



Research Reactor Center

University of Missouri-Columbia

Research Park
Columbia, MO 65211

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June 6, 2001

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Subject: Response to Request Dated 05/15/01 for Additional Information Regarding
Amendment Extending License Expiration Date (TAC No. MB0850)

Dear Sir or Madam:

On 12/27/00, the University of Missouri-Columbia Research Reactor submitted a request that Facility Operating License No. R-103 be extended to October 11, 2006. On 05/15/01, the U.S. Nuclear Regulatory Commission requested additional information concerning that proposed license extension. Enclosed is our response.

Sincerely,

Ralph A. Butler, P.E.
Chief Operating Officer

RAB:dcp

Enclosure

xc: Mr. Al Adams, USNRC
Mr. Craig Bassett, USNRC

NOTARY PUBLIC STATE OF MISSOURI
BOONE COUNTY
MY COMMISSION EXP. JUNE 13, 2004

A020

Request for Additional Information Dated May 15, 2001
University of Missouri-Columbia Research Reactor
Docket No. 50-186

1. *Please describe the impacts that your proposed license amendment will have on the terrestrial and aquatic biosphere including the impact on threatened and endangered species.*

The University of Missouri-Columbia Research Reactor is situated on a 7.5-acre lot in the central portion of University Research Park, an 84-acre track of land approximately one mile southwest of the University of Missouri-Columbia main campus. The campus is situated in the southern portion of Columbia, a city with a population of 69,101 (1990 U.S. Census Bureau). Columbia is the county seat and largest city in Boone County, Missouri.

Environmental monitoring at the MURR site is accomplished by monitoring the gaseous and liquid release points using continuous monitors and grab samples, as well as periodic monitoring of select locations surrounding the MURR facility. The "offsite" monitoring locations include taking grab soil, liquid, or air samples at select locations and the periodic reading of dosimeters posted in the area. Liquid environmental samples are collected twice each year at three select locations. The liquid samples are analyzed for alpha, beta, and gamma activities, as well as a separate tritium activity value. Data from these surveys are sent from MURR to the NRC Staff as part of the Annual Operating Report. The results of off-site monitoring have indicated no abnormal readings as a result of MURR operations.

The single liquid effluent release point for the MURR site is the sanitary sewer effluent line. 10 C.F.R. § 20.2003 and technical specification requirements limit liquid releases. All pool, primary system, and sample liquid effluents are directed to the facility drain system, which directs all liquid waste to the MURR Liquid Waste Tank system. The system acts as a holding point for decay of the radionuclides in the liquid. The liquid is then sampled by the Health Physics Group prior to release. The liquid effluent information from MURR is documented in an annual effluent report.

The University of Missouri-Columbia sanitary sewer system discharges directly into the City of Columbia's sanitary sewer system at several locations throughout campus. Sewage from the reactor facility flows southward through a 12-inch line which runs adjacent to Research Park Drive, eventually discharging into the 24-inch Hinkson Creek outfall sewer near Old Providence Road. The Columbia Regional Wastewater Treatment Plant is located in the southwest section of the city, approximately 3.7 miles west of the reactor facility. This is an activated sludge/anaerobic digester treatment facility with a design flow capacity of 16.5 million gallons per day (design population of 137,000 people). After processing, the effluent from the treatment facility is diverted to a series of constructed wetlands

which serve as polishing units to further purify the discharge. The effluent is then directed from these 'polishing' wetlands to a final wetlands area maintained by the Missouri Department of Conservation located adjacent to the Missouri River.

The principle stream of the Boone County drainage basin is Perche Creek. This creek enters the county from the northwest and then flows south and then southeasterly before entering the Missouri River approximately 8.5 miles from the reactor facility. Hinkson Creek, which drains the MURR site, is a major tributary of Perche Creek. It originates in the Centralia uplands near the town of Hallsville approximately 15 miles from the reactor facility. Hinkson Creek is a sinuous rocky stream with an average grade of 25 feet per mile. By the time the Hinkson Creek has approached the site of the reactor facility, it has drained approximately 50 square miles of Boone County. Hinkson Creek is a relatively shallow stream with frequent riffles, many pools, and rocky and/or dirt banks. The stream bottom is variable; loose rock and gravel make up a good percentage, while silt and sand coverings of the pool bottoms are frequent. Its greatest flow normally occurs between April and July. The average flow over a 15-year period (1967 to 1981) was 51.9 ft³/sec with no flow typically recorded several times a year.

The soils in the Columbia area are generally fine-grained with moderately pervious surface soils and less pervious subsoils. The soils are typically classified by the Soil Conservation Service system with the hydrological groups of C and D being the most prevalent. The soils near the reactor facility are alluvial and tend to be stratified along the slopes. A golf course to the west, the University Research Park, and fields adjacent to the park that have been cleared once represented a continuation of the woodland which is now restricted to the slopes with steep, stony terrains. The University Research Park and nearby areas are covered with Shirley silt loam of high fertility and favorable depth representative of Hinkson Creek alluvium. The golf course to the west and residential area to the north of the reactor facility are underlain by a thin silty loam. The sloped woodlands are covered by loose, thin silty loam of low fertility.

