that was built roughly concurrently with Fort Calhoun Station. However, as noted in the AEC's Final Environmental Statement (AEC 1972), this line was built to interconnect the Iowa Public Service Company, the NPPD, and others, and the decision to construct the line predates the decision to build Fort Calhoun Station. Consequently, this line is not within the scope of this review.

One 161-kV transmission line was constructed to connect Fort Calhoun Station to the transmission system. This transmission line runs approximately 11 km (7 mi) from the plant switchyard to Substation 1226, which is about 5 km (3 mi) west of Blair, Nebraska. The line occupies a single corridor in a 15-m-wide (50-ft-wide) right-of-way for the first 0.8 km (0.5 mi). For the remaining 10 km (6.5 mi), the line occupies a 30-m-wide (100-ft-wide) right-of-way. This line was entirely rebuilt in February 1999 to NESC code requirements (OPPD 2002).

The staff concludes that the impact of the potential for electric shock is SMALL and additional mitigation measures are not warranted because the transmission line constructed to connect Fort Calhoun Station to the grid has been reconstructed to NESC code requirements.

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

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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 Fort Calhoun Station, Unit 1 in regard to radiological impacts are listed in Table 4-5. The OPPD stated in its ER (OPPD 2002) that it is not aware of any new and significant information associated with the renewal of the Fort Calhoun Station, Unit 1 OL. The staff has not identified any significant new information during its independent review of the OPPD ER, the staff’s site visit, the scoping process, or its evaluation of other 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 staff concluded in the GEIS that the impacts are SMALL and additional 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 OPPD 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 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 OPPD 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 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 Period

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-6. The OPPD stated in its ER (OPPD 2002) that it is not aware of any new and significant information associated with the renewal of the Fort Calhoun Station, Unit 1 OL. The staff has not identified any significant new information during its independent review of the OPPD ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). For these issues, the staff concluded in the GEIS that the impacts are SMALL and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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Table 4-6. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
SOCIOECONOMICS	
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 OPPD 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 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 OPPD 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 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 OPPD ER, 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 OPPD ER, 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 plant-specific analysis, and environmental justice, which was not addressed in the GEIS.

Table 4-7. Environmental Justice and GEIS 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
SOCIOECONOMICS			
Housing impacts	4.7.1	I	4.4.1
Public services: 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 ^(a)	Not addressed ^(a)	4.4.6

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice must be addressed in the licensee’s environmental report and the staff’s environmental impact statement.

4.4.1 Housing Impacts During Operations

In determining housing impacts, the applicant chose to follow Appendix C of the GEIS (NRC 1996), which presents a population characterization method that is based on two factors, “sparseness” and “proximity (GEIS Section C.1.4 [NRC 1996; 1999]). Sparseness measures population density within 32 km (20 mi) of the site, and proximity measures population density and city size within 80 km (50 mi). Each factor has categories of density and size (GEIS Table C.1), and a matrix is used to rank the population category as low, medium, or high (GEIS Figure C.1).

Using data from the U.S. Bureau of the Census (USBC) 1990 Census of Population, the OPPD estimated 329,650 persons live within 32 km (20 mi) of Fort Calhoun Station (OPPD 2002). Using this data, the OPPD calculated a population density of 101 persons/km² (262 persons/mi²) within 32 km (20 mi) of Fort Calhoun Station. Thus, Fort Calhoun Station falls into Category 4 of the GEIS sparseness classification. There are an estimated 760,514 persons living within 80 km (50 mi) of Fort Calhoun Station (OPPD 2002). This equates to a population density of 60 persons/km² (97 persons/mi²) within 80 km (50 mi) of Fort Calhoun Station. Because Omaha is the largest city within 80 km (50 mi) of Fort Calhoun Station and has a total population well over 100,000, Fort Calhoun Station falls into Category 3 (one or more cities with 100,000 or more persons and fewer than 119 persons/km² [190 persons/mi²] within 80 km [50 mi]) of the GEIS proximity classification. According to the GEIS sparseness and proximity matrix, Fort Calhoun Station’s sparseness Category 4 and proximity Category 3 indicate that Fort Calhoun Station is in a high-population area.

The proximity score also was recalculated by the NRC staff using the 2000 Census. The conservative estimate using the 2000 Census was about 852,717, or 42 persons/km² (109 persons/mi²) within 80 km (50 mi) of Fort Calhoun Station, well within proximity Category 3. Applying the GEIS proximity measures (NRC 1996; 1999a), Fort Calhoun Station is classified as Category 3 (one or more cities with 100,000 or more persons and fewer than 119 persons/km² [190 persons/mi²] within 80 km [50 mi]). According to the GEIS, these sparseness and proximity scores identify the nuclear unit as being located in a high-population area.

In 10 CFR Part 51, Subpart A, Appendix B, Table B-1, the NRC concluded 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. Fort Calhoun Station is located in a high-population area; growth-control measures are not in effect. Based on the NRC criteria, the OPPD expects housing impacts to be SMALL during continued operations (OPPD 2002).

