



UNITED STATES DEPARTMENT OF COMMERCE  
National Institute of Standards and Technology  
Gaithersburg, Maryland 20899-

February 22, 2013

Mr. Anton Vogel  
Director, Division of Nuclear Materials Safety  
U.S. Nuclear Regulatory Commission, Region IV  
612 East Lamar Boulevard, Suite 400  
Arlington, TX 76011-4125  
Facsimile: 817-860-4125

Subject: Confirmatory Order Item 2

Dear Mr. Vogel:

Item 2 in Section V of the March 1, 2010 Confirmatory Order issued by the NRC to NIST in connection with NRC Inspection Report 030-03732/2008-001 and NRC Investigation Report 4-2008-062 states:

“For the years 2010 - 2014, NIST shall send a copy of its required annual audit results to the Director, Division of Nuclear Materials Safety, U.S. NRC, Region IV, for licenses SNM-362 and 05-03166-05, within 30 days of receiving the final audit report.”

I am submitting herewith, within the required 30 days, the required annual audit results for license SNM-362. NIST has taken the actions necessary to correct the findings noted in the report.

Unless otherwise directed, NIST does not plan to provide the NRC with a copy of the annual audit results for license 05-03166-05 for 2012 or future years for the following reasons: (1) When NIST requested an amendment of license 05-03166-05 in accordance with Item 5) of the Confirmatory Order, the NRC terminated license 05-03166-05 and issued a new license, 19-03166-06; and (2) the requirement above is not a requirement of license 19-03166-06.

If you have any questions, you may reach me at 301-975-4502 or at [richard.kayser@nist.gov](mailto:richard.kayser@nist.gov).

Sincerely,

Richard F. Kayser  
Chief Safety Officer

Attachment

NIST

**NUREG 1556 Audit of NRC License SNM-362**

**At the National Institute of Standards and Technology**

**Gaithersburg, MD**

**Conducted by:**

**Dakota Consulting Inc.  
1110 Bonifant Street  
Suite 310  
Silver Spring, MD 20910  
(240) 839-7812  
(240) 328-5297 fax  
Contact @dakota-consulting.com**

**Prepared by:**



**Andy Miller, CHP**

January 29, 2013

**Date**



**David Burkett, CHP, DABR**

January 29, 2013

**Date**

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#### Attachments

- Attachment A. Audit Checklist – Based on NUREG 1556, Vol 17, Appendix G
- Attachment B. Audit Checklist – Based on NUREG 1556, Vol 6, Appendix K.

## **1. OVERVIEW**

### **1.1 Introduction**

An on-site audit of the radiation safety program was performed at the Gaithersburg, MD facility for the National Institute of Standards and Technology (NIST) from December 19 through 21, 2012. The audit was in support of activities covered by Nuclear Regulatory Commission (NRC) License SNM-362 issued to the, Gaithersburg, MD with additional document reviews conducted off-site from December 21, 2012 through January 4, 2013.

The audit was performed by Andy Miller and David Burkett. The audit followed the format recommended in NRC NUREG 1556, Volume 17, Appendix G, Volume 11, Appendix M and Volume 6, Appendix K (related to the Part 36 irradiators).

Mr. Miller and Mr. Burkett conducted entry and exit briefings with the radiation safety staff and appropriate representatives of the Ionizing Radiation Safety Committee (IRSC) and NIST management. The entry briefing included representatives of the Gaithersburg Radiation Safety Division (GRSD): Mr. Tom O'Brien, Radiation Safety Officer (RSO), Mr. Tom McGiff, GSRD Health Physicist, and Mr. Manny Mejias, GSRD Health Physicist. The exit briefing included personnel from GSRD as well as NIST management.

### **1.2 Audit Purpose and Scope**

10 CFR 20.1101 requires, in part, that each NRC licensee conduct an annual audit of the radiation safety program to assess its content and implementation.

This audit included a review of the written radiation safety program at the NIST Gaithersburg site, including the Broadscope License, GSRD procedures, IRSC minutes, and applicable usage protocols and reviews. Auditors reviewed a variety of records, including the hazard review process for approving source acquisition and facility utilization, as well as records of laboratory surveillance, radioactive material inventory control and shipping, personnel monitoring, and personnel training. Follow-up actions of the 2011 annual audit of the SNM-362 license were reviewed, as well as records of response and follow up actions to any inspections/incidents that

may have occurred since the 2011 audit. The auditors toured several of the facilities under radiological control in Building 245 as well as those in other buildings on the NIST campus and interviewed individuals who were determined to be in positions to materially contribute information for the audit.

### **1.3 Audit Details**

The auditors conducted a performance based inspection based on interviews of GSRD personnel, NIST researchers, support personnel and tours of areas where license activities are conducted. During the audit, regulatory compliance was evaluated through observation, document reviews, and personnel interviews. Facilities and equipment were physically inspected. Issues identified were investigated as needed.

For the purposes of this audit, a finding is defined as any condition or action that apparently deviates from an applicable regulation, standard or procedure or adversely impacts the quality or reliability of any aspect of the radiation-safety program. A recommendation is defined as a suggestion that, when implemented, could improve the performance and effectiveness of a task, process or program. A noteworthy practice is defined as a practice that has resulted in the improvement in the effectiveness or efficiency of the radiation safety program.

There were four findings, seventeen recommendations, and seven noteworthy practices as a result of this audit.

### **1.4 Audit Report Format**

The audit report starts with a brief review of the two findings identified in the 2011 annual audit as well as a brief review of compliance with the Confirmatory Order (CO).

The main body of the audit report follows the outline given in NUREG 1556 Volume 11, Appendix M. Attachment A is a completed Audit Checklist based on NUREG 1556, Volume 17, Appendix G. Attachment B is a completed Audit Checklist based on NUREG 1556, Volume 6, Appendix K. Items on these checklists may overlap portions of the audit report as well as the

other attachments. The NUREG checklists were designed as standalone documents.

## **1.5 Past Audit Follow-up**

### **2011 Finding 1:**

The potential for occupational internal dose from radon and radon progeny due to leaking radium sources may not been fully evaluated as required by 10 CFR 20.1502, Conditions Requiring Individual Monitoring of External and Internal Occupational Dose.

### **2011 Finding 1 Discussion/Recommendations:**

The audit team recommends that NIST take steps to fully evaluate the potential for occupational internal dose from radon and radon progeny from the radium sources in their possession.

E-Perm equipment for measurement of radon was observed in Room A010 which could be calibrated and used to perform the surveys, or alternate measurements may be employed such as alpha-track detectors. Procedures should be updated to include evaluation in the event of source breach and periodic routine surveillance. Training of radiation safety staff in both the conduct of the survey and the new procedural requirements should be performed.

### **2011 Finding 1 NIST Response Evaluation**

The auditors reviewed the results of the area monitoring, the health physics analysis performed and the dose assessment performed by the GSRD staff. The reports were well written, comprehensive and technically sound. Estimated doses were well below limits. The auditors also observed E-Perms in use at other select locations in the facility for monitoring similar situations. Recommend closure of this item.

### **Events since last audit**

The auditors reviewed an incident report of a contamination event involving Mo-99 that occurred

in 2012. The auditors reviewed reports, the health physics analysis and the dose assessment performed by the GSRD staff. The reports were well written, comprehensive and technically sound. Estimated doses were well below limits.

#### **1.6 Confirmatory Order compliance**

The auditors discussed the status of compliance with the CO with the RSO. The auditors also reviewed training materials used for all new radioactive materials users. The training materials and program is comprehensive and covers all items listed in the CO, including but not limited to pertinent regulations, license conditions, events, policies and employee rights and responsibilities. Based on discussions with the RSO, it was determined that CO compliance had been thoroughly reviewed by regional NRC inspectors at their last inspection.

It is our opinion that NIST is meeting the requirements of the CO with the understanding that the Deep Cut Assessment will be started upon license renewal or January 31, 2013.

#### **1.7 Executive Summary**

There were four findings, seventeen recommendations, and seven noteworthy practices as a result of this audit.. Discussions on the audited program appear in Section 2. Specific findings, recommendations, and noteworthy practices are presented in Section 3.



## **2. RADIATION SAFETY PROGRAM DISCUSSION**

### **2.1 MANAGEMENT OVERSIGHT:**

(Management support to radiation safety; RSC; RSO; program audits, including annual reviews of program and ALARA reviews; control by authorized users; appropriate follow up on events and previous audit/inspection findings)

The NIST Director has the ultimate responsibility for establishing and maintaining the ionizing radiation safety program at NIST and provides executive leadership on issues involving compliance with regulatory requirements and the conditions of the license. The Director of NIST appoints the IRSC Chair and Vice Chair for indefinite terms at his/her discretion.

