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OPPD
Omaha Public Power District

Fort Calhoun Station
P.O. Box 550, Highway 75
Fort Calhoun, NE 68023-0550

March 14, 2003
LIC-03-0038

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

References: 1. Docket No. 50-285
2. Letter from U.S. Fish and Wildlife Service (J. Cochnar) to NRC (P. T. Kuo) dated January 13, 2003

SUBJECT: Comments on Letter from U. S. Fish and Wildlife Service concerning Impact of Fort Calhoun Station Operation on Pallid Sturgeon (TAC No. MB3402)

By letter dated December 9, 2002, the Nuclear Regulatory Commission (NRC) requested comments from the U. S. Fish and Wildlife Service (USFWS) on a Biological Assessment of the Potential Impacts to Threatened and Endangered Species Resulting from an Additional 20 years of Operation of the Fort Calhoun Station (FCS), Unit 1, Nuclear Power Plant. The response from the USFWS (Reference 2) indicated that additional information was needed before the USFWS could agree that the pallid sturgeon would not likely be adversely affected. The USFWS also requested that larval monitoring studies be initiated to verify that pallid sturgeon larvae are not being adversely affected by FCS operations.

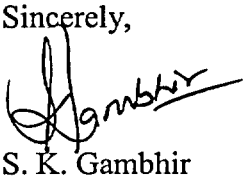
Mr. J. S. Cushing of the NRC requested that Omaha Public Power District (OPPD) provide information to support the NRC response to the USFWS. Attached please find the requested information to (1) assist the NRC in responding to the four specific questions posed by USFWS regarding thermal discharge from FCS and (2) demonstrate that there is no reasonable basis to believe that additional larval monitoring studies would provide information indicating that pallid sturgeon populations in the Missouri River are adversely affected by current FCS operations or would be adversely affected by renewal of the FCS operating license. Thus, additional studies are not warranted.

IE23

This letter contains no regulatory commitments. If you have any questions or require additional information, please contact T. C. Matthews at (402) 533-6938.

I declare under penalty of perjury that the foregoing is true and correct. (Executed on March 14, 2003)

Sincerely,



S. K. Gambhir
Division Manager
Nuclear Projects

Attachment

c: E. W. Merschoff, NRC Regional Administrator, Region IV
W. C. Walker, NRC Region IV, Senior Project Engineer (w/o attachment)
W. F. Burton, NRC Project Manager (w/o attachment)
J. S. Cushing, NRC Project Manager
A. B. Wang, NRC Project Manager (w/o attachment)
J. G. Kramer, NRC Senior Resident Inspector
Division Administrator - Public Health Assurance
Winston & Strawn (w/o attachment)

OPPD Comments on Letter from U. S. Fish and Wildlife Service Concerning Impact of Fort Calhoun Station Operation on Pallid Sturgeon

INTRODUCTION

Omaha Public Power District (OPPD) offers the following information to the U.S. Nuclear Regulatory Commission (NRC) to assist the commission in responding to a request for additional information from the U.S. Fish and Wildlife Service (USFWS) regarding the NRC's *Biological Assessment of the Potential Impacts to Threatened and Endangered Species Resulting from an Additional 20 Years of Operation of the Fort Calhoun Station, Unit 1, Nuclear Power Plant* (NRC 2002a). The assessment addresses potential impacts on five federally threatened or endangered species having potential to occur in the general vicinity of OPPD's Fort Calhoun Station (FCS), and concludes that renewal of the FCS operating license may affect, but is not likely to adversely affect, the pallid sturgeon and bald eagle, and will have no effect on the remaining three species. The NRC forwarded the assessment to USFWS for concurrence with these determinations via letter dated December 9, 2002 (NRC 2002b).

In its response to the NRC, dated January 13, 2003, USFWS indicated that additional information was required before it could concur with the NRC's "not likely to affect" determination for the pallid sturgeon (*Scaphirhynchus albus*). In this context, USFWS posed four specific questions regarding the thermal characteristics of the cooling water discharged by FCS to the Missouri River. In addition, the USFWS response notes that fish larval monitoring studies at FCS ended in 1977, and states that "Since the current operating license for FCS does not expire until 2013, the Service [USFWS] requests that the larval monitoring studies be reinitiated to verify that pallid sturgeon larvae are not being adversely affected by FCS operations" (USFWS 2003).