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). The GEIS assumes that no more than a total additional staff of 60 permanent workers might be needed during the license renewal period to perform routine maintenance and other activities. Although the OPPD expects to perform these routine activities during scheduled outages, the OPPD assumed that no more than 60 total employees would be added to its permanent staff during the license renewal period (OPPD 2002). Using the Regional Input-Output Modeling System (RIMS II), the U.S. Bureau of Economic Analysis calculated a regional employment multiplier appropriate for the electric services (utilities) sector for the Omaha Metropolitan Statistical Area (MSA). The OPPD used this value (4.0387) to estimate the number of direct and indirect jobs supported by additional Fort Calhoun Station employees that might be needed during the license renewal period (OPPD 2002). After applying the multiplier, a total of 242 (60×4.0387) new jobs would be created in the area with a USBC year-2000 labor force of 400,049 workers. These 242 new direct and indirect jobs represent less than 1 percent of the current total employment in the Omaha MSA (OPPD 2002). In summary, the OPPD is assuming that 60 additional permanent direct workers during the license renewal period would create an additional 182 indirect jobs in the community. These 242 new jobs (60 direct and 182 indirect) could result in a population increase of 603 in the area (242 jobs multiplied by 2.49 [the average number of persons per household in the state of Nebraska] [OPPD 2002]). This increase represents approximately 0.1 percent of the USBC's estimated population in year 2000 (604,960) for the combined area of Washington, Douglas, and Sarpy counties (OPPD 2002). The demand for the existing housing units could be met with the construction of new housing or the use of existing, unoccupied housing. In 2000, Omaha MSA employment was approximately 400,049, and the population was approximately 716,998 in the year 2000 (OPPD 2002). The vacancy rate is approximately 6 percent (OPPD 2002). The 242 projected housing units needed for OPPD personnel would not create a discernible change in housing availability, change in rental rates or housing values, or spur much new construction or conversion. As a result, the OPPD concludes that the impacts would be SMALL and mitigation measures would not be necessary (OPPD 2002).

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

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

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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 Fort Calhoun Station permitted withdrawal rate and actual use of water. The OPPD plans no refurbishment at Fort Calhoun Station, so plant demand would not change beyond current demands (OPPD 2002).

The OPPD assumed an increase of 60 license renewal employees during license renewal, the generation of 242 new jobs, and a net overall-population increase of approximately 603 persons and 242 households as a result of those jobs,^(a) all of which would create SMALL impacts. The plant-related population increase would require an additional 182 m³/d (48,240 gpd) of potable water (OPPD 2002).^(b) This amount represents less than 0.1 percent of the 252,386 m³/d (66.63 million gpd) that was consumed in 1995 in the combined region of Washington, Douglas, and Sarpy counties (OPPD 2002). This amount is within the residual capacity of the existing water systems that service Washington County. The staff finds that the impact of increased water use on area water systems is SMALL and that further 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.”

Section 4.7.4 of the GEIS defines the magnitude of land-use changes as small if very little new development and minimal changes to an area’s land-use pattern result. Moderate change results if considerable new development and some changes to the land-use pattern occur. The magnitude of change is large if large-scale new development and major changes in the land-use pattern occur.

The OPPD has identified a maximum of 60 additional employees during the license renewal term plus an additional 182 indirect jobs (total 242) in the surrounding community (OPPD 2002). Section 3.7.5 of the GEIS (NRC 1996) states that if plant-related population growth is less than 5 percent of the study area’s total population, offsite land-use changes would be small,

(a) Calculated by assuming that the average number of households is 1 per new job and that there are 2.49 persons per household (OPPD 2002).

(b) Calculated by assuming that the average American uses between 50 and 80 gal of water for personal use per day; 603 people × 80 gal per person/day = 48,240 gpd (182 m³/d).

especially if the study area has established patterns of residential and commercial development, a population density of at least 23 persons/km² (60 persons/mi²), and at least one urban area with a population of 100,000 or more within 80 km (50 mi). In this case, population growth will be less than 5 percent of the area's total population; the area has established patterns of residential and commercial development, a population density of well over 23 persons/km² (60 persons/mi²), and at least one urban area (Omaha MSA) with a population of 100,000 or more within 80 km (50 mi). Consequently, the staff concludes that population changes resulting from license renewal are likely to result in SMALL offsite land-use impacts.

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 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. If the plant's tax payments are projected to be small relative to the community's total revenue, tax-driven, land-use changes during the plant's license renewal term would be SMALL, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development. Section 4.7.2.1 of the GEIS states that if tax payments by the plant owner are less than 10 percent of the taxing jurisdiction's revenue, the significance level 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.