Attachment A lists the Missouri species of conservation concern and high-quality communities known from Boone County.

Attachment B is a document from the Missouri Department of Conservation that states "No listed plants or animals are known to occur on the project site."

The requested license extension requires no major refurbishment or construction activities. The requested license extension will result in no increase in gaseous or liquid effluents. Therefore, there will be no adverse impact on the terrestrial and aquatic biosphere, nor will there be an adverse impact on threatened and endangered species.

2. *Please describe water use at the reactor facility. What is the source of your water and what is the annual consumption of the facility?*

The University of Missouri-Columbia maintains five deep wells, each with varying flow rates, servicing the entire campus. The wells are located on property owned and controlled by the university. The reactor facility obtains its water from any one of five deep wells owned and maintained by the University.

Well depths are: East Well – 1237 feet
 West Well – 1200 feet
 South Well – 1237 feet
 North Well – 1415 feet
 Southwest Well – 1440 feet

The reactor facility consumed 38 million gallons of water in the year 2000. Of that quantity, 28 million gallons were used in the cooling tower. The remaining 10 million gallons of water were consumed by the 110+ reactor personnel and as make-up water for the reactor systems

MISSOURI SPECIES OF CONSERVATION CONCERN AND HIGH-QUALITY NATURAL COMMUNITIES KNOWN FROM BOONE COUNTY

PRINTOUT OF THE MISSOURI NATURAL HERITAGE DATABASE

24 MAY 2001

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SCIENTIFIC NAME.....	COMMON NAME.....	SRANK	GRANK	STATE STATUS	FEDERAL STATUS
*** FERNS AND FERN ALLIES					
OPHIOGLOSSUM VULGATUM	ADDER'S-TONGUE	S3	G5		
*** FLOWERING PLANTS					
BERGIA TEXANA	BERGIA	S2	G5		
BROMUS LATIGLUMIS	A BROME	S2S3	G5		
BROMUS NOTTOWAYANUS	A BROME	S2S3	G3G4		
BUCHLOE DACTYLOIDES	BUFFALO GRASS	S1	G4G5		
CERATOPHYLLUM ECHINATUM	COONTAIL	S1?	G4?		
CYPERUS DIANDRUS	UMBRELLA FLATSEDEGE	S1	G5		
CYPERUS SETIGERUS	BRISTLED CYPERUS	S1	G3G5		
ELEOCHARIS LANCEOLATA	LANCE-LIKE SPIKE RUSH	S1	G4G5		
PHLOX BIFIDA SSP STELLARIA	BIFID PHLOX	S1	G5?T3		
POTAMOGETON PUSILLUS VAR PUSILLUS	SLENDER PONDWEED	S1	G5T5		
TRIFOLIUM STOLONIFERUM	RUNNING BUFFALO CLOVER	S1	G3	E	E
VIBURNUM DENTATUM VAR DEAMII	SOUTHERN ARROW-WOOD	S1	G5T4T5		
*** FLATWORMS					
MACROCOTYLA GLANDULOSA	PINK PLANARIAN	S1	G1G3		
*** MOLLUSKS					
HENDERSONIA OCCULTA	CHERRYSTONE SNAIL	S3	G4		
*** INSECTS					
ATTANEURIA RURALIS	A PERLID STONEFLY	S3	G4		
HYDROPERLA FUGITANS	A SPRING STONEFLY	S3	G3		
MACROMIA PACIFICA	GILDED RIVER CRUISER	S3	G4		
SPEYERIA IDALIA	REGAL FRITILLARIS	G3			
*** FISH					
ACIPENSER FULVESCENS	LAKE STURGEON	S1	G3	E	
ALOSA ALABAMAE	ALABAMA SHAD	S2	G3		C
CARPIODES VELIFER	HIGHFIN CARPSUCKER	S2	G4G5		
CYCLEPTUS ELONGATUS	BLUE SUCKER	S3	G3		
FUNDULUS ZEBRINUS	PLAINS KILLIFISH	S2	G5		
HYBOGNATHUS HANKINSONI	BRASSY MINNOW	S3	G5		
MACRHYBOPSIS GELIDA	STURGEON CHUB	S3	G2		C
MACRHYBOPSIS MEEKI	SICKLEFIN CHUB	S3	G3		C
NOTROPIS BUCHANANI	GHOST SHINER	S2	G5		
NOTROPIS TOPEKA	TOPEKA SHINER	S1	G2	E	E
PERCOPSIS OMISCOMAYCUS	TROUT-PERCH	S1?	G5		
PLATYGOBIO GRACILIS	FLATHEAD CHUB	S1	G5		E
POLYODON SPATHULA	PADDLEFISH	S3	G4		
SCAPHIRHYNCHUS ALBUS	PALLID STURGEONS	G1G2		E	E
*** AMPHIBIANS					
RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	S3	G4T4		