OPPD agrees with the NRC's determinations with respect to the five federally threatened or endangered species addressed in its December 2002 assessment, and offers the following information to (1) assist the NRC in responding to the four specific questions posed by FWS regarding thermal discharge from FCS and (2) demonstrate that there is no reasonable basis to believe that additional larval monitoring studies would provide information indicating that pallid sturgeon populations in the Missouri River are adversely affected by current FCS operations or would be adversely affected by renewal of the FCS operating license. Thus, additional studies are not warranted.

RESPONSE TO THERMAL DISCHARGE INQUIRIES

As discussed in the NRC's Biological Assessment (NRC 2002a), the maximum cooling water flow during FCS normal operating conditions occurs in summer, and amounts to approximately 827 cubic feet per second (cfs), or about 2 percent of the average river flow during that time. At the plant's currently authorized maximum power level of 1500 megawatts-thermal (MWt), in effect since 1980, this cooling water is usually discharged at a nominal temperature of

approximately 23°F higher than the ambient river in the summer; in the winter, this temperature differential can be raised to approximately 31 – 32°F when a portion of the heated discharge is recirculated back to the intake structure to prevent icing (OPPD 2002, Sections 3.1.2, 3.1.3.2). In the spring and fall when river temperatures are cool, the cooling water discharge may range approximately 1 - 3°F higher than the summer nominal condition, and in winter the temperature differential can range several degrees higher than 31 – 32°F, reflecting the use of fewer cooling water pumps and higher efficiencies of plant heat exchangers and condensers during those times.

OPPD, in cooperation with others, conducted several modeling and monitoring studies from 1973 through 1977 to determine the characteristics of the thermal discharge from FCS (OPPD 1978, Section III). These studies were conducted prior to 1980 when the maximum authorized power level and discharge temperature of FCS was lower than present (i.e., 1420 MWt;). However, results from the studies demonstrated that the Atomic Energy Commission's initial projections for the FCS thermal plume dimensions bounded conditions projected for the current FCS power level (OPPD 2002, Section 4.4), so they provide useful insight to current operating conditions. OPPD is currently participating in a cooperative effort with the U.S. Environmental Protection Agency (EPA) and the Nebraska Department of Environmental Quality (NDEQ) to evaluate the characteristics of the thermal discharge from FCS using computer modeling (CORMIX) and field verification.

OPPD uses preliminary results from the current CORMIX study and pertinent information from the historical studies as basis for our response to the four specific questions posed by USFWS in its January 13, 2003 letter to NRC (USFWS 2003) regarding the thermal characteristics of the cooling water discharged by FCS to the Missouri River, as follows:

1. **How warm is the released water after it is discharged from FCS?**

   The initial temperature of the cooling water discharged from FCS is provided in the introductory discussion above. As noted, at maximum power and under normal operating conditions in summer, the FCS cooling water consists of approximately 827 cfs at a nominal temperature of approximately 23°F above the ambient river temperature. The maximum temperature of the FCS discharge authorized under the current National Pollutant Discharge Elimination System (NPDES) Permit for the plant is 110°F. However, a temporary authorization of 112°F is allowed in view of unusually high ambient river temperatures that have occurred in recent years, and may be established in the permit if results of the current CORMIX study indicate that water quality standards are met (OPPD 2002, Section 4.4).