The Nebraska State Constitution Article VIII, Section 11 stipulates that every corporation and political subdivision organized primarily to provide electricity shall annually make the same payments in lieu of taxes as it made in 1957 to the same public bodies, and that additionally, each public corporation pay to the treasurer of any county, within the limits of which such public corporation sells electricity at retail, a sum of 5 percent of the annual gross revenue. Because the OPPD is a publicly owned electric utility and a political subdivision responsible for the production and distribution of electricity within a 13-county service area, the OPPD is exempt from paying State-occupational, personal-property, and real-estate taxes. Instead, the OPPD, as directed by Article VIII, makes 6 payments in lieu of taxes each year to the municipalities and 12 Nebraska counties (Burt, Cass, Colfax, Dodge, Douglas, Johnson, Nemaha, Otoe, Richardson, Sarpy, Saunders, and Washington) in which the OPPD sold power in 1957. In addition, each county receives 5 percent of the total gross revenue the OPPD receives from electricity sales from within the county, minus the amount already paid to the incorporated area of the county. From 1996 to 2000, approximately 80 percent of the OPPD's total annual payments have been paid to Douglas County, the largest consumer of OPPD electricity. In 2000, the OPPD's payments totaled \$17.6 million, \$15 million of which was paid to Douglas

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County and its constituent municipalities. By comparison, the OPPD made payments totalling approximately \$1.79 million and \$330,000 to the county governments and constituent municipalities in Sarpy and Washington counties, respectively (OPPD 2002).

Based on a review of the issues related to land use and the criteria in the GEIS, the staff concludes that the net impact of plant-related population increases is likely to be SMALL. The staff also concludes that tax-related, land-use impacts are likely to be SMALL. There are several reasons for these conclusions. First, the OPPD does not intend to refurbish Fort Calhoun Station in conjunction with license renewal. Thus, there will be no increase in employment at Fort Calhoun Station as a result of refurbishment activities. Second, the OPPD has stated that the permanent workforce at Fort Calhoun Station will remain stable during the renewed-license operating period of 20 years (OPPD 2002). Last, the publicly owned OPPD will still be responsible for producing and distributing electricity (and the resulting in lieu payments) even if the license for Fort Calhoun Station is not renewed. Consequently, the staff concludes that the offsite land-use impacts are likely to be SMALL and would not require mitigation.

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.

The permanent employment associated with Fort Calhoun Station, Unit 1 is currently 772 employees (OPPD and contractors) (OPPD 2002). During periods of refuelling, which occur every 18 months and last about 30 days, approximately 600 workers are hired on a temporary basis. The "upper bound" for the potential increase in permanent staff during the license renewal term is 60 additional workers, or approximately 8 percent of the current permanent and contract workforce of 772. Access to Fort Calhoun Station is via U.S. Highway 75. The OPPD states that the highway in the vicinity of Fort Calhoun Station carries a level-of-service (LOS) designation of "B" from the City of Blair to Fort Calhoun. The NRC concluded in the GEIS that impacts to roads with LOS designations of "A" or "B" are small. Based on this information, the OPPD concluded that the impacts on transportation during the license renewal term would be SMALL and no mitigative measures would be warranted.

The staff reviewed the OPPD's assumptions and resulting conclusions. The staff concludes that any impact of the OPPD on transportation-service degradation is likely to be SMALL and does not require further mitigation.

4.4.5 Historic and Archaeological Resources

The National Historic Preservation Act (NHPA), as amended through 1992, requires Federal agencies to take into account the potential effects of their undertakings on historic properties. The historic-review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation in 36 CFR Part 800, as amended through 2001. Renewal of an OL for a nuclear power plant is an undertaking that could possibly affect either known or potential historic properties that may be located at the plant. Therefore, in accordance with the provisions of 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 Office before proceeding. If it is determined that historic properties are present, the NRC is required to assess and resolve possible adverse effects of the undertaking. In general, lands within the boundaries of a nuclear-plant site fall into one of the following categories:

- (1) Areas with No Potential for archaeological resources. These areas include lands where past disturbances related to the construction of the power station and appurtenant facilities have taken place to such an extent that once-extant cultural resources are no longer present. No further archaeological investigations would be recommended for these areas.
- (2) Areas with Low Potential for archaeological resources. Lands within the plant site that fall into this category are those that are relatively undisturbed but that possess characteristics that would normally indicate a low possibility for most types of cultural resources to occur. For the most part, these lands have a degree of slope greater than 15 percent. For most of these areas, further archaeological work would not be necessary, although there could be smaller areas within the larger zone where specific ground conditions could require investigation.
- (3) Areas with Moderate-to-High Potential for archaeological resources. These areas are classified as those that are relatively undisturbed by past activities and have a likelihood for prehistoric and historic archaeological sites, according to local models of prehistoric and historic land use and settlement patterning. Archaeological investigation would be recommended prior to undertaking any ground-disturbing activities in these areas.

According to the Fort Calhoun Station ER (OPPD 2002), the plant site is relatively small in terms of total acreage. The exclusion zone about 512 ha (1265 ac). Approximately 267 ha (660 ac) of the exclusion zone is on the Nebraska side of the Missouri River and consists of nearly level floodplain deposits (85 percent), with the remainder in the lower slopes of the Missouri River bluffs. The acreage lying between the existing rail spur and U.S. Highway 75

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also includes upland forest vegetation. Another 245 ha (604 ac) of the exclusion zone lies east of the Missouri River in Iowa and consists of river floodplain with cropland and natural vegetation. Of the 267 ha (660 ac) at the plant site, about 55 ha (135 ac) is occupied by plant facilities or is maintained as part of plant operations. Another 140 ha (345 ac) consists of leased cropland.

