United States Department of the Interior

U. S. GEOLOGICAL SURVEY
Box 25046 M.S. 974
Denver Federal Center
Denver, Colorado 80225

IN REPLY REFER TO:

March 11, 2005

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

Gentlemen:

The U.S. Geological Survey is herein responding to your request for additional information (TAC No. MB5030) dated February 16, 2005. This concerns the USGS amendment request to its research reactor facility license (No. R-113, Docket 50-274) to allow the recapture construction permit time.

Correspondence concerning this response should be directed to Tim DeBey, Reactor Supervisor.

Sincerely,

Tim DeBey
Reactor Supervisor

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 3/11/05 Tim DeBey

Copy to: Alexander Adams, NRC

A020

1. Please discuss the current material condition of the confinement structure and core components.

   Response: The confinement structure is made of reinforced concrete, including the walls, floor, and ceiling. There are openings for doors, windows, and a roof hatch. The roof is flat, with one drain located in the confinement area. GSA maintains the building and, most recently, they had a contractor replace the roofing material approximately 4 years ago. The structure shows no signs of deterioration of the concrete; no cracking, scaling, spalling, or settling has been observed.

2. Are there any major components that are replaced on an established schedule? If so, please discuss the schedule and the basis for the schedule.

   Response: There is not an established schedule to replace major components. Components have been replaced or refurbished as their operation or condition has indicated a need for such activity.

3. Your application discussed maintenance and repair of equipment and the use of routine checks and inspections. Are these routine checks and inspections also used to carry out testing and calibration of systems?

   Response: Typically testing and calibrations are performed on a specified calendar interval; however, if routine checks and inspections indicate a deviation from normal operation of a piece of equipment, testing and calibration may be performed as a result. For example, the daily prestart checks include a test point check of the analog power channels. If these checks indicated that a power channel was not functioning properly, further testing and possibly calibration of the system would result.

4. Are any reactor components subjected to high neutron fluence that would affect the component's lifetime? If so, what is your approach to managing aging of these components?

   Response: None of the reactor components are subjected to a high neutron fluence that would affect the component's lifetime.

5. Environmental dose results appears to be missing from your annual report for 2003. Please provide the missing data.

   Response: The Health Physics section of the 2003 annual report is attached to this submission.

6. Please provide results of your calculations to demonstrate compliance with 10 CFR 20.1101(d) of the dose to the individual member of the public likely to

receive the highest dose from air emission of radioactive material from the GSTR to the environment for years 2000 through 2004.

Response: We have used the COMPLY computer code to demonstrate compliance with 10 CFR 20.1101(d). The results for years 2000 through 2004 are as follows:

CY2000: Effective dose equivalent 0.2 mrem/yr
CY2001: Effective dose equivalent 0.3 mrem/yr
CY2002: Effective dose equivalent 0.2 mrem/yr
CY2003: Effective dose equivalent 0.1 mrem/yr
CY2004: Effective dose equivalent 0.1 mrem/yr

7. Please provide cubic feet and curies of solid radioactive waste shipped off-site for burial for the years 2000 through 2003.

Response: Radioactive waste burial data are given below; however, these data also include some radioactive waste from all USGS activities at the Denver Federal Center. The actual waste volume and activity from the reactor facility is less than the values given and the data below are conservative.

2000: 7.5 cu ft and <105.24 mCi activity
2001: 7.5 cu ft and <194 mCi activity
2002: 7.5 cu ft and <4.36mCi activity
2003: 7.5 cu ft and <9.45 mCi activity
(2004: no waste shipped)

8. Discuss the non-radiological impact that operation of the facility has on the environment. Discuss issues such as chemicals in the research program (under the reactor license) and the secondary coolant water chemical use. Describe the amount of chemical used, disposal, and introduction to and impact of the chemicals on the environment. Discuss water usage at the facility including the source of supply. Discuss wastewater discharges from the facility.

Reply: The reactor facility has very minimal non-radiological impact to the environment. No chemicals are used under the reactor license. No chemicals are added to either the primary or secondary coolant water. Water for the facility is supplied from Denver Water, the primary metro area potable water supply. Denver Water is able to supply up to 745 million gallons of potable water per day. Typical water usage at the reactor facility includes 200 gallons a month makeup water added to the primary tank and <50,000 gallons a month makeup water added to the secondary water tank. Wastewater discharged from the facility is <50,000 gallons a month in the form of bleedoff water from the secondary cooling system. This water is discharged to the sanitary sewer that is part of the Denver Wastewater Management Division system.