MISSOURI SPECIES OF CONSERVATION CONCERN AND HIGH-QUALITY NATURAL COMMUNITIES KNOWN FROM
BOONE COUNTY

PRINTOUT OF THE MISSOURI NATURAL HERITAGE DATABASE

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SCIENTIFIC NAME.....	COMMON NAME.....	SRANK	GRANK	STATE STATUS	FEDERAL STATUS
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*** BIRDS

GALLINULA CHLOROPUS	COMMON MOORHEN	S2	G5		
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	S2	G4	E	T
VIREO BELLII	BELL'S VIREO	S3	G5		

*** MAMMALS

MUSTELA FRENATA	LONG-TAILED WEASEL	S2	G5		
MYOTIS GRISESCENS	GRAY BAT	S3	G3	E	E
MYOTIS SEPTENTRIONALIS	NORTHERN MYOTIS	S3	G4		
MYOTIS SODALIS	INDIANA BAT	S1	G2	E	E

*** AQUATIC COMMUNITIES

HEADWATERS (PRAIRIE REGION)

*** TERRESTRIAL COMMUNITIES

DRY LIMESTONE/DOLOMITE CLIFF
 DRY LIMESTONE/DOLOMITE FOREST
 DRY PRAIRIE
 DRY-MESIC LIMESTONE/DOLOMITE FOREST
 EFFLUENT CAVE
 LIMESTONE GLADE
 MESIC FOREST
 MESIC LIMESTONE/DOLOMITE FOREST
 MOIST LIMESTONE/DOLOMITE CLIFF

51 Records Processed

TERMS AND DEFINITIONS

Federal Status

The federal status is derived from the provisions of the Endangered Species Act of 1973, as amended, which is administered by the U.S. Fish and Wildlife Service. Passage of the Endangered Species Act of 1973 gave the United States one of the most far-reaching laws ever enacted by any country to prevent the extinction of imperiled animals and plants. Protecting endangered and threatened species and restoring them to the point where their existence is no longer jeopardized is the primary objective of the Fish and Wildlife Service's Endangered Species Program.

E = ENDANGERED

Any species which is in danger of extinction throughout all or a significant portion of its range.

T = THREATENED

Any species which is likely to become endangered within the foreseeable future.

C = CANDIDATE

Plants or animals which the Service is reviewing for possible addition to the list of endangered and threatened species.

PE = PROPOSED ENDANGERED

PT = PROPOSED THREATENED

Species officially proposed for listing as endangered or threatened. Final ruling not yet made.

State Status

Rule 3CSR10-4.111 of the *Wildlife Code of Missouri* and certain state statutes apply to state *Code* listed species. The state status "endangered" is determined by the Department of Conservation under constitutional authority.

Global Rank

A numeric rank (G1 through G5) of relative endangerment based primarily on the number of occurrences of the element (i.e., species, subspecies, or variety) globally. Other factors in addition to the number of occurrences are considered when assigning a rank, so the numbers of occurrences suggested for each numeric rank below are not absolute guidelines.

G1 = Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. (typically 5 or fewer occurrences or very few remaining individuals or acres)

G2 = Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction throughout its range. (6 to 20 occurrences or few remaining individuals or acres)

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range. (21 to 100

occurrences)

G4 = Widespread, abundant, and apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery. Thus, the element is of long-term concern. (usually more than 100 occurrences)

G5 = Demonstrably widespread, abundant, and secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G#G# = Numeric range rank: A range between two of the numeric ranks. Denotes range of uncertainty about the exact rarity of the element.

G? = Unranked: element is not yet ranked globally.

GU = Unrankable: Possibly in peril range-wide but status uncertain; need more information.

GH = Historical: Of historical occurrence throughout its range, i.e., formerly part of the established biota, with the expectation that it may be rediscovered (e.g., Bachman's warbler).

GX = Extinct: Believed to be extinct throughout range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.

Subrank:

T = Taxonomic subdivision: rank applies to a subspecies or variety.

Qualifiers:

? = Inexact: denotes inexact numeric rank.

Q = Questionable taxonomy: taxonomic status is questionable; numeric rank may change with taxonomy.

State Rank

A numeric rank (S1 through S5) of relative endangerment based primarily on the number of occurrences of the element (i.e., species, subspecies, or variety) within the state. Other factors considered when assigning a rank include: abundance, population trends, distribution, number of protected sites, degree of threat, suitable habitat trends, level of survey effort and life history. Thus, the number of occurrences suggested for each numeric rank below are not absolute guidelines. Missouri species of conservation concern typically do not fall within the range of S4-S5.