Based on the impacts of past construction activities and particularly the fact that much of the plant site is situated on floodplain alluvium, which has been developed since approximately 1850, the section of the site that lies south of the current Union Pacific rail spur should be categorized as having No Potential for cultural resources, either prehistoric or historic. A possible exception to this categorization could be the hypothesized buried presence of the steamboat wreck, the *Benton*, in proximity to the current nuclear-plant site (Section 2.2.9.2).

However, the section of the plant site that lies north of the rail spur and that is bounded on the west by U.S. Highway 75 should be categorized as having Moderate-to-High Potential because it contains remnants of the former town of DeSoto, a historic property that is potentially eligible for listing on the National Register of Historic Places. As discussed in Section 2.2.9.2, archaeological investigations within the highway right-of-way revealed the existence of significant subsurface remains of elements of the former town site. The OPPD has indicated that no additional land-disturbing activities at the plant site or along the existing transmission line right-of-way are planned for the license renewal period.

Based on the presently known cultural-resources status at the Fort Calhoun Station plant and the staff's cultural-resource analysis and consultation, the staff concludes that the potential impacts on historic and archaeological resources during the license renewal period are expected to be SMALL and mitigation is not warranted.

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy in which Federal actions should not result in disproportionately high and adverse impacts on minority^(a) or low-income populations. Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under NEPA. The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice (CEQ 1997). Although the Commission is not subject to the Executive Order, the Commission has voluntarily committed to undertake environmental-justice reviews. Specific guidance is provided in NRC Office of Nuclear Reactor

(a) The NRC guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, Black races, or Hispanic ethnicity. "Other" races and multiracial individuals may be considered as separate minorities (NRC 2001).

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 minorities within the census block groups^(a) in each state within the 80 km (50 mi) potentially affected by the license renewal of Fort Calhoun Station, Unit 1 exceeds the corresponding percentage of minorities in the state of which it is a part by 20 percentage points, or if the corresponding percentage of minorities within the census block group is at least 50 percent. 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 state of which it is a part by 20 percentage points, or if the corresponding percentage of low-income population within a census block group is at least 50 percent. For census block groups within Washington, Douglas, and Sarpy counties, for example, the percentage of minority and low-income populations is compared to the percentage of minority and low-income populations in Nebraska. The OPPD conducted its analysis using census tracts rather than the smaller block groups.

The scope of the review as defined in NRC Guidance (NRC 2001) should include an analysis of impacts on minority and low-income populations, the location and significance of any environmental impacts during operations on populations that are particularly sensitive, and any additional information pertaining to mitigation. The descriptions to be provided by this review should state whether these impacts are likely to be disproportionately high and adverse. The review should also evaluate the significance of such impacts.

The staff examined the geographic distribution of minority populations recorded during the 2000 Census (Geolytics Software 2000) and low-income populations recorded during the 1990 Census (Geolytics Software 1990) within 80 km (50 mi) of Fort Calhoun Station, Unit 1, encompassing 12 counties in Nebraska (Burt, Butler, Cass, Colfax, Cuming, Dodge, Douglas, Lancaster, Sarpy, Saunders, Thurston, and Washington) and 6 counties in Iowa (Crawford, Harrison, Mills, Monona, Pottawattamie, and Shelby). The analysis was also supplemented by

(a) 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 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 (USBC 1999).

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field inquiries to the planning department and social service agencies in Washington, Douglas, and Sarpy counties.^(a)

The OPPD conducted its analysis for minority and low-income populations using the convention of including a census tract if at least 50 percent of its area lay within 80 km (50 mi) of Fort Calhoun Station, Unit 1 (OPPD 2002). Using this convention, the 80-km (50-mi) radius included 153 census tracts. The “more than 20 percentage points” criterion was used to determine whether a census tract should be counted as containing a minority or low-income population (OPPD 2002). Figures 4-1 and 4-2 show the distribution of census block groups for the minority and low-income populations, respectively (shaded areas).

Based on the “more than 20 percentage points greater” criterion, minority populations exist in three counties in Nebraska (Thurston, Colfax, and Douglas) and one county in Iowa (Crawford). Figure 4-1 shows the locations of census block groups with minority populations.

By the NRC criteria (50 percent of population, or at least 20 percentage points greater than the state), three counties in Nebraska (Thurston, Burt, and Douglas) and one county in Iowa (Pottawattamie) contain census block groups within 80 km (50 mi) of Fort Calhoun Station that contain low-income populations. Figure 4-2 shows the locations of census block groups with low-income populations.

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 disproportionate manner. Based on staff guidance (NRC 2001), air, land, and water resources within about 80 km (50 mi) of Fort Calhoun Station were examined. Within that area, a few potential environmental impacts could affect human populations; all of these were considered SMALL for the general population. These include

- groundwater-use conflicts (discussed in Section 4.5)
- electric shock (discussed in Section 4.2.1)
- microbiological organisms (discussed in Section 4.1.4)
- postulated accidents (discussed in Chapter 5 of this SEIS and Chapter 5 of the GEIS)

(a) Washington, Douglas, and Sarpy counties were the focus of this inquiry because all of these counties lie within the 80-km (50-mi) radius and are nearest Fort Calhoun Station. The staff concluded that any findings of environmental-justice issues in these counties would warrant further field inquiries in more distant counties. For reasons stated later in this section, further investigation was not warranted.