9. Are there any historic properties that are impacted by the operation of the facility?

   Response: There are no historic properties that are impacted by the reactor operation.

10. Are there any listed plants or animals in the vicinity of the facility?

    Response: There are no listed plants or animals in the vicinity of the facility.

Health Physics Section of the CY2003 USGS Reactor Annual Report

VII. Radioactivity Releases

A. Listed below are the total amounts of radioactive gaseous effluent released to the environment beyond the effective control of the reactor facility.

Table 1. Gaseous Effluents Released to the Environment

Month	**Argon-41** (curies)	**License Allowable** (Ci) (R-113)	Tritium (HTO) (mCi) *	**10CFR20 Allowable** (mCi)
January	0.192	5.833	0.184	124
February	0.016	5.833	0.070	124
March	0.148	5.833	0.083	124
April	0.164	5.833	0.060	124
May	0.179	5.833	0.146	124
June	0.210	5.833	0.080	124
July	0.164	5.833	0.100	124
August	0.150	5.833	0.075	124
September	0.403	5.833	0.075	124
October	0.338	5.833	0.157	124
November	0.135	5.833	0.059	124
December	0.190	5.833	0.078	124
Total	2.289	70.00	1.167	1488
% of Allowable	3.27%	————	0.08%	————

* **Note**: The tritium concentrations are estimates based on the amount of water lost by evaporation from the reactor multiplied by the concentration of tritium as HTO. Tritium sample analyses are being performed by Hazen Research.

B. One 55-gallon drum of low-level radioactive solid waste was shipped for burial in Washington State during the year.

Note: The principal radioactive waste generated at the reactor facility is the demineralizer resin. Used resin with small quantities of rinse water was de-watered by evaporation and placed in a 55-gallon drum.

VIII. Radiation Monitoring

Our program to monitor and control radiation exposures included the four major elements below during the operating year.

1. Fifteen gamma-sensitive area monitors are located throughout the Nuclear Science Building. A remote readout panel is located in the reactor health physics office. High alarm set points range from 2 mR/hr to 50 mR/hr. High level alarms are

very infrequent and due to sample movements.

2. One Continuous Air Monitor (CAM) samples the air in the reactor bay. An equilibrium concentration of about 1 x 10^{-8} μCi/ml present for two minutes will result in an increase of 400 cpm above background. There are two alarm setpoints. A low-level alarm is set at 3000 cpm and the high level alarm is set at 10000 cpm. Reactor bay air is sampled during all reactor operations. The fixed particulate air filter is changed each week and counted on a HPGE gamma spectrometer counting system. The charcoal filter, fitted behind the air filter, is also changed and counted weekly. In all instances, sample data were less than airborne concentration value (10 CFR Part 20, Appendix B, Table 2) for all particulate radioisotopes produced by the reactor.

3. Contamination wipe surveys and radiation surveys with portable survey instruments are performed at least once a month. All portable instruments are calibrated with a 3-Curie (initial activity) Cs-137 source traceable to NBS, and wipes are counted on a Gamma Products G5000 low level counting system. Six contaminated areas were noted during routine wipe surveys with contamination above 30 pCi/100 cm^2 beta. The three highest had beta activity of 239 pCi/100 cm^2 and two had 40 pCi/100 cm^2. Soap and water were used to remove the contamination. All other areas were less than 30 pCi/100 cm^2 beta and 15 pCi/100 cm^2 alpha. The roof area over the reactor tank is roped off and posted as a radiation area (averaging 2.5 mR/hr) during 1 MW operations.

4. Personnel, X and gamma, beta and neutron film badges are assigned to all permanent occupants of the Nuclear Science Building. LiF TLD dosimeters were used at four outdoor environmental stations. Reactor facility visitors are issued self-reading dosimeters. Reactor staff personnel are issued albedo neutron badges.

Table 2. Personnel Monitoring Results (12/1/02 – 11/30/03)

	Deep Dose Equivalent	Shallow Dose Equivalent	
Name	Whole Body (Rem)	Whole Body (Rem)	Extremity (Rem)
Aakhus-Witt A.	0.010	0.016	0.081
Aspey, N.	0.0	0.0	Not monitored
DeBey, T	0.052	0.056	0.093
Helfer, P	0.0	0.0	0.0
Hutchings, R.	0.0	0.0	Not monitored
Liles, D	0.069	0.070	0.177
Perryman, R	0.050	0.056	0.252

Note: Personnel dosimetry results from December 2003 are not available at this time.

Reactor visitors and occasional experimenters wore pocket dosimeters that resulted in no individual reading that was greater than one (1) mrem.