The NIST Chief Safety Officer is responsible for:

- (1) Overseeing the establishment, implementation, and maintenance of ionizing radiation safety program at NIST supporting the SNM-362 NRC license; and
- (2) Submitting applications for renewals of and amendments to NRC License Number SNM-362 pursuant to IRSC review and approval.

The IRSC provides oversight of the operations and activities of the NIST radiation safety programs. The IRSC provides the NIST RSO with independent advice and oversight for the ionizing radiation safety program at NIST Gaithersburg.

Records of IRSC meeting minutes were reviewed for the calendar year 2012 meetings. Meetings were held regularly and a quorum was established for each meeting. Records of the IRSC indicated continuing oversight and was exercising its responsibilities.

The RSO is well qualified and is a Certified Health Physicist. The RSO serves as the SNM-362 license manager and as the point of contact with the NRC. The RSO is responsible for managing the radiation safety program and all aspects of the utilization of ionizing radiation sources. The RSO, or designee, has the authority, as delegated by the NIST Director, necessary to meet his responsibilities and to immediately stop any operations that may (1) compromise the health or safety of NIST employees and non-NIST personnel; (2) have an adverse impact on the environment or public; or (3) result in noncompliance with NRC, State, or local requirements. Overall, the management elements of the Radiation Safety Program at NIST (Director, Chief

Safety Officer, IRSC, and RSO) are adequately structured and staffed to exercise their organizational responsibilities.

## **2.2 AMENDMENTS AND PROGRAM CHANGES:**

(Amendments to the license were properly implemented; if applicable, program and procedural changes were approved and implemented in accordance with license condition).

There have been no amendments to the SNM-362 radioactive materials license since the last audit was conducted on October 27<sup>th</sup> and October 28<sup>th</sup> 2011. The radioactive materials license SNM-362 has been in timely renewal since 2007.

The NIST RSO receives generic NRC communications such as Regulatory Information Summaries, NMSS Newsletter, and other generic NRC communications. The RSO reviews these documents for information pertinent to NIST. All of these documents are filed after RSO review.

## **2.3 FACILITIES:**

(Facilities as described in license; uses; control of access; engineering controls; calibration facilities; shielding; air flow)

The facilities are as described in the SNM-362 radioactive materials license. NIST is a Broadscope licensee, which provides NIST with a great deal of flexibility in the management of its configuration of its facilities. During the tour of the facilities the auditors observed various engineering controls to protect workers for radioactive materials. These engineering controls include shielding, remote handling tools (see Figure 1), and effective ventilation.

The entire NIST facility is enclosed with a fence. Access to the facility is through the front gate which has guards present who check each person's identification. All visitors must stop at the guard house to obtain a visitor badge and must be preapproved by a NIST employee.

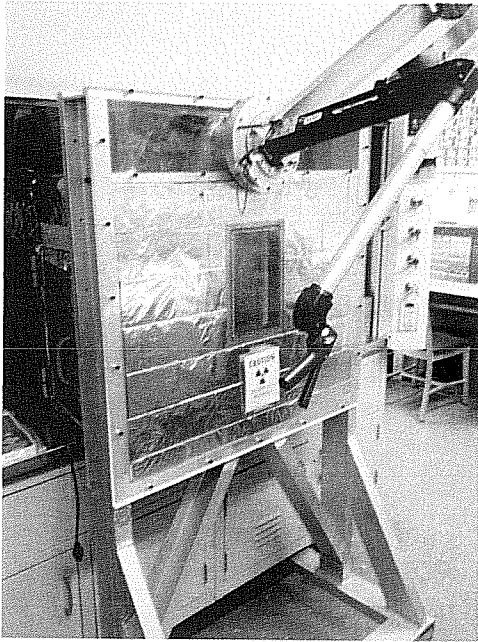
Sections of Building 245 where radioactive materials are used or stored require a key card to gain access to that area of the building. Once inside this area a key is required to gain access to the radioactive materials use areas.

Laboratories where radioactive materials are used or stored must be locked when not attended. During the facility tour, all doors to radioactive material laboratories were locked with one exception. On December 21<sup>st</sup> at 10:45 am, in Building 245 the audit team observed the door to one room that contained radioactive materials was blocked open. The only radioactive material present was a source in a liquid scintillation counter. No laboratory staff members were present. This item was corrected immediately by GRSD staff who locked the door. This was an isolated incident; notably the only one seen in three days of tours.

Large radioactive material sources are in compliance with the NRC Order for Increased Controls on Quantities of Concern. Access to quantities of concern of radioactive materials is strictly controlled. Only personnel who have job functions requiring access to these sources are provided access to these areas. All other personnel must be escorted by an individual who has unescorted access.

Several of the radioactive materials laboratories contain fume hoods for working with radioactive materials. The air flow through the face of the hoods is checked quarterly by the GRSD staff and a sticker marking the proper height of sash is placed on the hood. GRSD staff run comply code annually to verify NIST is in compliance with air emission constraints.

In the 2011 annual audit of the radiation safety program conducted by Tidewater, Inc., housekeeping for radioactive materials was identified as an area for improvement, specifically radioactive waste containers in laboratories were overflowing with radioactive waste. During the facility tour no radioactive waste containers were observed overflowing with radioactive waste. (See Figure 2).



**Figure 1: Shielding and remote handling tools**



**Figure 2: Empty radioactive waste container**

## **2.4 EQUIPMENT AND INSTRUMENTATION:**

(Operable and calibrated survey equipment; procedures; 10 CFR Part 21)

NIST maintains calibrated and operable survey instrumentation to support the radioactive materials work performed at the facility. During the tour of the facility radiation survey equipment was observed in all rooms posted for radioactive materials. All radiation survey equipment was calibrated and operable.

NIST is required to calibrate radiation survey equipment semi-annually. Instrument calibrations are performed by GRSD staff using NIST primary standards. Instruments not meeting calibrations standards or not operating appropriately are removed from service until the instrument has been repaired and calibrated. Calibration records are maintained and are available for review by external auditors such as the NRC. GRSD provides the laboratory with a loaner radiation survey instrument while the laboratory's radiation survey instrument is being calibrated by the GRSD staff.

Several liquid scintillation counters (LSCs) are available at the NIST facility. The LSCs used for compliance contamination surveys undergo quality control testing on each day of use by GRSD staff.

NIST has several whole body scanners, which are calibrated annually. GRSD staff perform periodic operational checks on the whole body scanners.

Pocket ionization chambers are calibrated annually and records are maintained.

## **2.5 MATERIAL USE, CONTROL, AND TRANSFER:**

(Materials and uses authorized; security and control of licensed materials; and procedures for receipt and transfer of licensed material)

Radioactive material packages are delivered to a central receiving warehouse, Building 301. NIST employees using a NIST vehicle transfer the radioactive material packages to Building 245. GRSD staff survey and inventory the radioactive materials packages. The packages are delivered to the laboratories by the GRSD staff.

A warehouse staff member was interviewed via telephone during the audit. The individual was knowledgeable regarding emergencies procedures for receipt of radioactive materials packages. The warehouse staff knew to contact the GRSD staff or the police if a radioactive materials package was received damaged. See Finding 1 for a discussion of an apparent violation regarding package receipt.

NIST reported possession of sources having sufficient activity to require reporting to the National Source Tracking System as required by 10 CFR 20.2207 Reports of transactions involving nationally tracked sources.

All SRM shipments of radioactive material must be reviewed by GRSD staff. GRSD staff verifies that a current radioactive materials license is on file at NIST and the receiving facility is licensed to receive both the type and quantity of radioactive material in the SRM source. A record of this verification is maintained. GRSD staff was observed processing SRM shipment requests. Some shipments of SRMs were delayed until GRSD staff could obtain the appropriate radioactive material license from the customer. Shipments of brachytherapy sources do not follow the same formal review procedure as SRMs. However, NIST staff contacts GRSD to verify the customer has a radioactive materials license on file and is authorized to receive the type and quantity of radioactive material being shipped. (See recommendation 1).

DOT and IATA trained staff prepare radioactive materials for shipment. Janet Stann was observed preparing SRMs for shipment. Ms. Stann had all necessary radiation survey equipment, shipping papers, and supplies required to package radioactive material for shipment. Ms. Stann only packages radioactive materials after GRSD has approved the shipment (license verification). She was very knowledgeable regarding DOT and IATA regulations and she was competent in preparing the radioactive materials for shipment.

Records were reviewed for 279 radioactive materials shipments made in 2012. All shipping records were in compliance with DOT and IATA regulations.

GRSD maintains an inventory of all sealed sources at NIST. Semi-annually all sealed sources are leak tested by GRSD staff. Annually GRSD sends to each Source Custodian a sealed source

inventory. The Source Custodian updates the inventory and returns the updated inventory to GRSD. Leak test records for 2012 were reviewed and determined to be in compliance.