The pathways through which the environmental impacts associated with the Fort Calhoun Station, Unit 1 license renewal can affect human populations are discussed in each associated section. The staff then 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 populations could be disproportionately affected. In addition, the staff did not identify any location-dependent disproportionate impacts affecting these minority and low-income populations. The staff concludes that offsite impacts from Fort Calhoun Station, Unit 1 to minority and low-income populations would be SMALL and no additional mitigation actions are warranted.

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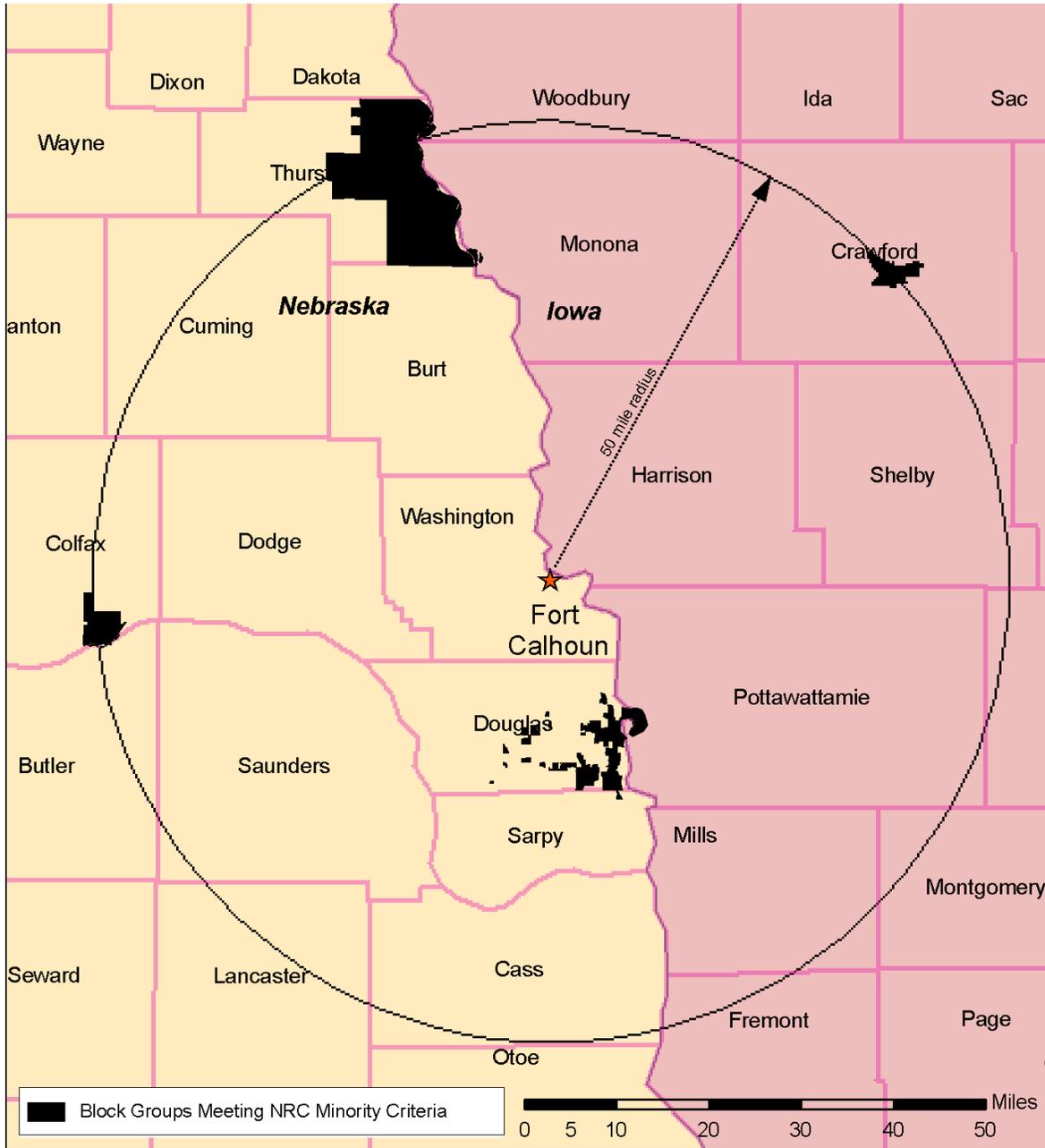


Figure 4-1. Geographic Distribution of Minority Populations (shown in shaded areas) Within 80 km (50 mi) of Fort Calhoun Station Based on 2000 Census Block Group Data