2. **How far downstream does the released water travel before being fully mixed with the Missouri River in the May-July time period? Does this distance vary under high and low flow conditions?**

   The downstream distance that FCS cooling water travels has not been directly assessed in the current CORMIX studies, which have been focused on conformance to provisions of Nebraska Title 117 Chapter 1, Section 041, for mixing zones: i.e., that limited area or volume of a water body designated by NDEQ that is allowed for dispersal of the discharge, upon

meeting initial discharge limits. However, CORMIX thermal plume modeling results using near worst case summer low flow conditions indicate that the plume temperature would fall to approximately 2.66°F above river ambient temperature at a point 5000 feet downstream, the distance assumed at the downstream end of the mixing zone. This modeling run assumed only circulating water flow from the plant (802 cfs, slightly lower than total discharge of 827 cfs), a discharge temperature of 23.6°F above river ambient temperature, which approximates full power conditions; and worst case summer river conditions, including a summer 7-day, 10-year low flow (7Q10) of 28,892 cfs and an ambient river temperature of 87°F. Historical thermal plume studies indicate that low river flows result in poorer mixing conditions than high river flow conditions, so predicted plume temperature at a point 5000 feet downstream would be lower at higher river flows (OPPD 1978, Section III, page 8).

Historical triple-depth field monitoring of the plume in August 1975 provides an example of how rapidly temperatures dissipate in the near field part of the plume during typical summer conditions. At the time those measurements were made, the plant was operating at 96 percent power level, initial discharge temperature was 16.6°F above river ambient temperature, and river flow was 35,000 cfs. Results indicated that maximum plume temperatures were 1.7°F and 1.4°F within 1600 feet and 5800 feet of the discharge point, respectively, and was less than 1°F above ambient at and beyond 150 feet from the Nebraska bank (OPPD 1978, Section III, Table 18).

3. **How much does the water plume warm the Missouri River in total after mixing? Does the amount of warming vary under high and low flow conditions?**

Simple dilution calculations can be used to provide theoretical estimates of river temperature increases after total mixing. Assuming a cooling water discharge flow of 827 cfs at an assumed temperature increase of 23.6°F, which approximates maximum plant power level in summer, the average river temperature would be increased by approximately 0.7°F under summer low flow conditions (7Q10) of 28,892 cfs, and by approximately 0.2°F under a summer maximum monthly average flow (July) of 78,560 cfs. However, as may be inferred from OPPD's response to Question 3 above, full mixing likely does not occur for several miles below the outfall, yet heat dissipation factors other than dilution (e.g., heat loss to the atmosphere) are important in reducing plume temperature.

4. **During the pallid sturgeon spawning period (May – July), how far downstream (under high and low flow conditions) is a temperature change detectable? Is it detectable at the mouth of the Platte River?**

As noted above, preliminary results of the CORMIX study have focused on near-field plume temperatures (e.g., at 5000 feet downstream). However, it is expected that plume excess temperatures would be virtually indistinguishable within a few miles downstream from the outfall. For example, results of triple-depth field monitoring of the thermal plume under conditions cited above in the response to Question 2 indicate that plume excess temperatures were mostly at or below 1°F within approximately 4 miles below the outfall (OPPD 1978,

Section III, Table 18). Diurnal variations in the ambient river may be as high as 3°F, based on FCS operations logs. The mouth of the Platte River is approximately 50 river miles downstream from FCS. Therefore, the FCS thermal plume is undetectable many miles upstream from the mouth of the Platte River.

USFWS REQUEST TO REINSTATE LARVAL MONITORING STUDIES

The USFWS notes that, although no pallid sturgeon spawning has been documented in the Missouri River between FCS and Gavins Point Dam, there does appear to be potential spawning habitat between Gavins Point Dam and Ponca State Park (USFWS 2003). USFWS further indicates that, if spawning does occur in that reach of the river, then pallid sturgeon larvae may drift as far downstream as FCS and be susceptible to entrainment. Noting that the NRC's assessment indicates that larval monitoring at FCS ended in 1977 and that the current operating license for FCS does not expire until 2013, USFWS requested that the FCS larval monitoring studies be reinitiated "to verify that pallid sturgeon larvae are not being adversely affected by FCS operations" (USFWS 2003).

OPPD does not believe that reinstatement of larval monitoring studies at FCS is warranted for several reasons, most of which were discussed in the NRC's Biological Assessment (NRC 2002a). The following discussion highlights these reasons and provides relevant supporting information.