During the audit, the following Source Custodians were asked to provide the inventory of radioactive materials present in a laboratory: Lizabeth Laureano-Perez, Alan Thompson, and Jerome LaRosa. Each Source Custodian was able to provide a radioactive materials inventory. Each Source Custodian was asked to retrieve two sources on the inventory. All Source Custodians were able to locate the requested sources.

NIST maintains records of SNM inventory, receipt and transfers. NIST files semi-annual report in the Nuclear Materials Management and Safeguard System (NMMSS).

## **2.6 AREA RADIATION SURVEYS AND CONTAMINATION CONTROL:**

(Radiological surveys; air sampling; leak tests; inventories; handling of radioactive materials; contamination controls; records; and public doses)

GRSD technicians perform weekly radiation contamination surveys in laboratories where unsealed radioactive materials are used. Direct radiation dose measurements and wipe surveys are performed in each weekly survey. Weekly surveys are documented and a copy of the latest survey is posted at the entrance of the room. A supervisory health physicist reviews the weekly surveys.

Laboratories that use unsealed radioactive materials are audited by a health physicist quarterly. The audit consists of an independent radiation survey and a review of compliance items. Items of noncompliance are documented on the audit report and entered into the HAPPY database. Completed corrective actions are documented in the HAPPY database. During the next audit all items that have not been corrective are followed up by the health physicist.

Area monitors are placed throughout Building 245. The data from these area monitors shows compliance with 10 CFR 20 public dose limits. GRSD also runs the COMPLY code annually to demonstrate compliance with air emission constraints. The 2011 NESHAP report shows compliance with radioactive air emission constraints. NIST did not release radioactive materials via the sanitary sewer system in 2011 and 2012.

Source Custodians were asked to describe their work with radioactive materials and what type of radiation surveys they performed. At the conclusion of their work the Source Custodians indicated they performed a wipe survey. Various answers were given by the Source Custodians as to what the trigger level was for a wipe survey. None of the Source Custodians indicated that they used a portable radiation survey instrument to survey the work area. At all locations a calibrated portable survey instrument was readily available. (See recommendations 2 and 3).

## **2.7 TRAINING AND INSTRUCTIONS TO WORKERS**

(Training and retraining requirements and documentation; interviews and observations of routine work; staff knowledge of all routine activities; 10 CFR Parts 19 and 20 requirements; emergency situations; and supervision by authorized users)

The main entrances to Building 245 and the Physics Building were posted with a NRC Form 3, a Section 206 notice, employee rights as specified in the energy Reorganization Act of 1974, and a notice where the license, regulations and radiation safety program documents can be located.

Safety training is required per NRC and DOT regulations as well as a license condition for SNM-362 radioactive materials license. GRSD develops and maintains appropriate training materials. Radiation Safety training is provided both online and in a lecture format. New employees are required to complete the radiation safety training prior to working with radioactive materials. The training consists of an online portion followed by classroom lecture and hands on training. Records of radiation safety training are maintained by GRSD.

During the audit, Source Custodians were questioned about emergency procedures. All Source Custodians gave appropriate emergency response answers and they knew how to contact GRSD and the police department if the incident occurred after hours.

## **2.8 RADIATION PROTECTION**

(Radiation protection program with ALARA provisions; external and internal dosimetry; exposure evaluations; dose and survey records and reports; annual notifications to workers; bulletins and other generic communications)

Dosimetry services are provided by the US Navy Dosimetry Center in Bethesda, Maryland. Whole body and extremity dosimeters are provided to workers based on a hazard assessment.



Dosimeters are exchanged on a quarterly frequency. Radiation workers who received 100 mrem or more in a year are provided a copy of their radiation doses or upon request. Typical doses to employees working under the SNM-362 license are very low.

Occupational radiation dose records are maintained by GRSD. Dosimetry records were reviewed for 2011 and occupational radiation doses were in compliance with 10 CFR 20.1201. Most radiation doses were less than 10 percent of the occupational dose limits.

## **2.9 RADIOACTIVE WASTE MANAGEMENT**

(Disposal; effluent pathways and control; storage areas; transfer; packaging, control, and tracking procedures; equipment; incinerators, hoods, vents, and compactors; license conditions for special disposal method)

Radioactive waste is stored in Room A010. Room A010 is a former accelerator vault. A010 has a fire detection and alarm system but no fire suppression system (no fire sprinkler or fire extinguishers). Also, this area does not have emergency lighting in the event of a power failure. A010 does not have any windows and is very dark without lighting. (See recommendation 4).

Liquid radioactive waste is stored in A010. The liquid waste was appropriately labeled. However, the liquid waste container was not in a secondary containment. (See recommendation 5).

Radioactive waste which will be shipped for disposal at a commercial disposal facility is transferred to Building H100 for storage and preparation. Radioactive waste generated under the SNM-362 license is kept separate from waste generated under other radioactive material licenses.

Most solid radioactive waste is compacted into 55 gallon drums prior to shipment to a commercial disposal facility. Waste brokers mark and label the drums for shipment. The waste brokers also prepare the shipping papers based on information provided by NIST. NIST staff regularly performs wipe surveys and exposure rate surveys on the drums.

NIST does not perform incineration of radioactive waste.

## **2.10 DECOMMISSIONING**

(Records relevant to decommissioning; decommissioning plan/schedule; notification requirements; cost estimates; funding methods; financial assurance; and Timeliness Rule requirements; changes in radiological conditions since decommissioning plan was submitted)

NIST had a contractor prepare an update to the decommissioning cost estimate report in 2010.

GRSD maintains radioactive materials inventory records, survey records, and disposal records. All of these records are part of the required decommissioning records.

GRSD should consider implementing footprint management for all locations of radioactive materials use. At least annually GRSD should provide a list of rooms and buildings where radioactive materials are used or stored. During this review, GRSD should look for any buildings where radioactive materials are no longer being used. NRC regulations require decommissioning activities to begin in buildings, where radioactive materials operations have ceased, within 24 months. Effective footprint management will alert GRSD staff if any buildings meet the decommissioning criteria. (See recommendation 6.)

## **2.11 TRANSPORTATION**

(Quantities and types of licensed material shipped; packaging design requirements; shipping papers; hazardous materials (HAZMAT) communication procedures; return of sources; procedures for monitoring radiation and contamination levels of packages; HAZMAT training; and records and reports)

DOT and IATA trained staff prepare radioactive materials for shipment. Janet Stann was observed preparing SRMs for shipment. Ms. Stann had all necessary radiation survey equipment, shipping papers, and supplies required to package radioactive material for shipment. Ms. Stann only packages radioactive materials after GRSD has approved the shipment (license verification). She was very knowledgeable regarding DOT and IATA regulations and she was competent in preparing the radioactive materials for shipment.

New employees must complete DOT and IATA training prior to shipping radioactive materials. DOT and IATA refresher training is provided by the GRSD staff every two years.

Records were reviewed for 279 radioactive materials shipments made in 2012. All shipping records were in compliance with DOT and IATA regulations.

## **2.12 NOTIFICATIONS AND REPORTS**

(Reporting and followup of theft, loss, incidents and overexposures. Notification of change in RSO and/or authorized user. Radiation exposure reports provided to individuals.)

Three reports regarding leaking sources were made to the NRC during 2012. A variety of routine reports such as NSTS reports, NMSS transaction reports and SRM transfer reports were submitted to the NRC or their designated contractors in 2012. The RSO was very familiar with the NRC reporting requirements and the NRC Emergency Operations Center phone number.

## **2.13 POSTING AND LABELING**

(Notices; license documents; regulations; bulletins and generic information; posting of radiation areas; and labeling of containers of licensed material)

Based on observations, doors to facilities were posted with “Caution- Radioactive Materials” signs and “Caution – Radiation Area” signs as appropriate. Equipment and containers were frequently found labeled with a variety of type of “Caution – Radioactive Materials” postings. (see recommendation 7). Waste containers were also appropriately labeled.

Areas marked “Caution – Radiation Area” were in compliance with the applicable dose rates. The entrances to Buildings were posted with a current copy of NRC Form 3.

See Finding 4 for a discussion of an apparent violation of 10 CFR 20.1901(a).

## **2.14 INDEPENDENT AND CONFIRMATORY MEASUREMENTS**

(Areas surveyed, both restricted and unrestricted, and measurements made; comparison of data with staff’s results and regulations)

Independent and confirmatory measurements were made with a Fluke Biomedical Victoreen 451B serial number 1901 calibrated September 26, 2012. All independent and confirmatory measurements were in compliance with NRC regulations.

No food, drinks, or tobacco use were observed in any of the radiological laboratories.

### **3. AUDIT RESULTS**

There were four findings, seventeen recommendations, and seven noteworthy practices as a result of this audit.

#### **3.1 Findings**

##### **Finding 1:**

10 CFR 20.1906 (c) states, in part, that "The licensee shall perform the monitoring required by paragraph (b) of this section as soon as practical after receipt of the package, but not later than 3 hours after the package is received at the licensee's facility if it is received during the licensee's normal working hours, or not later than 3 hours from the beginning of the next working day if it is received after working hours."