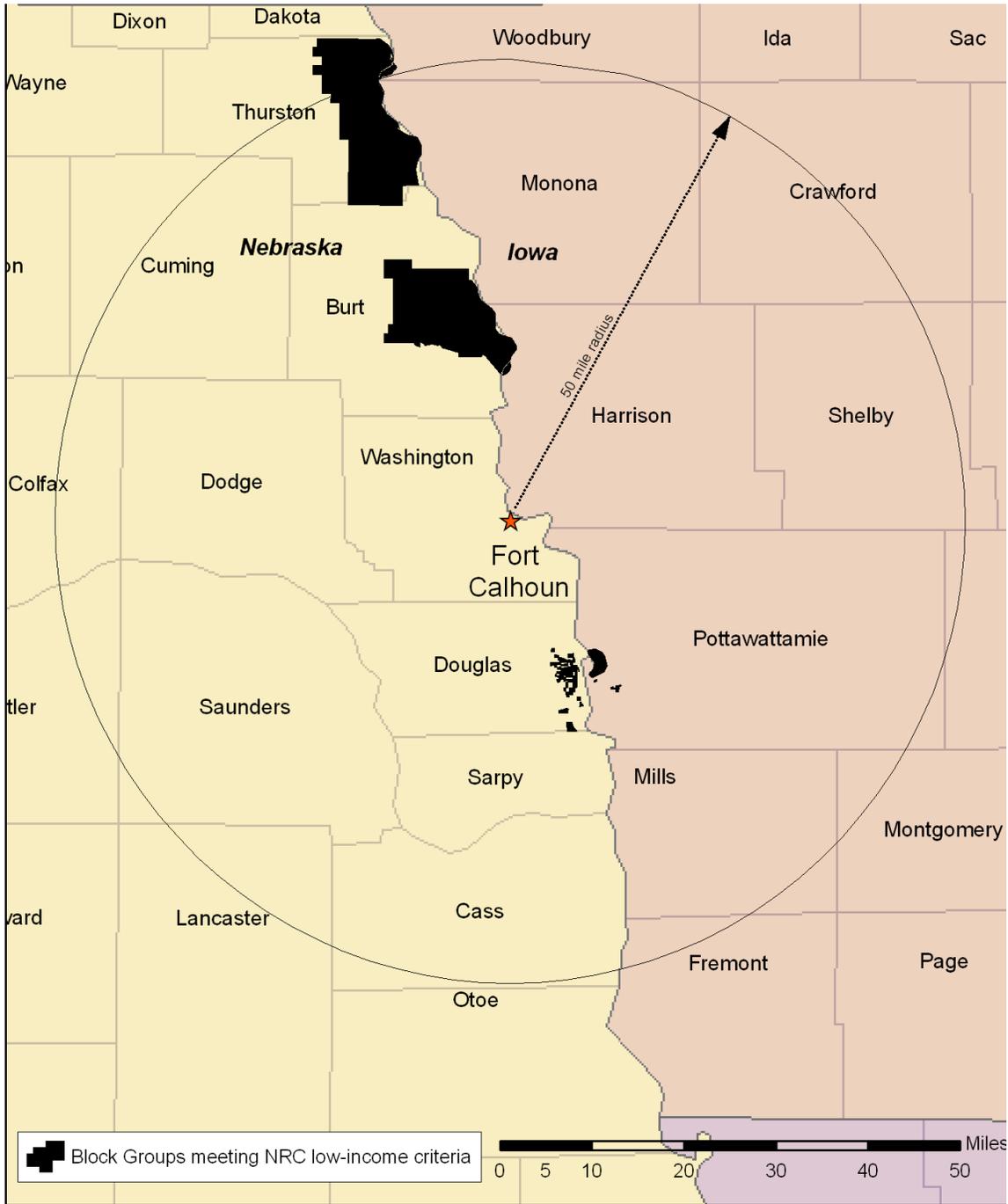


Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of Fort Calhoun Station Based on 1990 Census Block Group Data

4.5 Groundwater Use and Quality

The Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 applicable to Fort Calhoun Station groundwater use and quality is identified in Table 4-8. The OPPD stated in its ER (OPPD 2002) that it is not aware of any new and significant information associated with the renewal of the Fort Calhoun Station OL. The staff has not identified any significant new information during its independent review of the OPPD ER (OPPD 2002), 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 staff concluded that the impacts are SMALL and additional 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
GROUND-WATER USE AND QUALITY	
Ground-water use conflicts (potable and service water; plants that use <100 gpm)	4.8.1.1

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

- Ground-water use conflicts (potable and service water; plants that use <100 gpm). Based on information in the GEIS, the Commission found that

Plants using less than 100 gpm are not expected to cause any groundwater use conflicts.

As discussed in Section 2.2.2, Fort Calhoun Station groundwater use is less than 0.068 m³/s (100 gpm). The staff has not identified any significant new information during its independent review of the OPPD ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no groundwater-use conflicts during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to groundwater use and quality that are applicable to Fort Calhoun Station.

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 4-9.

Table 4-9. 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

The presence of threatened or endangered species in the vicinity of Fort Calhoun Station is discussed in Sections 2.2.5 and 2.2.6 of this SEIS. This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected by the continued operation of the nuclear power plant during the license renewal term. The staff began consultation with the FWS regarding threatened and endangered species by requesting a list of threatened and endangered species (NRC 2002a). The staff submitted a biological assessment to the FWS on December 9, 2002, concerning threatened and endangered species that could be affected by continued operation and maintenance of Fort Calhoun Station and the associated transmission lines (NRC 2002b, Appendix E). The assessment concluded that the continued operation of Fort Calhoun Station, Unit 1 may affect, but is not likely to adversely affect, the Federally listed pallid sturgeon and bald eagle, and would have no effect on the western prairie fringed orchid, piping plover, or least tern. On January 13, 2003, FWS requested additional information on the pallid sturgeon, which the NRC provided by letter May 30, 2003 (see Appendix E). Based on all the data available, it is still the NRC's position that the license renewal and continued operation of Fort Calhoun Station, Unit 1 may affect, but is not likely to adversely affect, the pallid sturgeon and bald eagle, and would have no effect on the western prairie fringed orchid, piping plover, or least tern.