1. **The probability of significant numbers of pallid sturgeon larvae to occur in the Missouri River at or upstream from FCS is very low considering the quantity and quality of available spawning habitat, absent or inferior spawning cues, the low population of adults, and other factors.**

   The Gavins Point–Ponca reach of the Missouri River may have some potential to support spawning of the pallid sturgeon, at least from the standpoint that this unchannelized reach exhibits greater diversity and more natural habitat characteristics than does the river downstream, which is channelized. However, spawning substrate is reportedly quite limited, based on observations of Hesse and Mestl (1993, pages 56 and 63) with respect to the paddlefish (*Polyodon spathula)*, which spawns adhesive eggs on coarse substrates in swift current, as is presumed to be the case for the pallid sturgeon (Smith 1979, page 16; USFWS 2000a, page 101). In addition, as indicated by USFWS in their January 13, 2003 letter (USFWS 2003), no pallid sturgeon spawning has been documented in the Missouri River between FCS and Gavins Point Dam, and the specific suitability of the Gavins Point-Ponca reach for pallid sturgeon spawning has not been demonstrated. Further, it is recognized that the hydrologic regime established under the current water control plan (CWCP) of the U.S. Army Corps of Engineers (USACE), particularly suppression of spring flows, has likely resulted in the loss of spawning cues (i.e., warm water coupled with river stage increases) for the pallid sturgeon (USFWS 2000a, pages 101, 125, 191), which would act to reduce or eliminate spawning success even if otherwise suitable spawning habitat is present. Moreover, while the critical importance of this habitat component is recognized, the

magnitude, frequency, and duration of these spawning cues for the pallid sturgeon currently remain unknown, and the USACE has indicated the need for additional research, monitoring, and evaluation to determine appropriate temperature and hydrologic parameters (USACE 2003, page 1).

The absolute rarity of the pallid sturgeon in the Missouri River from Gavins Point to St. Louis is indicated by recent collections that have included the lower Missouri River, in which the species has comprised only 0.2 to 0.4 percent of total river sturgeons collected (USFWS 2000a, page 104). Both the absolute rarity of the species in the river and its relative rarity in the FCS site vicinity and upstream to Gavins Point argue for low potential production of larvae upstream from FCS. As noted in the NRC's Biological Assessment (NRC 2002a), relatively more frequent observations of this species on the Missouri River have been made near the mouth of the Platt River, approximately 50 river miles downstream from FCS, and the Natural Heritage Program has documented only four occurrences nearer FCS or upstream, in years ranging from 1985 to 1996 (NRC 2002a). The relative rarity of pallid sturgeons in the vicinity of FCS and upstream to Gavins Point is also indicated by historical collections. No pallid sturgeons were reported to be collected in the extensive monitoring studies conducted by OPPD and others in the FCS vicinity in the 1970s (OPPD 1978, Hesse, Bliss, and Zuerlein 1982). Kallemeyn and Novotney (1977) collected 248 sturgeons as a result of extensive collections in 1976 at one station in the unchannelized reach below Fort Randall Dam, two stations in the unchannelized reach below Gavins Point Dam, 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 sturgeons were collected in the channelized reach below Sioux City, a finding consistent with the low catches of shovelnose sturgeons in the FCS studies.

If some pallid sturgeon do successfully spawn in the unchannelized Gavins Point – Ponca reach, it is reasonable to expect that many of these larvae, at least those with a relatively high survival probability, remain in that reach, considering the much higher availability of shallow water habitat relative to the downstream channelized river, which is important to their survival (USACE 2003, pages 7-9; USFWS 2000a, pages 198-203). Shallow water habitat, an indicator of potentially suitable nursery habitat for the pallid sturgeon, currently amounts to approximately 4,900 acres (63.8 acres/mile) in the Gavins Point-Ponca reach, as compared to only 1,027 acres (2.1 acres/mile) in the 484 river miles from Ponca to the Booneville reach, below Kansas City, where shallow water habitat increases to 18.3 acres/mile (USACE 2003, page 10).