Contrary to the above requirement, on October 15, 2012, the elapsed time from courier delivery of a DOT labeled radioactive materials package to the licensee at the main receiving dock until GRSD performed the package receipt survey exceeded the 3 hour monitoring requirement.

This was identified as an apparent violation of 10 CFR 20.1906(c).

##### **Finding 1 Discussion/Recommendations:**

Based on a review of records, it was determined that on October 15, 2012 a Yellow-II package was delivered to the main receiving dock by FedEx at 10:48 AM (Tracking number 504099124380). Package receipt paperwork attached to the package that was stored in the GSRD receiving area indicated that the receipt survey was performed at 2:50 PM that afternoon.

FedEx delivered that package to a NIST employee at 10:48 AM. It could be argued by an inspector that when the carrier delivers the package and a licensee representative signs for the package, the receipt survey clock begins.

**Finding 2:**

10 CFR 20.1904(b) requires, in part, that “Each licensee shall, prior to removal or disposal of empty containers to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.

Contrary to the above, Room 155 in Building 245 is not marked with a “Caution – Radioactive Materials” sign, is not authorized for the storage of radioactive materials, and is not under routine surveillance by GSRD.

The auditors observed that the room contained a large number of lead pigs used to store radioactive materials. Certain pigs were labeled with “Caution – Radioactive Materials” stickers and/or labels with information (e.g. activity, isotope) that indicated that the pigs contained radioactive material.



**Figure 3. Lead pigs stored in Building 245, Room 155**



**Figure 4. Lead pigs stored in Building 245, Room 155**

This was identified as an apparent violation of 10 CFR 20.1904(b).

**Finding 2 Discussion/Recommendations:**

The pigs need to be surveyed to verify that they do not contain residual material or contamination. Labels need to be defaced, removed or the containers need to be marked as "EMPTY".

An alternative recommendation is to authorize the room for storage and place the room into the surveillance program.

**Finding 3:**

The rollup door that controls entry into the ground level floor of Neutron Calibration Range in Building 245 had been posted with a “Caution-Radioactive Material” sign. The sign had been degraded by the weather and was no longer posted.



**Figure 5. Posting at Rollup Door Entrance to Neutron Calibration Range**

The rollup door that controls entry to the former NTOF facility at ground level had been posted with a “Caution-Radioactive Material” sign. The sign had been degraded by the weather and was no longer posted.



**Figure 6. Posting at Rollup Door Entrance to the former NTOF facility**

**Finding 3 Discussion/Recommendations:**

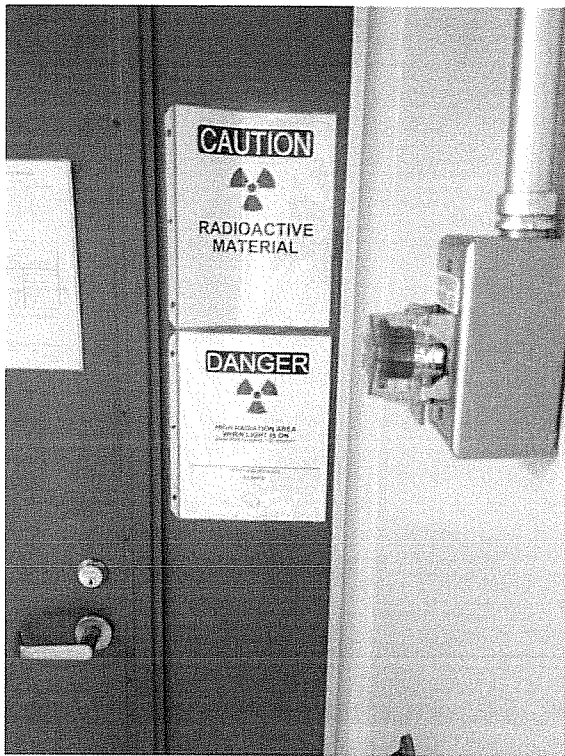
The GSRD technician and the auditor located sign inside the fenced area adjacent to the rollup door for the Neutron Calibration facility. The technician indicated that he would replace the sign as soon as possible. GSRD management needs to ensure that signage can withstand to challenges of the elements.



**Finding 4:**

10 CFR 20.1901(a) requires, in part, that “Unless otherwise authorized by the Commission, the symbol prescribed by this part shall use the colors magenta or purple, or black on a yellow background.”

Contrary to the above, at numerous locations throughout Building 245, posted signs were observed with red colors on a yellow background.



**Figure 7. Typical lab entrance posting**

This was identified as an apparent violation of 10 CFR 20.1901(a).

**Finding 4 Discussion/Recommendations:**

Clearly, the intent of hazard communication is being met by these signs. This is more a narrow regulatory compliance issue versus a higher safety significant item. Nevertheless, the intent of the audit is to self-identify apparent violations and effect corrective action or analysis.

Prior versions of 10 CFR may have allowed this color combination. GSRD will need to research the regulations in this matter. NIST can ask for an exemption through licensing or could replace the signage.

## **3.2 Recommendations**

### **Recommendation 1:**

Shipments of brachytherapy sources; typically returns to licensees; do not follow the same formal review procedure as SRMs. However, NIST research staff contacts GRSD to verify the customer has a radioactive materials license on file and is authorized to receive the type and quantity of radioactive material being shipped.

### **Recommendation 1 Discussion:**

NIST has an effective program that reviews and stores copies of licenses prior to shipment of SRMs. NIST should expand the SRM shipment review procedure to all shipments of radioactive materials.

### **Recommendation 2:**

Source Custodians were asked to describe their work with radioactive materials and what type of radiation surveys they performed. At the conclusion of their work the Source Custodians indicated they performed a wipe survey. Various answers were given by the Source Custodians as to what the trigger level was for a wipe survey. None of the Source Custodians indicated that they used a portable radiation survey instrument to survey the work area.

### **Recommendation 2 Discussion:**

At all locations a calibrated portable survey instrument was readily available. GRSD should consider emphasizing survey requirements in the next annual radiation safety training. Proper use of a survey meter can prevent the spread of contamination from the laboratory to the hallways or whole body counters.

### **Recommendation 3:**

GRSD technicians perform meter, wipe and compliance surveys of assigned areas on a routine basis. GRSD health physicists perform independent meter, wipe and compliance surveys and audits of assigned areas on a routine basis. The survey is well documented with a map of the area that clearly indicates where assessments were performed. Lab users had performed swipe

surveys only, however the documentation reviewed did not include a map and was often challenging to interpret for individuals who did not actually perform the wipe surveys.

**Recommendation 3 Discussion:**

Recommend the lab users use the same preprinted laboratory forms generated by GSRD to document survey locations.

**Recommendation 4:**

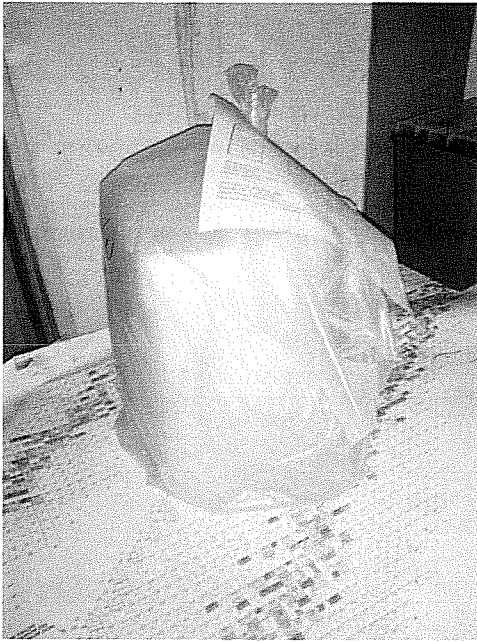
Radioactive waste is stored in A010, which is a former accelerator vault. Room A010 has a fire detection and alarm system but no fire suppression system (no fire sprinkler or fire extinguishers). Also, this area does not have emergency lighting in the event of a power failure. A010 does not have any windows and is very dark without lighting.

**Recommendation 4 Discussion:**

GRSD should consult with the fire safety group about placing fire extinguishers in A010. GRSD should consider installing emergency lighting in this area.

**Recommendation 5:**

Liquid radioactive waste is stored in A010. The liquid waste was appropriately labeled. However, the waste container was not in a secondary containment. Secondary containment is a cost effective preventative measure that can minimize the spread of radioactive material in the event of a container failure.



**Figure 9. Liquid radioactive waste without secondary containment**

**Recommendation 5 Discussion:**

GRSD should consider storing all liquid radioactive waste containers in secondary containment in the waste area.

