June 11, 2008

Dr. Tamara Dickinson, Reactor Administrator
Department of the Interior
U.S. Geological Survey
12201 Sunrise Valley Dr., MS 911
Reston, VA 20192

SUBJECT: NRC INSPECTION REPORT NO. 50-274/2008-201

Dear Dr. Dickinson:

On May 27-29, 2008, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at your U.S. Geological Survey TRIGA Reactor facility. The enclosed report documents the inspection results, which were discussed on May 29, 2008, with you and members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed activities, and interviewed personnel. Based on the results of this inspection, no findings of significance were identified.

In accordance with 10 CFR 2.390 of the NRC's, "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Craig Bassett at 404-358-6515.

Sincerely,

/RA/

Johnny H. Eads, Branch Chief
Research and Test Reactors Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-274
License No. R-113

Enclosure: NRC Inspection Report No. 50-274/2008-201
cc w/enclosure: Please see next page

cc:

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Environmental Services Manager
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Lakewood, CO 80226

Mr. Eugene W. Potter
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Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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DATE	6/5/08	6/10/08	6/11/08

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No:	50-274
License No:	R-113
Report No:	50-274/2008-201
Licensee:	Department of the Interior U.S. Geological Survey (USGS)
Facility:	USGS TRIGA Reactor
Location:	Denver Federal Center Denver, Colorado
Dates:	May 27-29, 2008
Inspector:	Craig Bassett
Approved by:	Johnny Eads, Branch Chief Research and Test Reactors Branch B Division of Policy and Rulemaking Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

United States Geological Survey
USGS TRIGA Reactor Facility
Report No. 50-274/2008-201

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the licensee's Class II research reactor safety program including: organizational structure and staffing, review and audit and design change functions, procedures, radiation protection, environmental protection, and shipment of radioactive material since the last NRC inspection of this facility. The licensee's program was acceptably directed toward the protection of public health and safety. No violations or deviations were noted.

Organizational Structure and Staffing

- The organizational structure and functions were consistent with the requirements specified in Section H of the Technical Specifications and Chapter 3 of the Reactor Operations Manual.

Review and Audit Functions and Design Change

- Reviews and audits were being conducted by the Reactor Operations Committee in compliance with the requirements specified in Chapter 3 of the Reactor Operations Manual and Section H of the Technical Specifications.

- The licensee's design change program was being implemented as required using the criteria specified in Section 50.59 of Title 10 of the Code of Federal Regulations, "Changes, Tests, and Experiments," with the required acceptance reviews and approvals.

Procedures

- The procedural control and implementation program met Technical Specifications requirements.

Radiation Protection

- Periodic surveys were completed and documented as required by procedure.

- Postings and signs met regulatory requirements.

- Personnel dosimetry was being worn as required and recorded doses were well within the NRC's regulatory limits.

- Radiation survey and monitoring equipment was being maintained and calibrated as required.

- The Radiation Protection and As Low As Reasonably Achievable Programs met regulatory requirements.

- Radiation protection training was acceptable.

Environmental Protection

- Effluent monitoring was in accordance with license and regulatory requirements and releases were within the specified regulatory and Technical Specifications limits.

- The environmental protection program met NRC requirements.

Transportation of Radioactive Material

- Radioactive materials were transferred to the licensee's NRC Materials License for shipment and/or disposal.

REPORT DETAILS

Summary of Plant Status

The licensee's one megawatt TRIGA Reactor continued to be operated in support of United States Geological Survey (USGS) programs and non-USGS entities. During one day of the inspection the reactor was started up and operated at full power to support on-going research and to conduct contract irradiation work.

1. Organizational Structure and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69001)

The inspector reviewed selected aspects of the following regarding the licensee's organization and staffing to ensure that the requirements of Section H of Technical Specifications (TS), outlined in License Amendment No. 11, dated January 30, 2006, were being met:

- Current staffing levels and staff qualifications
- Staffing requirements for safe operation of the facility
- Organizational structure for the USGS TRIGA Reactor (GSTR) Facility
- U.S. Geological Survey TRIGA Reactor Annual Reports for 2006 and 2007
- Reactor Operations Manual (ROM), Chapter 3, "Nuclear Center Organization," latest revision dated November 2004

b. Observations and Findings

The organizational structure and functions at the facility had not changed since the last inspection (refer to NRC Inspection Report No. 50-274/2007-201). Review of records verified that management administrative requirements and responsibilities were fulfilled as required by TS and the ROM. Qualifications of the staff appeared to be adequate and met the requirements specified in ANSI Standard 15.4, "Standards for Selection and Training of Personnel for Research Reactors."