The low potential for significant numbers of pallid sturgeon larvae to occur in the drift at FCS is directly supported by the low incidence of *Scaphirhynchus sp.* larvae found in intensive Missouri River fish larvae collections by OPPD and others in the vicinity of FCS in the 1970s. A review of available summary reports for that period indicate that the number of *Scaphirhynchus sp.* larvae collected in these efforts included none in 1974 and 1975, 1 in 1976, and 1 to a few in 1977 (OPPD 1978, Section IV, Chapter 3, Tables 3.1 and 3.3; OPPD

1977, Chapter 4, Table 4.2). Harrow and Schlesinger (1980, pages 1-5, Figure 1, pages 51-57) collected only 23 *Scaphirhynchus sp.* larvae (of a total 44,110 total larvae) in intensive vertical composite plankton net sampling at seven cross-channel transects on the Missouri River between Gavin's Point Dam and Leavenworth, Kansas. Fewer than 10 of these larvae were collected at the transect located at FCS. It is highly likely that all of these larvae were shovelnose sturgeon, which were and remain much more common than the pallid sturgeon in the Missouri River, as discussed above.

2. **If any pallid sturgeon larvae occur in the drift at FCS, their probability of loss to entrainment in the cooling water system is very low.**

On the basis of information from USFWS (UFWS 2000a, page 122) cited in NRC's Biological Assessment, some pallid sturgeon larvae, if spawned in the unchannelized Gavins Point-Ponca Reach, approximately 88 - 165 river miles upstream, may persist in the drift at FCS and, if so, may be subject to entrainment. Assuming an average river velocity of 3 feet per second, these drift-phase larvae would pass the site in approximately 3 days or less. Information from USFWS (Krentz 2003, pers. comm.) for hatchery-reared pallid sturgeon indicate that larvae at this stage would be relatively early-stage yolk-sac larvae, likely longer than 9 mm in length and substantially less than 18 mm, the approximate length at hatching and at 11 days, respectively, for laboratory-reared larvae. This suggests that drift-phase larvae at FCS would have limited swimming ability relative to ambient river current and would be dispersed. The few *Scaphirhynchus sp.* larvae collected by Harrow and Schlesinger (1980, pages 1-5, Figure 1, pages 51-57) at FCS in 1978, believed to be larvae of the relatively common shovelnose sturgeon, were all less than 12 mm in length.

FCS cooling water flow comprises only 1.8 - 2.0 percent of the average Missouri River flow during May-July, inclusive of the period when pallid sturgeon, if present, would be expected in the drift based on estimated spawning time (USFWS 2000a, page 100) and a 5 - 8 day period from fertilization to hatching for hatchery-reared fish (Krentz 2003, pers. comm.). Assuming homogeneous distribution of larvae in the river and conservatively assuming 100 percent mortality of entrained larvae, the potential fractional loss of drift larvae would also be 1.8 - 2.0 percent. OPPD recognizes that actual losses could be somewhat higher or lower than this estimate depending on such factors as actual entrainment survival rates and spatial heterogeneity of larvae. Nonetheless, on the basis of the information presented here and on the extensive entrainment monitoring and fish population studies conducted by OPPD at FCS in the 1970s (e.g., OPPD 1978, Section IV, Chapter 3, Parts II.D and IV; Hergenrader et al 1982, pages 219-220), none of which demonstrated adverse effects on fish populations, potential entrainment losses for pallid sturgeon larvae in the drift at FCS would be very low both on an absolute basis and in relation to the very high mortalities that would be expected for these larvae as a result of factors unrelated to FCS operation.