**Recommendation 6:**

GSRD maintains surveillance of a large number of areas, but we could not identify how GSRD could determine when they needed to initiate decommissioning activities in the event all licensed activities stopped in a building.

**Recommendation 6 Discussion:**

GRSD should consider implementing footprint management for all locations of radioactive materials use. At least annually GRSD should provide a list of rooms and buildings where radioactive materials are used or stored. During this review, GRSD should look for any buildings where radioactive materials are no longer being used. NRC regulations require decommissioning activities to begin in buildings, where radioactive materials operations have ceased, within 24 months. Effective footprint management will alert GRSD staff that buildings meet the decommissioning criteria.

**Recommendation 7:**

Labeling of containers of radioactive materials is required to contain information such as isotope, activity, exposure rate in order to inform a person of the nature of the radiation hazards that may be present. Labeling of containers is not performed in a consistent manner. In one laboratory, this accomplished with “post-it” notes that sometimes list a source number or at other times lists an isotope and activity.



**Figure 10. Storage pig labeling –limited information**



**Figure 11. Post-it note labeling example**

**Recommendation 7 Discussion:**

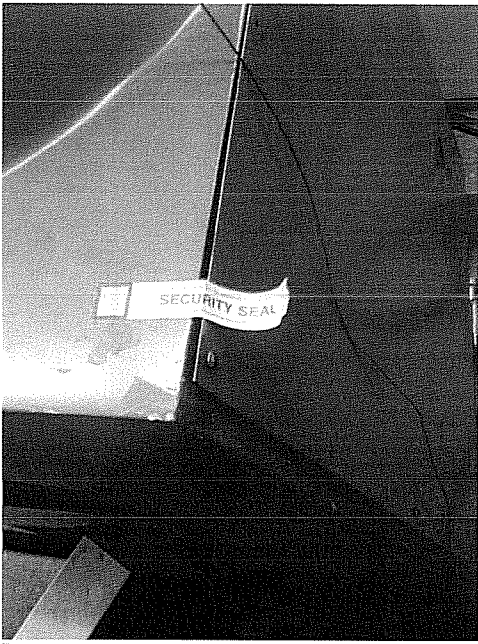
Recommend a more consistent approach for labeling containers. This should be part of the hazard review for the laboratory. The hazard review process be expanded to specify appropriate labeling for containers of radioactive materials such as isotope, activity, assay date, dose rate or special instructions to provide researchers, GSRD staff or first responders with information to more adequately communicate any hazards that may be present. A more consistent labeling approach may be easier to audit and inventory.

**Recommendation 8:**

Security seals were installed on irradiators in a variety of locations. Often these seals were intact, but we found several instances where they had been opened indicating access to a device.

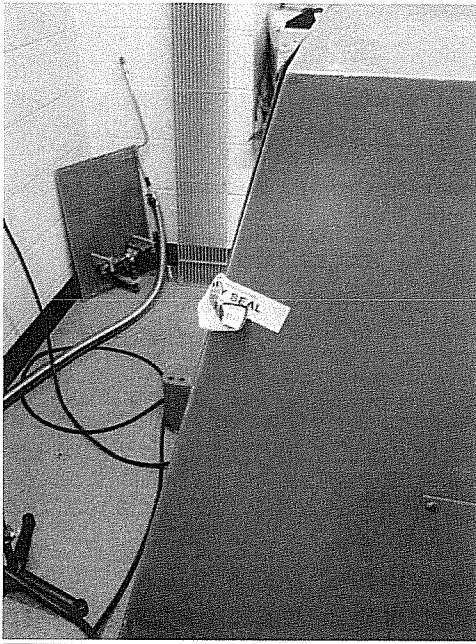


**Figure 12. Broken security seal – Room B143**



**Figure 13. Broken security seal – Room B140**





**Figure 14. Broken security seal – Room B140**

**Recommendation 8 Discussion:**

Based on discussions with the staff, we could not determine who ownership for this process. If it is determined that security seals are required, the program needs to be effectively managed. If it is determined that security seals are not required, we recommend removal of all seals.

**Recommendation 9:**

GSRD calibrates and repairs survey instruments in Room A10 of Building 245, which is a former part of the Linac. This area does not have emergency lighting in the event of a power failure. As demonstrated to the GSRD technician, the rooms does not have any windows and is very dark without lighting.

**Recommendation 9 Discussion:**

GSRD should consider installing emergency lighting in this area.

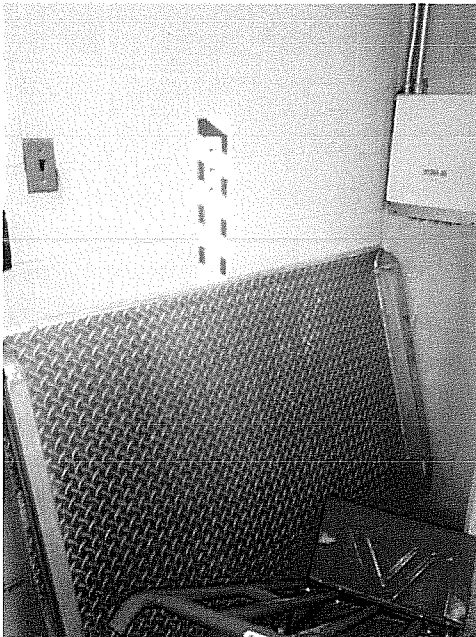
**Recommendation 10:**

Building 245 Room B131 is the entrance to the package receipt and source storage area. To the left of the door, a sign indicating “NBS Radiation Hazard Control Area” is posted:



**Figure 15. Left side of entrance to Room 131**

To the right of the door, the posting is blocked by equipment:



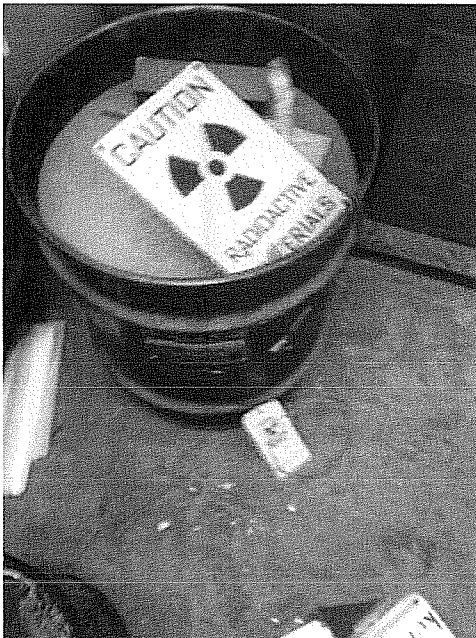
**Figure 16. Right side of entrance to Room 131**

**Recommendation 10 Discussion:**

Recommend relocation of the equipment or removal of the signage if it is no longer applicable to the program.

**Recommendation 11:**

Room B143 of Building 245 contains a variety of neutron sources. One drum on the floor had a metal “Caution – Radioactive Materials” sign lying on top of the shielded drum. A “Caution-Radioactive Materials” tag listing an isotope with an RS number was not on the drum. A tag was found on the floor in close proximity to the source.



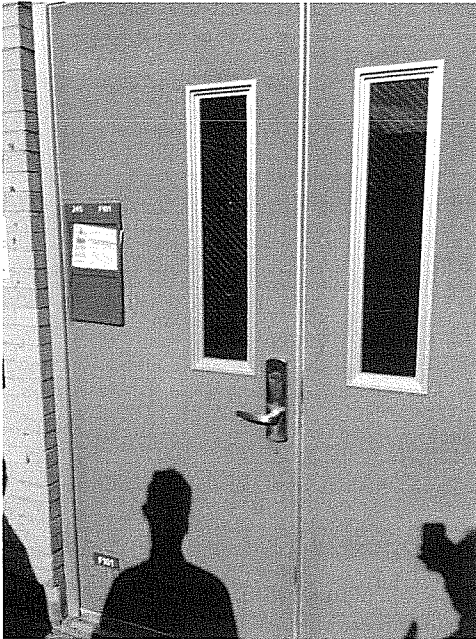
**Figure 17. Neutron source drum – Room B143**

**Recommendation 11 Discussion:**

Recommend that GSRD and the source custodian verify that the source tag matches the source in the drum.

**Recommendation 12:**

The pool irradiator facility doors in Building 245, Room F101 are not marked with a “Caution – Radioactive Materials” sign on either door.



**Figure 18. Entrance 1 to Room F101**



**Figure 19. Entrance 2 to Room F101**

However, Building 245, Room B143 is marked with a “Caution – Radioactive Materials” sign as shown below.



**Figure 20. Dock Entrance to Room B143**

**Recommendation 12 Discussion:**

The deck to the pool irradiator is appropriately marked with a “Caution – Radioactive Materials” sign. We recommend the facility either post both doors to the pool irradiator area with a “Caution – Radioactive Materials” sign (preferred) or remove the sign from Room B143 on the exterior of the building. This is a more consistent approach.