Although the staff has come to the conclusion that the proposed renewal of the Fort Calhoun operating license is not likely to adversely affect any threatened or endangered species, the Fish and Wildlife Service has been unable to concur with the staff's determination. As a result, pursuant to 50 CFR § 402.14(a), the staff plans to pursue formal consultation with FWS. Since the current operating license (the impacts of which were analyzed in *Final Environmental Statement Related to the Operation of Fort Calhoun Station Unit 1* [AEC 1972]) does not expire until August 2013, the staff has determined that the proposed action causes no irreversible or

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irretrievable commitment of resources not previously considered, and that proceeding with the proposal does not foreclose the formulation or implementation of any reasonable and prudent alternatives. Therefore, pursuant to 50 CFR § 402.09, the staff has concluded that the proposed action may proceed.

4.6.1 Aquatic Species

As described in Section 2.2.5, only the pallid sturgeon (*Scaphirhynchus albus*) is Federally listed as threatened or endangered. No other aquatic organisms that have Federally threatened or endangered status are expected to occur in the vicinity of Fort Calhoun Station. This fish is often found near confluences, islands, and at the downstream end of sandbars (OPPD 2002). It is believed that this fish spends some time in the Missouri River and returns to the Platte River annually to spawn or possibly overwinter (66 FR 19910 [FWS 2001]).

The pallid sturgeon, once common in the Missouri River, is endangered throughout its historic range. The relative rarity of the pallid sturgeon in the vicinity of Fort Calhoun Station and upstream to Gavins Point Dam is indicated by historical collections. No pallid sturgeon were reported to be collected in the extensive monitoring studies conducted by OPPD and others in the Fort Calhoun Station vicinity in the 1970s (OPPD 1978, Hesse, Bliss, and Zuerlein 1982). Kallemeyn and Novotney (1977) collected 248 sturgeon as a result of extensive collections in 1976 at four stations, one station in the unchannelized reach below Fort Randall Dam river kilometer (rkm) 1416 (river mile [rmi] 880), two stations in the unchannelized reach below Gavins Point Dam rkm 1305 (rmi 811), and one station in the channelized reach below Sioux City, Iowa. Only one pallid sturgeon was found in these collections, in the reach below Fort Randall Dam. All of the remainder were shovelnose sturgeon and, of these, 227 were collected in the unchannelized reach below Gavins Point. No sturgeon were collected in the channelized reach below Sioux City. This finding is consistent with the low catches of shovelnose sturgeon in the OPPD studies for Fort Calhoun Station (OPPD 1978).

According to the FWS, habitat-restoration projects, which have occurred since the mid-1970s, have benefited fish species on the Missouri River. Approximately 511 pallid sturgeon were stocked in the Platte River in 1997 and 1998. Nevertheless, in the lower Missouri River, within which Fort Calhoun Station is situated, more recent documented occurrences of pallid sturgeon are rare. According to the Nebraska Natural Heritage Program (NGPC 2001), between Gavins Point Dam, including its tailwaters, and Nemaha County, approximately at river kilometer (Rkm) 887 (river mile [Rmi] 525), 32 occurrences of pallid sturgeon were documented from January 1980 through June 2001. Fort Calhoun Station is located at Rkm 1039 (Rmi 646). The number of pallid sturgeon occurring upstream of Fort Calhoun Station, according to this data source (NGPC 2001), is 15 out of the 32 occurrences with 17 out of the 32 occurrences downstream of Fort Calhoun Station and approximately 7 out of the 32 occurrences documented at the Plattsmouth Bend. This data source (NGPC 2001) also documents an

additional 8 pallid sturgeon near the confluence of the Platte and Missouri Rivers, but in the Platte River, during this same time period (i.e., from Rkm 0.0 to Rkm 53 [Rmi 0.0 to Rmi 33] within the Platte River). In a separate study funded by the U.S. Army Corps of Engineers (USACE) and carried out by the Nebraska Game and Parks Commission (Mestl 2003), 13 pallid sturgeon were documented in this same reach of the lower Missouri River (i.e., between Rkm 1305 and Rkm 887 [Rmi 811 and Rmi 525]) during 2001–2002. The majority of these (i.e., 10 out of the 13 pallid sturgeon) were located near the Plattsmouth Bend (approximately Rkm 954 to 956 [Rmi 593 to 594]).

The studies done by OPPD in the early 1970s documented no occurrences of the pallid sturgeon in the reach of the river near Fort Calhoun Station and the Natural Heritage Program has documented only 15 occurrences of pallid sturgeon upstream of Fort Calhoun Station to Gavins Point Dam, in the years ranging from January 1980 through June 2001 (NGPC 2001), while NGPC documented none upstream of Fort Calhoun Station in their independent study carried out in 2001 and 2002 (Mestl 2003).