The inspector noted that the organizational structure and staffing at the facility were adequate for the current operational workload. However, there had been various changes in personnel. A Senior Reactor Operator, who had worked at the facility for several years, retired in January 2006. This had been anticipated by the licensee and an individual was hired and trained to fill the vacant operator position. But that person left the facility in July 2007. Since that time two other people were hired and they were also trained to become reactor operators. They took the NRC operator examination and subsequently received their licenses on March 25, 2008.

During the inspection, the licensee informed the inspector that, due to a restructuring within the USGS, the reactor facility was administratively transferred from the USGS Central Region Geologic Discipline to the USGS National Headquarters Geologic Discipline. As a result of this transfer, the facility had been assigned a new reactor administrator. Dr. Tamara Dickinson became the Reactor Administrator on February 1, 2008.

c. Conclusions

The licensee's organization and staffing were in compliance with Section H of the facility TS and Chapter 3 of the ROM.

2. Review and Audit Functions

a. Inspection Scope (IP 69001)

In order to verify that the licensee had established and conducted reviews and audits, and design change reviews, as required by TS Sections H.2, H.4, and H.5, and ROM Chapter 3, the inspector reviewed selected aspects of:

- Responses to the review and audit reports
- Facility design change records for the past two years
- Safety review records and audit reports for the past two years
- Reactor Operations Committee (ROC) meeting minutes for 2006 through 2008
- ROC Committee functions outlined in the U.S. Department of the Interior, U.S. Geological Survey Manual, Series/Chapter/Paragraph 308.44, "Reactor Operations Committee," dated February 5, 1999
- ROM, Chapter 3, "Nuclear Center Organization," latest revision dated November 2004

b. Observations and Findings

(1) Review and Audit Functions

The inspector verified that the ROC was meeting semiannually as required and that membership met TS Section H.2, ROC charter, and ROM requirements. Review of the meeting minutes for the past two years indicated that the committee provided guidance, direction, and oversight for the reactor and ensured suitable and safe reactor operations.

The ROC minutes and audit records showed that safety reviews and individual audits had been completed for the functional areas specified by TS Sections H.3, H.4, and H.5, and at the frequency specified in Section 3.8 of Chapter 3 of the ROM. The inspector noted that the audits included a review of reactor operations, maintenance and operations logs, fuel movement, facility procedures, the operator requalification program, and various aspects of the Radiation Protection Program. The results of audits had been conducted by various members of the ROC and were documented in a report dated May 2, 2006, an undated report in 2007, and a report dated April 22, 2008. The inspector determined that the review and audit program, the findings noted, and licensee actions taken in response to the findings, were acceptable.

(2) Design Change

The inspector determined that design changes at the GSTR required a facility staff review followed by an ROC review and subsequent approval. Two changes had been proposed and processed recently. Those changes involved the reactor tank and the Reactor Room and both were designed to enhance security at the GSTR.

The inspector reviewed the records of the "50.59 Reviews for USGS TRIGA Facility" and determined that the appropriate evaluations had been performed and the material had been referred to the ROC for approval. From the review, the inspector also determined that the ROC reviews and approvals were focused on safety and met licensee program requirements.

c. Conclusions

Audits and reviews conducted by the ROC were in accordance with the requirements specified in Section H of the TS and Chapter 3 of the ROM. The licensee's design change program was being implemented as required using the criteria specified in 10 CFR 50.59 with the required acceptance reviews and approvals.

3. Procedures

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to ensure that safety standards and written instructions for those activities specified in TS Sections H.2 and H.3 were in effect:

- Observation of procedural implementation
- Selected ROM Chapters and GSTR procedures
- Records of changes and temporary changes to procedures
- ROC meeting minutes documenting procedure change reviews and approvals
- ROM, Chapter 4, "Administrative Procedures," latest revision dated November 2004
- ROM, Chapter 5, "Operating Procedures," Revision 4, dated October 2005
- ROM, Chapter 8, "Radiation Protection Program," latest revision dated May 1, 2006

b. Observations and Findings

The inspector reviewed ROM Chapters 4 and 8, and selected GSTR procedures contained in ROM Chapter 5. These ROM Chapters and GSTR procedures provided guidance for the administrative, operations, and health physics (HP) functions of the facility. The inspector confirmed that written procedures were available for those tasks and items required by TS Sections H.2 and H.3. The licensee controlled changes to procedures and the ROC conducted the review and approval process as required. The inspector noted that the GSTR procedures were reviewed biennially as required by the ROM.

