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:

January 12, 2005

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

Dear NRC staff:

The attached annual report of the U.S. Geological Survey TRIGA non-power reactor facility is submitted in accordance with license conditions. The facility docket number is 50-274.

Sincerely,

Timothy M. DeBey
Reactor Supervisor

Enclosure

Copy to:
Al Adams, MS O-11-D-19

A001
A020

U.S. GEOLOGICAL SURVEY TRIGA REACTOR

ANNUAL REPORT

JANUARY 1, 2004 - DECEMBER 31, 2004

NRC LICENSE NO. R-113 - DOCKET NO. 50-274

I. **Personnel Changes**: Two personnel changes occurred in CY 2004 with the hiring of Gregory Lightner as a health physics technician and the end of a one-year appointment for Regina Hutchings, a part-time student assistant.

II. **Operating Experience**

The Geological Survey TRIGA Reactor (GSTR) was in normal operation for the year 2004. No major facility changes were made during the year.

A synopsis of irradiations performed during the year is given below, listed by the organization submitting the samples to the reactor staff:

Organization	Number of Samples
Geologic Division – INAA	1097
Geologic Division - Geochronology	1801
Non-USGS affiliated	923
Total	3821

A. Thermal power calibrations were performed in May and November, with minor adjustments made to the instrumentation.

B. During the report period, 192 daily checklists and 12 monthly checklists were completed in compliance with technical specifications requirements for surveillance of the reactor facility.

C. Tours were provided to individuals and groups during the year for a total visitor count of approximately 300.

III. Tabulation of Energy Generated

	MWH operated	Critical hours	Pulses
Jan	26.137	28.23	0
Feb	28.233	29.59	0
Mar	27.637	29.25	0
Apr	104.770	116.48	0
May	41.291	44.73	0
June	27.469	29.83	3
July	40.389	42.93	0
Aug	102.347	105.87	1
Sept	69.900	72.25	0
Oct	30.141	31.73	0
Nov	111.000	112.68	0
Dec	79.271	84.28	0
Totals	688.585	726.82	4

IV. Unscheduled Shutdowns

Number	Date	Cause
997	5/6/04	Building evacuation – fire drill
998	8/10/04	DAC watchdog scram (root cause unknown)
999	8/20/04	Building power outage (lost underpressure)
1000	8/23/04	Building power outage (lost underpressure)
1001	8/26/04	DAC DIS064 timeout (root cause unknown)
1002	11/30/04	DAC DIS064 timeout (root cause unknown)
1003	12/1/04	Building evacuation – RAM alarm (det failure)
1004	12/9/04	DAC DIS064 timeout (root cause unknown)

V. Major Maintenance Operations

1. The CAM pump motor was changed in November, 2004.
2. The belt on the main exhaust fan was replaced in December, 2004.

VI. Summary of 10 CFR 50.59 changes

No 50.59 changes were made during this year.

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	0.116	5.833	0.057	124
February	0.058	5.833	0.057	124
March	0.080	5.833	0.151	124
April	0.246	5.833	0.069	124
May	0.089	5.833	0.125	124
June	0.073	5.833	0.075	124
July	0.125	5.833	0.074	124
August	0.207	5.833	0.055	124
September	0.122	5.833	0.159	124
October	0.076	5.833	0.087	124
November	0.317	5.833	0.162	124
December	0.209	5.833	0.087	124
Total	1.718	70.00	1.158	1488
% of Allowable	2.45%	----------	0.078%	----------

* **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 were performed by Hazen Research.

Note: The principal radioactive waste generated at the reactor facility is the demineralizer resin. Used resin with small quantities of rinse water is de-watered by evaporation and placed in a 55-gallon drum. No waste was disposed during the calendar year 2004.

VIII. Radiation Monitoring

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

1. Thirteen 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 beta-gamma 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. Five areas were identified greater than 30 pCi/100 cm^2 beta-gamma contamination. Two of the five areas of high removable contamination were found on the inside of the shipping cask @ 10,249 pCi/100 cm^2 beta-gamma and on the top of the table in the reactor room @ 1,007 pCi/100 cm^2 beta-gamma contamination. The other three areas of removable contamination were found on the reactor bay table and the small cave with 65 pCi/100 cm^2 beta-gamma, 31 pCi/100 cm^2 beta-gamma contamination, and on the reactor bay floor with 35 pCi/100 cm^2 beta-gamma contamination. All other areas were less than 30 pCi/100 cm^2 beta-gamma 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. LiF TLD dosimeters were used at five outdoor environmental stations. Reactor facility visitors are issued self-reading dosimeters. Reactor staff personnel are issued albedo neutron badges.

Table 2. Personnel Monitoring Results (12/1/03 – 11/30/04)

	Deep Dose Equivalent	Shallow Dose Equivalent	
Name	Whole Body (Rem)	Whole Body (Rem)	Extremity (Rem)
DeBey, T	0.060	0.084	0.121
Hutchings, R*	0.0	0.0	0.0
Lightner,G	0.058	0.071	0.078
Liles, D	0.018	0.018	0.040
Perryman, R	0.097	0.128	0.266

* Cancelled 8/31/2004

Note: December's personnel dosimetry results are not available at this time.

Table 3. Environmental Dose Results

Location	Dose Jan-Mar (RAD)	Dose Apr-June (RAD)	Dose July-Sept. (RAD)	Dose Oct.- Dec. (RAD)	Total (RAD)
Exhaust Stack	0.0118	0.0041	0.0047	0.002	0.0226
Cooling Tower Fence	0.003	0.00	0.00	0.00	0.003
West Vehicle Gate	0.0106	0.00	0.0059	0.0016	0.0181
West Room 151 Gate	0.0173	0.00	0.0023	0.00	0.0196
Southwest Light Pole	0.0131	0.00	0.0033	0.0048	0.0212
Control (background)	0.0249	0.0307	0.0227	0.0292	0.1075
Southeast Light Pole	0.0025	0.0	0.0	0.0	0.0025

Note: Above totals have the background subtracted (see control).

X. Environmental Monitoring

There have been no uncontrolled radioactivity releases from the reactor to the present date. Thus, the data on file from past years to the present are considered to be background information.
Environmental soil and water samples were taken and analyzed. No elevated readings or reactor-produced isotopes were identified (fallout Cs-137 was identified).