**Recommendation 13:**

The outside pool irradiator facility doors in Building 245, Room F101 and the outside calibration lab door in Building 245, Room B143 both list emergency contact information which may be out of date. The information on the door to Room B143 is in marginal condition.

**Recommendation 13 Discussion:**

GSRD should work with the source custodians to update information on these signs.

**Recommendation 14:**

On the outside loading dock to Building 245 we found a closed 55 gallon drum that had no markings.

**Recommendation 14 Discussion:**

Recommend GSRD determine the contents of the drum and take appropriate actions to store or dispose as needed.

**Recommendation 15:**

The SNM and NMSS databases were examined for completeness. The database printout dated July 11, 2012 listed a series of items in Building 245, Room A0101. The worksheet printout dated June 30, 2012 listed the same series of items in Building 245, Room B132. On the date of the audit; December 21, 2012, the series of items were listed in a different database and were actually located in Building 245, Room B132.

**Recommendation 15 Discussion:**

Recommend a more uniform approach to recordkeeping and multiple database reconciliation for this process.

**Recommendation 16:**

The current forms used by GSRD for surveys contain a wealth of information. However items that are not present on the form are current action levels for contamination or dose rate.

**Recommendation 16 Discussion:**

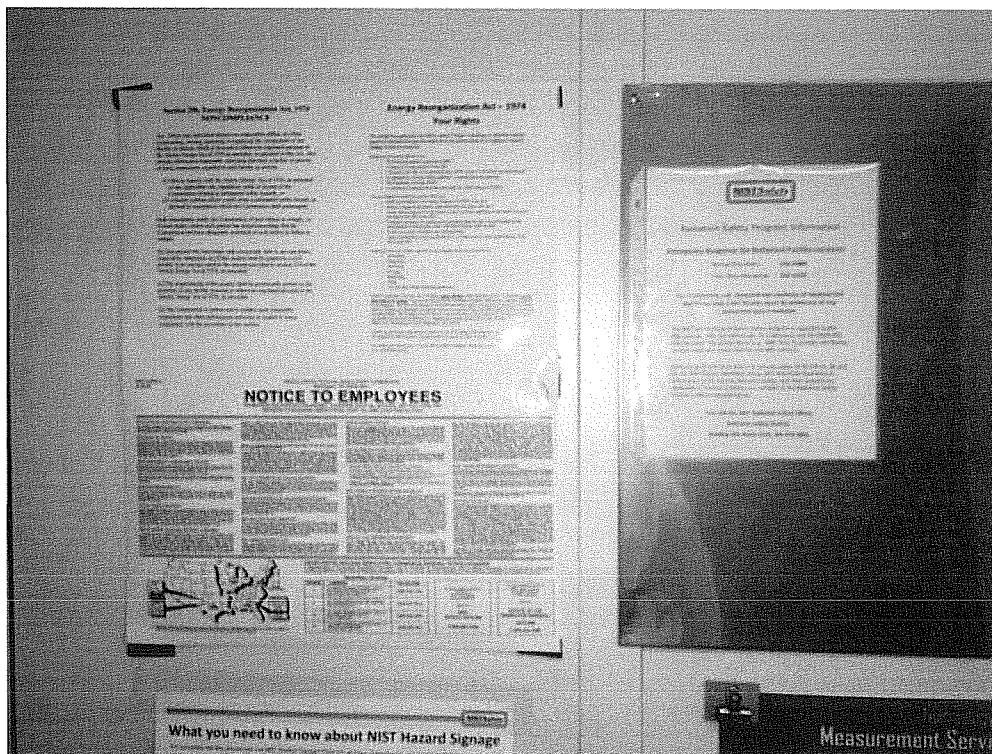
Based on discussions with staff, it was determined that the current procedure lists the action levels for contamination or dose rate. Staff members are familiar with these action levels as well.

However, these survey documents could be used many years in the future in support of decommissioning. Without an attached procedure, a future user may have difficulty in

determining action levels that may be needed in support of decommissioning. Recommend adding action levels for contamination or dose rate.

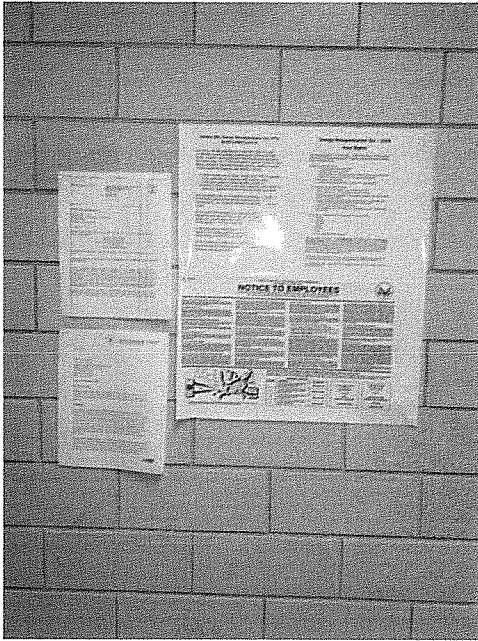
**Recommendation 17:**

The main entrances to Building 245 and the Physics Building were posted with a NRC Form 3, a Section 206 notice, employee rights as specified in the energy Reorganization Act of 1974, and a notice where the license, regulations and radiation safety program documents can be located.



**Figure 21. Postings at the main entrance to Building 245**

Other entrances to Building 245 (as shown in Figure 22) did not include a notice where the license, regulations and radiation safety program documents can be located.



**Figure 22. Postings at the side entrance to Building 245**

**Recommendation 17 Discussion:**

The requirement for having all posted information available is being met by having at least one full posting set at the entrance to each building. A more consistent approach is recommended by having the same information at all entrances when posted or removal of extra postings at extra entrances.



### 3.3 Noteworthy Practices

The following Noteworthy Practices identified during the audit are presented:

- The method for obtaining, reviewing and managing licenses for compliance with Part 30 is working very well and should be expanded.
- DOT IATA training is very effective. The auditors were impressed with the breadth and depth of knowledge of IATA and DOT shipping compliance exhibited by the SRM shipping clerk.
- GSRD has instituted a very comprehensive and aggressive survey program and schedule. This will serve the program well to identify issues at the earliest opportunity.
- Meter calibrations are performed and documented in an excellent manner
- Radioactive waste pickup in radioactive materials laboratories is working extremely well. The auditors found all waste containers to be empty, vice earlier findings on the previous audit.
- Based on interviews with numbers personnel, NIST researchers and employees know to call GSRD with questions, concerns or in the event of an incident.
- The NSTS/SNM records are in fantastic shape due to the hard work of the custodian of the program.

**Suggested Audit Checklist****Based on NUREG-1556, Vol 17, Appendix G**

**Note:** All areas indicated in audit notes may not be applicable to every license and may not need to be addressed during each audit. For example, licensees do not need to address areas which do not apply to their activities and activities which have not occurred since the last audit need not be reviewed at the next audit.

**1. AUDIT HISTORY** ☐ N/A (N/A means “Not applicable” – Initial Audit)

- A. Last audit of this location conducted November 2011
- B. Problems/deficiencies identified during last two audits or two years, whichever is longer
- ☒ Yes ☐ No
- C. Open problems/deficiencies from previous audits:  
**No. Findings noted in the previous audit have been closed. Observations (suggestions) were addressed as needed.**
- D. Any previous problem/deficiency not corrected or repeated  
☐ Yes ☒ No ☐ N/A

Explain:

**Based on discussions with licensee personnel and a review of records the finding from the previous audit was recommended to be closed.**

**2. ORGANIZATION AND SCOPE OF PROGRAM**

A. Briefly describe organizational structure and note any personnel changes.

1. Structure is as described in license documents? ☒ Yes ☐ No
2. Multiple authorized locations of use? ☒ Yes ☐ No
3. Briefly describe scope of activities involving licensed material, frequency of use, staff size, etc.

See discussion in Section 2.1 of the main audit report.