After reviewing the 2006 and 2007 training records and interviewing staff members, the inspector determined that the training of personnel on procedures was adequate. During tours of the facility, the inspector observed that personnel performed facility operations and tasks in accordance with applicable procedures.

c. Conclusions

The procedural control and implementation program was acceptably conducted and maintained.

4. Radiation Protection

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with 10 CFR Parts 19 and 20 and TS Section F requirements:

- GSTR HP Logbook #40
- HP Quarterly Reports for 2006 through 2008 to date
- Radiological signs and posting in various areas of the facility
- Training records for GSTR staff and various support personnel
- USGS TRIGA Reactor Quarterly Reports for 2006 through 2008 to date
- U.S. Geological Survey TRIGA Reactor Annual Reports for 2006 and 2007
- U.S. Geological Survey TRIGA Reactor Monthly Checklists for the past two years
- GSTR Annual Audit of Radiation Exposures and Radioactive Material Releases for 2006 and 2007
- Routine periodic survey and monitoring records for the past year documented on Radiological Survey maps and USGS TRIGA Reactor Facility Start-Up Checklists
- Maintenance and calibration records of radiation monitoring equipment for the past two years documented in the Instrument Calibration Log
- GSTR Radiation Protection Program as outlined in ROM, Chapter 8, "Radiation Protection Program," latest revision dated May 1, 2006, including the following:
  - Section 8.1, "Radiation Protection Policy"
  - Section 8.2, "Health Physics Training"
  - Section 8.3, "Radioactive Material Control"
  - Section 8.4, "Radiation Monitoring"
  - Section 8.5, "Instrumentation"
  - Section 8.6, "Records"
  - Section 8.7, "Emergency Response and Exposure Guidelines"
  - Section 8.8, "Declared Pregnant Woman Guidelines"
  - Section 8.9, "Planned Special Exposures"
- ROM GSTR Procedure No. 15, "Pocket Dosimeter Drift Check Procedure," latest revision dated April 1994 and last review dated April 21, 2008
- ROM GSTR Procedure No. 16, "Pocket Dosimeter Calibration Procedure," latest revision dated April 2006 and last review dated April 21, 2008
- ROM GSTR Procedure No. 20, "Procedure for Radiation Instrument Calibrations," latest revision dated October 2004, and last review dated November 9, 2006
- The As Low As Reasonably Achievable (ALARA) Program outlined in ROM, Chapter 8, dated October 1994, and recent ALARA reviews
- Memorandum from the Reactor Supervisor to the Director, U.S. Geological Survey affirming USGS commitment to ALARA, dated March 9, 2007
- Memorandum from the Reactor Administrator to the Director, U.S. Geological Survey stating that the USGS TRIGA Reactor Facility maintains a Safety Conscious Work Environment Policy, dated March 15, 2007

b. Observations and Findings

(1) Surveys

Selected start-up and monthly radiation and/or contamination surveys were reviewed by the inspector. The surveys had been completed by HP staff members as required. Any contamination detected in concentrations above established action levels was noted and the area was decontaminated. Results of the surveys were documented so that facility personnel would be knowledgeable of the radiological conditions that existed in the controlled areas of the facility.

During the inspection the inspector conducted a radiation survey along side a licensee representative in the Reactor Bay. It was noted that the licensee used proper techniques during the survey. The radiation levels noted by the inspector were generally comparable to those found by the licensee.

(2) Postings and Notices

Radiological signs were typically posted at the entrances to controlled areas. Caution signs, postings, and controls for radiologically controlled areas were as required in 10 CFR Part 20, Subpart J. Licensee personnel observed the precautions for access to radiation areas. Other postings at the facility showed the industrial hygiene hazards that were present in the areas as well.

Copies of NRC Form-3, "Notice to Employees," noted at the facility were the latest version, as required by 10 CFR Part 19.11, and were posted in various areas throughout the facility. These locations included the bulletin boards in the hallways by each entrance to the facility Protected Area and in the hallway by the facility calibration range. Copies of other notices to workers were posted in appropriate areas in the facility.

(3) Dosimetry

The inspector determined that the licensee used thermoluminescent dosimeters (TLDs) for whole body monitoring of beta and gamma radiation exposure with an additional component to measure neutron radiation. The licensee used TLD finger rings for extremity monitoring. The dosimetry was supplied and processed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor (Global Dosimetry Solutions). An examination of the TLD results, indicating exposure to radiation at the facility for the past two years, showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limits. The records showed that the highest annual whole body exposure received by a single individual for 2006 was 237 millirem (mr) deep dose equivalent (DDE). The highest annual extremity exposure for 2006 was 430 mr shallow dose equivalent (SDE) and the highest skin or other shallow dose was 261 mr SDE. The highest annual whole body exposure received by a single person for 2007 was 260 mr DDE. The highest annual extremity exposure for 2007 was 1270 mr SDE and the highest skin or other shallow dose was 362 mr SDE.