S1 = Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. (typically 5 or fewer occurrences or very few remaining individuals)

S2 = Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. (6 to 20 occurrences or few remaining individuals or acres)

S3 = Rare and uncommon in the state. (21 to 100 occurrences)

- S4** = Widespread, abundant, and apparently secure in state, with many occurrences, but the species is of long-term concern. (usually more than 100 occurrences)
- S5** = Demonstrably widespread, abundant, and secure in the state, and essentially ineradicable under present conditions.
- S#S#** = Numeric range rank: A range between two of the ranks. Denotes range of uncertainty about the exact rarity of the element.
- S?** = Unranked: Species is not yet ranked in the state.
- SU** = Unrankable: Possibly in peril in the state, but status uncertain; need more information.
- SE** = Exotic: An exotic established in the state; may be native in nearby regions (e.g., house finch or catalpa in eastern U.S.)
- SA** = Accidental: Accidental or casual in the state (i.e., infrequent and far outside usual range).
- SP** = Potential: Potential that element occurs in the state but no occurrences reported.
- SR** = Reported: Element reported in the state but without persuasive documentation which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.
- SRF** = Reported falsely: Element erroneously reported in the state and the error has persisted in the literature.
- SH** = Historical: Element occurred historically in the state (with expectation that it may be rediscovered). Perhaps having not been verified in the past 20 years, and suspected to be still extant.
- SX** = Extirpated: Element is believed to be extirpated from the state.

Qualifiers:

- ?** = Inexact or uncertain: for numeric ranks, denotes inexactness; for SE denotes uncertainty of exotic status. (The ? qualifies the character immediately preceding it in the SRANK.)

June 5, 2001
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University of Missouri-Columbia
Research Reactor Center

No listed plants or animals are known to occur on the project site.

The following species and/or natural communities are known from the vicinity of the project site.

<u>Scientific Name</u>	<u>Common Name</u>	<u>Federal Status</u>	<u>State Status</u>	<u>State Rank</u>	<u>Size/ Acres</u>	<u>Township/ Range</u>	<u>Sec.</u>	<u>Ownership</u>
PERCOPSIS OMISCOMAYCUS - Hinkson Creek	TROUT-PERCH			S1?		048N013W	24	PRIVATE

The following species are historically known from the project area.

<u>Scientific Name</u>	<u>Common Name</u>	<u>Federal Status</u>	<u>State Status</u>	<u>State Rank</u>	<u>Size/ Acres</u>	<u>Township/ Range</u>	<u>Sec.</u>	<u>Ownership</u>
NOTROPIS TOPEKA - Hinkson Creek	TOPEKA SHINER	E	E	S1		048N013W	24	PRIVATE

Additional information for planning purposes:

Streams in the area should be protected from soil erosion, water pollution and instream activities that modify or diminish aquatic habitats.

Indiana bats roost and raise young under the bark of trees in riparian forests and upland forests near perennial streams in north Missouri. Favored roosts are large diameter (>9" dbh; best are ≥21" dbh) dead oaks and hickories, and living shagbark hickory. Other tree species such as elm, cottonwood, ash, and maple, if they have exfoliating bark, also may be used as roosts. Indiana bats especially need snags standing in openings, at edges, or where tree canopy is sparse. Projects should avoid or minimize the removal of potential roost trees from riparian zones or from woodlots within 0.6 mile of perennial streams or permanent water. If removal of potential roost trees is unavoidable, it should be done when Indiana bats are not likely to be present, i.e., between 15 September and 1 April. During the course of development, if possible, leave snags standing. Indiana bats feed upon terrestrial and aquatic insects; they preferentially forage in and around the canopy of riparian and floodplain forest, but also along forest/field edges and fencerows. Therefore, mature forest canopy should be enhanced and stream quality not degraded.

FEDERAL STATUS - The federal status is derived from the provisions of the federal Endangered Species Act, which is administered by the U.S. Fish and Wildlife Service. The Endangered Species Act provides federal protection for plants and animals listed as Endangered or Threatened. E = Endangered, T = Threatened, C = Candidate for Federal listing, PE = Proposed to be listed as endangered.

STATE STATUS (E) - the state status is determined by the Department of Conservation under constitutional authority. Rule 3CSR10-4.111 Endangered Species of the Wildlife Code of Missouri and certain state statutes apply to state Endangered species.

STATE RANK - A numeric rank of relative endangerment based primarily on the number of occurrences of the species within the state of Missouri. S1 = Critically imperiled in the state, S2 = Imperiled in the state, S3 = Rare and uncommon in the state.

Eastern collared lizard populations, natural communities and geologic features are recognized as sensitive biological resources and may also appear on this report.