3. **Loss of pallid sturgeon larvae from entrainment at FCS would not significantly affect pallid sturgeon populations in the Missouri River.**

   Information from USFWS suggests that fecundity of pallid sturgeon may be in the range of 62,000 – 170,000 (USFWS 2000a, page 101), indicating a very low overall survival probability from egg to mature adult, even under natural conditions suitable for maintaining a stable population. High mortality, particularly in the early life stages, is a normal expectation, and incremental additional mortality of these early life stages represents far less potential for impact to the population than would incremental additional mortality to later life stages, particularly adults. Under present conditions in the Missouri River, survival probability for pallid sturgeon larvae is much lower than would be expected under natural conditions as a result of the massive habitat modifications that have taken place. As noted by USFWS (2000a, pages 112-113), destruction and alteration of ecological functions and habitat is believed to be the primary cause of declines in survival of pallid sturgeon, and the amount of larval and juvenile habitat available downstream of spawning sites is implicated as a major factor in recruitment. As indicated above, shallow water habitat, an indicator of potentially suitable nursery habitat for the pallid sturgeon, is very limited for many miles downstream from FCS. USACE data indicates that current shallow water habitat for at least 272 river miles below FCS is in the range of 2-5 percent of historic levels, and the river reach to well below Kansas City comprises only 7-24 percent of that needed to achieve 20 acres/mile, the minimum amount that the USACE and USFWS agree is necessary for the continued survival of the pallid sturgeon (USACE 2003, pages 10-12). Poor survival of pallid sturgeon larvae downstream from FCS is further indicated by the fact that the only pallid sturgeon larvae or young-of-the-year apparently so far documented in the river, despite intensive survey efforts, have been a few specimens in Lisbon Chute, part of the Big Muddy National Wildlife Refuge, at approximate river mile 217, over 400 river miles downstream from FCS (USFWS 2000a, page 106-107; USFWS 2000b; USFWS 2002). These factors indicate that survivability of any pallid sturgeon larvae that occur in the drift at FCS would be very low, and that the small incremental mortality that could result from entrainment at FCS would not have a detectable adverse effect on the population.

4. **Additional larval monitoring studies at FCS would not demonstrate that FCS has an adverse effect on the Missouri River pallid sturgeon populations.**

   OPPD believes that further entrainment monitoring studies at FCS would not demonstrate that FCS has any effect on the pallid sturgeon population, and considers it particularly inappropriate to conduct additional larval monitoring studies at FCS with the objective of verifying that pallid sturgeon larvae are not being adversely affected by FCS operations, as stated in the USFWS January 13, 2003 request. The extensive larval monitoring conducted at FCS in the 1970s clearly demonstrates that a small percentage of fish larvae present in the drift at FCS are lost as a result of entrainment through the plant's cooling system. Therefore, it is a reasonable expectation that a small fraction of pallid sturgeon larvae, if present, could also be lost. This phenomenon is density dependent, and it does not follow that adverse impact on individual larvae is a reasonable indicator of adverse impact to the pallid sturgeon

population. OPPD notes that the USFWS Pallid Sturgeon Recovery Plan, Section 1.2.3, recognizes that adverse effects of water intakes with respect to the pallid sturgeon are appropriately focused at the population level. In addition, there would likely be substantial technical difficulties in even demonstrating impact to individual pallid sturgeon larvae. For example, based on the collections of Harrow and Schlesinger (1980), and information presented above, it is likely that *Scaphirhynchus sp.* larvae collected in the drift at FCS would be early yolk-sac larvae (e.g., less than 12 mm in length), considerably smaller than the 16 - 24 mm length likely to be needed to render a species determination from routine morphological examination, based on information provided by USFWS (Krentz 2003, pers. comm.).

Monitoring studies of fish impingement and entrainment at FCS and fish populations in the Missouri River, tributary streams, and backwater habitats on and near the FCS site in the 1970s did not specifically document the presence of pallid sturgeon, and no detectible effect on Missouri River fish populations from FCS operation was discerned on the basis of these intensive studies. As noted in the Pallid Sturgeon Recovery Plan (USFWS 1993, page 10) and broadly stated elsewhere, destruction and alteration of habitats by human modification of the river system is the primary cause of declines in reproduction, growth, and survival of pallid sturgeon, and it is unlikely that the species can be recovered without restoring these habitat elements, which include morphology, hydrology, temperature regime, cover, and sediment/organic matter transport. OPPD notes that there has been little change in these factors since FCS studies were conducted in the 1970s, and it is difficult to imagine that further entrainment studies would produce any different result.

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