The inspector noted that the extremity dose of 1270 mr SDE to one individual for 2007 was unusually high. Upon reviewing this with the RSO, it was noted that the

licensee had conducted an investigation into this matter and asked the dosimetry vendor to verify the results. The dosimetry vendor stated that the dose was correct. Upon further investigation and review of video of the work that had been performed, the licensee identified some work practices and some equipment issues that probably lead to the elevated dose. After modifying and improving the work practices and obtaining other equipment (i.e., longer tongs), no further elevated doses have been received and no other problems have been encountered.

The inspector verified that NRC Form-5 reports had been completed and provided to each employee who received exposure at the facility during 2006 and 2007.

(4) Radiation Monitoring Equipment

Examination of selected radiation monitoring equipment indicated that the instruments had the acceptable up-to-date calibration sticker attached. The instrument calibration records indicated that calibration of portable survey meters was typically completed by licensee staff personnel. However, some instruments, including the neutron detection instruments, were shipped to vendors for calibration. Calibration frequency met procedural requirements and records were maintained as required. Area Radiation Monitors and stack monitors were also being calibrated as required. These monitors were also typically calibrated by licensee staff personnel.

During the inspection the inspector visited the calibration range at the facility. The calibration range appeared to be adequate and the appropriate techniques were outlined in the applicable procedures. Proper precautions and controls had been established and were in place to maintain doses ALARA during use of the calibration range. The inspector and a licensee staff member used the range to compare reading of various licensee instruments with that of the inspector. The readings of all the instruments were similar and no anomalies were noted.

(5) Radiation Protection Program

The licensee's Radiation Protection and ALARA programs were established and described in ROM Chapter 8 and through associated GSTR procedures that had been reviewed and approved. The programs contained instructions concerning organization, training, monitoring, personnel responsibilities, audits, record keeping, and reports. The ALARA program provided guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20. The programs, as established, appeared to be acceptable.

The inspector also determined that the licensee had conducted an annual review of the radiation protection program for 2006 and 2007 in accordance with 10 CFR 20.1101(c). This had been completed by the ROC. In addition, annual audits of the ALARA program entitled, "Radiological Exposures and Radioactive Material Release," had been conducted by the reactor supervisor and were documented in reports dated January 30, 2007, and January 29, 2008.

The licensee did not require or have a respiratory protection program.

(6) Radiation Protection Training

The inspector reviewed the radiation worker (or rad worker) training given to staff members, to those who are not on staff but who are authorized to use the experimental facilities of the reactor, and to support personnel. Initial rad worker training was given to everyone before they started work in the facility. Refresher training for reactor staff was given every two years; everyone else received refresher training every three years. The inspector noted that the last refresher training had been conducted on March 8, 2007.

The initial and refresher training covered the topics specified in 10 CFR Part 19 as required. Training records showed that personnel were acceptably trained in radiation protection practices. The training program was acceptable.

(7) Facility Tours

The inspector toured the Reactor Control Room, the Reactor Room, and selected support laboratories and rooms with licensee representatives on various occasions. No unmarked radioactive material was noted. Radiation Areas and Radioactive Material Storage Areas were posted as required.

c. Conclusions

The inspector determined that the Radiation Protection and ALARA Programs, as implemented by the licensee, were in accordance with regulatory requirements because: 1) surveys were completed and documented acceptably to permit evaluation of the radiation hazards present; 2) notices and postings met regulatory requirements; 3) personnel dosimetry was being worn as required and recorded doses were well within the NRC's regulatory limits; 4) radiation survey and monitoring equipment was being maintained and calibrated as required; and 5) the radiation protection training program was acceptable.