The staff has concluded that continued operation of the plant under license renewal is not likely to adversely affect the pallid sturgeon, and will have no effect on other listed or proposed endangered or threatened aquatic species within the immediate vicinity of Fort Calhoun Station. Therefore, it is the staff's determination that the impact on threatened or endangered aquatic species from an additional 20 years operation of Fort Calhoun Station would be SMALL and further mitigation is not warranted.

4.6.2 Terrestrial Species

Federally listed threatened and endangered terrestrial species that have the potential to occur on or in the vicinity of Fort Calhoun Station or Line 74S/74 are described in Section 2.2.6 of this SEIS. These species include the bald eagle, least tern, piping plover, and western prairie fringed orchid.

Bald eagles occur in the vicinity of Fort Calhoun Station predominantly during spring and fall migrations and during the winter. Continued operation of Fort Calhoun Station, Unit 1 could affect bald eagles if plant operations resulted in changes to conditions in the Missouri River that affected food availability (i.e., the availability of fish or waterfowl) or if Line 74S/74 presented a hazard to the eagles.

Discharges of heated water to the Missouri River during plant operations result in warmer water in the outfall area, and during the winter, the resulting open water can attract eagles that would otherwise migrate further south. This additional open water increases food availability for bald eagles during the winter and represents a benefit to eagles.

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Only one transmission line (Line 74/74S) is associated with Fort Calhoun Station and within the scope of the license renewal application review. On the basis of its design, location, and surrounding habitats, it is unlikely that the line could adversely affect the bald eagle. Line 74S/74 is an 11-km (7-mi) long 161-kV line that was completely reconstructed in 1999 to National Electrical Safety Code requirements that include configuration standards that reduce the hazard of raptor electrocution. Approximately 1.6 km (1 mi) of the line crosses old-field and woodland habitats of the Missouri River bluff; the remaining 10 km (6 mi) cross agricultural land. The Missouri River bluffs area that is traversed by the line is relatively developed and is traversed by U.S. Highway 75. The line does not cross the Missouri River or any water body that might attract eagles or serve as travel corridors for the species. In addition, because of the level of disturbance and human activities, habitats along the line are not likely to be used by bald eagles. These conditions greatly reduce or eliminate the probability that bald eagles would accidentally strike the transmission line and be killed or injured.

The NRC has assessed the impacts of transmission lines on avian populations in its GEIS on the effects of nuclear power plant license renewal (NRC 1996). In the GEIS, the NRC concluded that mortality resulting from bird collisions with transmission lines associated with license renewal and an additional 20 years of operation would be of small significance. This conclusion was based on (1) the fact that existing literature does not indicate that collision mortality is high enough to result in population-level effects and (2) the lack of known instances where nuclear power plant lines affect large numbers of individuals in local areas. There have been no reports of collisions or electrocutions of bald eagles along Line 74S/74 and no other demonstrated impact to this species during the operation of Fort Calhoun Station. Therefore, the staff has concluded that the continued operation of Fort Calhoun Station may affect, but is unlikely to adversely affect, the bald eagle.

Least terns and piping plovers use sandbar habitats along the Missouri River, but none have been observed in the Fort Calhoun Station area because of the lack of suitable habitat in this reach of the river. There have been no reports of collisions or electrocutions of piping plovers or least terns along Line 74S/74 and no other demonstrated impact to either of these species during the operation of Fort Calhoun Station. The lack of suitable prairie habitat at Fort Calhoun Station and along the corridor of Line 74S/74 makes the occurrence of the western prairie fringed orchid in the Fort Calhoun Station vicinity very unlikely. Therefore, the staff has concluded that the continued operation of Fort Calhoun Station and the continued maintenance of Line 74S/74 will have no affect on the least tern, piping plover, or western prairie fringed orchid.

The staff has concluded that the continued operation of Fort Calhoun Station may affect, but is not likely to adversely affect, the bald eagle and will have no effect on the western prairie fringed orchid, piping plover, or the least tern. Therefore, it is the staff's determination that the impact on threatened or endangered terrestrial species from an additional 20 years of operation of Fort Calhoun Station would be SMALL and 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 significant new 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; reviewed the licensee's program to determine any significant new impacts; and conducted its own independent review, including public scoping meetings, to identify issues with significant new information. Processes for identifying and evaluating new information are described in Chapter 1 under License Renewal Evaluation Process.

4.8 Summary of Impacts of Operations During the Renewal Term

Neither the OPPD nor the staff is aware of information that is both new and significant related to any of the applicable Category 1 issues associated with Fort Calhoun 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 additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for 12 Category 2 issues applicable to Fort Calhoun Station operation during the renewal term and for environmental justice and chronic effects of electromagnetic fields. For all 12 issues and environmental justice, the staff concluded that the potential environmental impact of renewal-term operations of Fort Calhoun 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.

4.9 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

36 CFR Part 800. Code of Federal Regulations, Title 36, *Parks, Forests, and Public Property*, Part 800, "Protection of Historic Properties."

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