- B. Radiation Safety Officer ☒ Yes ☐ No
1. Authorized on license ☒ Yes ☐ No
  2. Fulfills duties as RSO ☒ Yes ☐ No

- C. Use only by authorized individuals ☒ Yes ☐ No

Remarks:

**3. TRAINING, RETRAINING, AND INSTRUCTIONS TO WORKERS**

- A. Instructions to workers per [10 CFR 19.10] ☒ Yes ☐ No
- B. Training program required ☒ Yes ☐ No
- C. Training records maintained ☒ Yes ☐ No
- D. Evaluation of individuals' understanding of procedures and regulation based on interviews, observation of selected workers ☒ Yes ☐ No
1. Each has an up-to-date copy of the licensee's safe use and emergency procedures
  2. Adequate understanding of:
    - a. Current safe use procedures ☒ Yes ☐ No
    - b. Emergency procedures ☒ Yes ☐ No

## E. Revised Part 20, Workers cognizant of requirements for:

1. Radiation Safety Program [20.1101] ☒ Yes ☐ No
2. Annual dose limits [20.1301, 20.1302] ☒ Yes ☐ No
3. New NRC Forms 4 and 5 ☒ Yes ☐ No
4. 10% monitoring threshold [20.1502] ☒ Yes ☐ No
5. Dose limits to embryo/fetus and declared pregnant women [20.1208]  
☒ Yes ☐ No
6. Procedures for opening packages [20.1906] ☒ Yes ☐ No

Remarks:

**4. INTERNAL AUDITS, REVIEWS OR INSPECTIONS**A. Audits are conducted ☒ Yes ☐ No

1. Audits conducted by
2. Frequency

B. Content and implementation of the radiation protection program reviewed annually  
[20.1101(c)] ☒ Yes ☐ NoC. Records maintained [20.2102] ☒ Yes ☐ No**5. FACILITIES**Facilities as described in license application ☒ Yes ☐ No

Remarks:

**6. MATERIALS**Isotopes, quantities, and use as authorized on license ☒ Yes ☐ No

Remarks:

**7. LEAK TESTS**

- A. Leak test performed as described in correspondence with NRC (consultant;leak test kit; licensee performed) ☒ Yes ☐ No
- B. Frequency: every 6 months or other interval, as approved by NRC or Agreement State ☒ Yes ☐ No
- C. Records with appropriate information maintained ☒ Yes ☐ No

Remarks:

**8. INVENTORIES**

- A. Conducted at 6-month intervals ☒ Yes ☐ No
- B. Records with appropriate information maintained ☒ Yes ☐ No

Remarks:

**9. RADIATION SURVEYS**

- A. Instruments and Equipment: ☒ Yes ☐ No
1. Appropriate operable survey instrumentation possessed or readily available ☒ Yes ☐ No
2. Calibrated as required [20.1501] ☒ Yes ☐ No
3. Calibration records maintained [20.2103(a)] ☒ Yes ☐ No
- B. Briefly describe survey requirements [20.1501(a)]:
- C. Performed as required [20.1501(a)] ☒ Yes ☐ No
1. Radiation levels within regulatory limits ☒ Yes ☐ No
2. Corrective action taken and documented ☒ Yes ☐ No
- D. Records maintained [20.2103] ☒ Yes ☐ No
- E. Protection of members of the public
1. Adequate surveys made to demonstrate either (a) that the TEDE to the individual likely to receive the highest dose does not exceed 100 mrem in a year, or (b) that if an individual were continuously present in an

unrestricted area, the external dose would not exceed 2 mrem in any hour and 50 mrem in a year [20.1301(a)(1), 1302(b)] ☒ Yes ☐ No

2. Unrestricted area radiation levels do not exceed 2 mrem in any one hour [20.1301(a)(2)] ☒ Yes ☐ No

3. Records maintained [20.2103, 2107] ☒ Yes ☐ No

Remarks:

**10. RECEIPT AND TRANSFER OF RADIOACTIVE MATERIAL (INCLUDES WASTE DISPOSAL)**

A. Describe how packages are received and by whom:

**Packages come to a central facility for FedEx. Freight deliveries often come direct to Building 245.**

B. Written package opening procedures established and followed [20.1906(e)]  
☐ Yes ☒ No

C. If package shows evidence of degradation, monitor for contamination and radiation levels  
☒ Yes ☐ No ☐ N/A

D. Monitoring of degraded packages performed within time specified[20.1906(c)]  
☒ Yes ☐ No ☐ N/A

E. Transfer(s) between licensees (including "disposal") performed per 70.36 and 70.42  
☒ Yes ☐ No ☐ N/A

F. Records of receipt/transfer maintained [20.2103(a), 70.51(b)(1)] ☒ Yes ☐ No

G. Transfers within licensee's authorized users or locations performed as required [L/C]  
☒ Yes ☐ No ☐ N/A

H. Package receipt/distribution activities evaluated for compliance with 20.1301 [20.1302]  
☒ Yes ☐ No ☐ N/A

Remarks:

**See Finding 1 for a discussion of an apparent violation regarding package receipt.**

**11. TRANSPORTATION (10 CFR 71.5(a) and 49 CFR 170-189)**

**A. Licensee shipments are:**

- |    |   |  |
|----|---|--|
| 1. | Delivered to common carriers                  | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| 2. | Transported in licensee's own private vehicle | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A |
| 3. | No shipments since last audit                 | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A |

**B. Packages**

- |    |   |  |
|----|---|--|
| 1. | Authorized packages used [173.415, 416(b)]      | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A |
| 2. | Closed and sealed during transport [173.475(f)] | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No                              |

**C. Shipping Papers**

- |    |  |   |
|----|--|---|
| 1. | Prepared and used [172.200(a)]   | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 2. | Proper {Shipping name, Hazard Class, UN Number, Quantity, Package Type, Nuclide, RQ, Radioactive Material, Physical and Chemical Form, Activity, Category of label, TI, Shipper's Name, Certification and Signature, Emergency Response Phone Number, "Cargo Aircraft Only" (if applicable)} [172.200-204] | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 3. | Readily accessible during transport [177.718(e)]   | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |

**D. Vehicles**

- |    |  |   |
|----|--|---|
|    |  | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 1. | Cargo blocked and braced [177.842(d)]  | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 2. | Placarded, if needed [172.504]   | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| 3. | Proper overpacks, if used (shipping name, UN Number, labeled statement indicating that inner package complies with specification package) [173.25] | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |

- E. Any incidents reported to DOT [171.15, 16] ☐ Yes ☒ No

Remarks:

**12. PERSONNEL RADIATION PROTECTION**

- A. ALARA considerations are incorporated into the Radiation Protection Program [20.1101(b)] ☒ Yes ☐ No

- B. Adequate documentation of determination that unmonitored occupationally individuals are not likely to receive >10% of allowable limit [20.1502(a)] ☒ Yes ☐ No ☐ N/A

OR

- C. External dosimetry provided and required ☒ Yes ☐ No ☐ N/A

1. Supplier Naval Dosimetry Center Frequency Monthly and quarterly

2. Supplier is NVLAP-approved [20.1501(c)] ☒ Yes ☐ No

3. Dosimeters exchanged at required frequency [L/C] ☒ Yes ☐ No

- D. Occupational intake monitored and assessed [20.1502(b)] ☒ Yes ☐ No ☐ N/A

- E. Reports

1. Reviewed by GSRD staff Frequency as received

2. Auditor reviewed personnel monitoring records for 2012.

3. Prior dose determined for individuals likely to receive doses [20.2104] ☒ Yes ☐ No

4. Maximum exposures TEDE Other

5. NRC Forms or equivalent [20.2104(d), 2106(c)]

a. NRC Form 4 "Cumulative Occupational Exposure History"

☒ Yes ☐ No

Complete:

☒ Yes ☐ No

b. NRC Form 5 "Occupational Exposure Record for a Monitoring



Period"

☒ Yes ☐ No

Complete:

☒ Yes ☐ No

6. Worker declared her pregnancy in writing during inspection period  
(review records) ☒ Yes ☐ No ☐ N/A

If yes, determine compliance with [20.1208] ☒ Yes ☐ No

Check for records per [20.2106(e)] ☒ Yes ☐ No

- F. Records of exposures, surveys, monitoring, and evaluations maintained  
[20.2102, 2103, 2106, L/C] ☒ Yes ☐ No

Remarks:

**Doses are well below limits. ALARA is evident.****13. AUDITOR'S INDEPENDENT MEASUREMENTS (IF MADE)**

A. Survey instrument Serial No. Last calibration  
Fluke Biomedical Victoreen 451B serial number 1901 calibrated September 26, 2012

B. Auditor's measurements compared to licensee's ☒ Yes ☐ No

C. Describe the type, location, and results of measurements:

**14. NOTIFICATION AND REPORTS**

A. Licensee in compliance with [19.13, 70.50] (reports to individuals, public and occupational, monitored to show compliance with Part 20

B. Licensee in compliance with [20.2201, 70.50] (theft or loss)  
☐ Yes ☐ No ☒ None

C. Licensee in compliance with [20.2202, 70.50] (incidents)  
☐ Yes ☐ No ☒ None

D. Licensee in compliance with [20.2203, 70.50] (overexposures and high radiation levels)  
☒ Yes ☐ No ☐ None

- E. Licensee aware of telephone number for NRC Emergency Operations Center [(301) 816-5100]  
☒ Yes ☐ No

**15. POSTING AND LABELING**

- A. NRC Form 3 "Notice to Workers" is posted [19.11] ☒ Yes ☐ No
- B. Parts 19, 20, 21, Section 206 of Energy Reorganization Act, procedures adopted pursuant to Part 21, and license documents are posted, or a notice indicating where documents can be examined is posted [19.11, 21.6] ☒ Yes ☐ No
- C. Other posting and labeling per [20.1902, 1904] and the license is not exempted by [20.1903, 1905] ☐ Yes ☒ No