5. Environmental Protection

a. Inspection Scope (IP 69001)

To determine that the licensee was complying with the requirements of 10 CFR Part 20 and TS Section B, the inspector reviewed selected aspects of:

- GSTR "Argon-41 Record" Logbook
- GSTR Environmental "TLD Film Record" Logbook
- U.S. Geological Survey TRIGA Reactor Annual Reports for 2006 and 2007
- Environmental monitoring release records documented on the appropriate forms
- GSTR "H-3 in Reactor Water" Logbook tracking gross alpha and beta activity in reactor water and cooling water
- ROM GSTR Procedure No. 17, "Procedure for Determining Argon-41 Release," latest revision dated April 2007 and last review dated April 23, 2007
- ROM GSTR Procedure No. 20, "Procedure for Radiation Instrument Calibrations," latest revision dated October 2004 and last review dated November 9, 2006

- ROM GSTR Procedure No. 22, "Procedure for Analysis of Stack Gas Radionuclides," latest revision dated May 1995 and last review dated April 23, 2007
- Calibration records for the Ar-41 monitor (stack), area monitors, and the Continuous Air Monitor (CAM) for the past two years

b. Observations and Findings

On-site and off-site gamma radiation monitoring was completed using the reactor facility stack effluent monitor, various environmental monitoring TLDs, and area monitors in accordance with the applicable procedures. Data indicated that there were no measurable doses above any regulatory limits. Biennial environmental soil and water samples were taken and analyzed. No reactor-produced isotopes were identified in the samples.

The inspector determined that gaseous releases continued to be monitored and calculated as required, were acceptably documented, and were within the annual 10 millirem dose constraints of 10 CFR 20.1101 (d), Appendix B concentrations, and TS limits. COMPLY code calculations indicated an effective dose equivalent to the public of 0.1 millirem per year for 2006 and 0.3 millirem per year for 2007. No new potential release paths were noted following observation of the facility by the inspector.

The program for the monitoring, storage, or transfer of radioactive liquid and solids was consistent with applicable regulatory requirements. No liquid discharges had been made during 2006 and 2007. Radioactive material was monitored and released when below acceptable limits or was acceptably transferred to the licensee's NRC Materials License for disposition. The principles of ALARA were acceptably implemented to minimize radioactive releases. Monitoring equipment was acceptably maintained and calibrated. Records were current and acceptably maintained.

c. Conclusions

Effluent releases were within the specified regulatory and TS limits. The environmental protection program was in accordance with NRC requirements.

6. Transportation

a. Inspection Scope (IP 86740)

To verify compliance with regulatory and procedural requirements for the transfer or shipment of licensed radioactive material, the inspector reviewed the following:

- GSTR HP Logbook #40
- Training records of staff members responsible for shipping licensed radioactive material
- ROM GSTR Procedure No. 18, "Instructions for Packaging Limited Quantities of Radioactive Materials," latest revision dated October 2007 and last review dated October 15, 2007
- ROM GSTR Procedure No. 23, "Procedure for Receipt of Radioactive Material Shipments," latest revision dated February 2002 and last review dated April 23, 2007

- Selected US Geological Survey TRIGA Reactor forms, "Radioisotope Request and Receipt Form," for 2007 and 2008 to date

b. Observations and Findings

Records showed that no radioactive material was shipped from the facility under the reactor license, License No. R-113. All radioactive material was transferred to the licensee's NRC Materials License, License No. 05-01399-08, expiration date February 28, 2015, for packaging, shipment, and/or disposal in accordance with licensee requirements. This was documented on the Radioisotope Request and Receipt forms and in the HP Logbooks as required.

The training of the staff members responsible for shipping the material was reviewed. Following completion of the initial qualifications, training was renewed every three years. The latest training had been completed on February 15, 2007, for two staff members and on May 22, 2008, for the others.

c. Conclusions

Radioactive materials were transferred to the licensee's NRC Materials License for shipment and/or disposal.

7. Exit Meeting Summary

The inspector reviewed the inspection results with members of licensee management at the conclusion of the inspection on May 29, 2008. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

A. Buehrle	Reactor Operator
T. DeBey	Manager, GSTR and Reactor Supervisor
T. Dickinson	Reactor Administrator
G. Lightner	Reactor Health Physics Technician
D. Liles	Reactor Health Physicist and USGS Radiation Safety Officer
B. Roy	Reactor Operator

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors
IP 86740	Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None.

Closed

None.

LIST OF ACRONYMS USED

ALARA	As low as reasonably achievable
CFR	Code of Federal Regulations
DDE	Deep dose equivalent
GSTR	Geological Survey TRIGA Reactor
HP	Health physics
IFI	Inspector Follow-up Item
IP	Inspection Procedure
mr	millirem
NRC	Nuclear Regulatory Commission
ROC	Reactor Operations Committee
ROM	Reactor Operations Manual
SDE	Shallow dose equivalent
TLD	Thermoluminescent dosimeter
TS	Technical Specifications
USGS	United States Geological Survey