Remarks:

**See Findings 2, 3 and 4 for a variety of posting issues that are apparent violations.**

**16. RECORDKEEPING FOR DECOMMISSIONING**

- A. Records of information important to the safe and effective decommissioning of the facility maintained in an independent and identifiable location until license termination ☒ Yes ☐ No
- B. Records include all information outlined in [70.25(g)] ☒ Yes ☐ No

Remarks:

**17. BULLETINS AND INFORMATION NOTICES**

- A. Receipt of NRC Bulletins, NRC Information Notices, NMSS newsletters, etc.  
☒ Yes ☐ No
- B. Appropriate action taken in response to Bulletins, Information notices, etc.  
☒ Yes ☐ No

Remarks:

**18. SPECIAL LICENSE CONDITIONS OR ISSUES**

- A. Review special issue conditions or other issues, and describe findings:  
**See Irradiator license NUREG checklist**
- B. Problems/deficiencies identified at licensee facilities other than at audit location:
- C. Evaluation of compliance:

**19. CONTINUATION OF REPORT ITEMS**

(If more space is needed, use separate sheets and attach to report.)

**20. PROBLEMS OR DEFICIENCIES NOTED; RECOMMENDATIONS** N/A

**Note:** Briefly state (1) the requirement and (2) how and when violated. Provide recommendations for improvement.

**See Findings 1- 4 in the attached report for requirements and potential violations.**

**21. EVALUATION OF OTHER FACTORS**

- A. Senior licensee management is appropriately involved with the radiation safety program and/or RSO oversight  
☒ Yes ☐ No
- B. RSO has sufficient time to perform his/her radiation safety duties and is not too busy with other assignments  
☒ Yes ☐ No
- C. Licensee has sufficient staff  
☒ Yes ☐ No

Remarks/recommendations:

## Suggested Audit Checklist for 10 CFR Part 36 Irradiators

### Based on NUREG-1556, Vol 6, Appendix K

**Note:** All areas indicated in audit notes may not be applicable to every license and may not need to be addressed during each audit. For example, licensees do not need to address areas which do not apply to their activities and activities which have not occurred since the last audit need not be reviewed at the next audit.

### Audit History

- A. Last audit of this location conducted on (date) November 2011
- B. Were previous audits conducted at intervals not to exceed least every 12 months? [10 CFR 20.1101] **Yes**
- C. Were records of previous audits maintained? [10 CFR 20.2102] **Yes**
- D. Were any deficiencies identified during last two audits or two years, whichever is longer? **Yes**
- E. Were corrective actions taken? (Look for repeated deficiencies).  
**Yes. Findings and observations were noted in the previous audit. None of these findings or observations dealt with Part 36 issues.**

### Organization And Scope of Program

- A. If the mailing address or places of use changed, was the license amended? **N/A**
- B. If ownership changed or bankruptcy filed, was NRC prior consent obtained or was NRC notified? **N/A**
- C. Radiation Safety Officer
  - 1. If the RSO was changed, was license amended?  
**N/A No change of RSO since last audit.**
  - 2. Does new RSO meet the licensee's training requirements?  
**N/A No change of RSO since last audit.**

3. Is RSO fulfilling his/her duties?  
**Yes.**
4. To whom does RSO report?  
**NIST management and chair of the RSC**
- D. If the designated contact person for NRC changed, was NRC notified?  
**N/A no change of RSO since last audit.**
- E. Sealed Sources and Devices
  1. Does the license authorize all of the NRC regulated radionuclides contained in irradiators?  
**Yes. Licensee is a Type A Broad Scope. License conditions list applicable nuclides and amounts.**
  2. Have copies of (or access to) SSD Certificates?  
**Not examined. The license in effect at the time of the audit does not meet the current NRC licensing template which now references and requires SSD data. Licensee is in the process of renewing the license. Licensee is aware that NRC may be of assistance in locating SSD's when necessary.**
  3. Are the sealed sources, and if applicable, devices in accordance with the description in the Sealed Source and Device (SSD) Registration Certificates? [10 CFR 32.210]  
**N/A The license in effect at the time of the audit does not meet the current NRC licensing template which now references and requires SSD data.**
  4. Have manufacturers' manuals for operation and maintenance?  
**Yes. Observed manufacturer's manuals in the Vertical Range area.**
  5. Are the actual uses of the irradiator consistent with the authorized uses listed on the license?  
**Yes. Licensee uses irradiators for calibrations and materials studies.**
  6. Are the sealed sources used under conditions specified in the "Conditions of Normal Use" and "Limitations and/or Other Considerations of Use" on the SSD Registration Certificates?  
**Not examined. As SSD's are obtained, the licensee is encouraged to ensure that these areas are reviewed as part of the internal licensing and hazard review process.**

**Training and Instructions to Workers**

- A. Were all workers who are likely to exceed 1 mSv (100 mrem) in a year instructed per [10 CFR 19.12]?
- Yes. Observed HP staff and researchers wearing dosimetry when in irradiator areas as instructed.**
- Refresher training provided, as needed?
- Annual refresher training records included those individuals likely to exceed 1 mSv in a year.**
- Records maintained?
- Yes. Records were maintained by GSRD.**
- B. Did each individual permitted to operate the irradiator without a supervisor present, receive instruction according to the license commitments and 10 CFR 36.51 before operating the irradiator?
- Yes, based on discussions with GSRD staff and irradiator operator**
- C. Are records of training, tests, safety reviews, and annual evaluations maintained for each authorized irradiator operator? [10 CFR 36.81(b), (c)]
- Yes, based on discussions with GSRD staff.**
- D. Did individuals who perform non-routine operations receive training before performing these operations?
- N/A. The licensee does not perform non-routine operations. Manufacturers or vendors are used to accomplish these tasks.**
- E. Did interviews reveal that individuals know the emergency procedures?
- Yes. Based on discussions with the irradiator operator, the individual knew the appropriate emergency procedures.**
- F. Did this audit include observations of irradiator operations?
- No. Site visit only. At the time of the audit, no irradiations were being performed.**
- G. Do workers know requirements for the following:
1. the radiation safety program
  2. annual dose limits
  3. new Form NRC 4 and 5
  4. 10% monitoring threshold
  5. dose limits to embryo/fetus and declared pregnant worker
  6. grave danger posting?
- Yes. Based on discussions with the irradiator operator, the individual was familiar with the requirements listed above. In addition, the GSRD staff member with irradiator program safety oversight was familiar with these requirements as well.**

**Radiation Survey Instruments And Radiation Monitors**

- A. Are all portable survey meters calibrated at least annually to an accuracy of  $\pm 20\%$  for the gamma energy of the sources in use? [10 CFR 36.57(c)]  
**Yes. Based on a review of records and discussions with GSRD staff.**
- B. Are portable survey meters of a type that does not saturate and read zero at high dose rates? [10 CFR 36.57(c)]  
**Yes.**
- C. Are calibration records maintained?  
**Yes.**
- D. Are all operable survey instruments able to detect 0.5 microsievert (0.05 mrem) per hour?  
**Yes.**
- E. Has the licensee evaluated the location and sensitivity of the radiation monitor to detect sources carried by the product conveyor system for automatic conveyor systems? [10 CFR 36.29(a)]  
**N/A. The licensee does not irradiate materials using a conveyor system.**
- F. Has the licensee tested the operability and sensitivity of monitor used to detect the presence of high radiation levels in the radiation room before personnel entry at frequency specified in license application?  
**Yes.**
- G. Has the licensee tested the operability and sensitivity of monitor used to detect contamination of pool water due to leaking sources? (frequency of checks as specified in license application?)  
**N/A. The pool irradiator source strength is lower than the levels specified in 10 CFR 36.1(b).**
- H. For underwater irradiators not in a shielded radiation room, has the licensee tested the operability and sensitivity of monitor used to detect abnormal radiation levels? (frequency of checks as specified in license application?)  
**N/A. The pool irradiator source strength is lower than the levels specified in 10 CFR 36.1(b).**

**Conductivity Meters**

- A. Are appropriate operable conductivity meters possessed and used?  
**N/A. The pool irradiator source strength is lower than the levels specified in 10 CFR 36.1(b). Therefore the requirements of 10 CFR 36.63 do not apply.**
- B. Are conductivity meters calibrated at least annually? [10 CFR 36.63(b)]  
**N/A. The pool irradiator source strength is lower than the levels specified in 10 CFR 36.1(b). Therefore the requirements of 10 CFR 36.63 do not apply.**

**Although not required, the licensee does filter the water in the pool irradiator in a water purification system.**

**Sealed Source Accountability Program**

- A. Are records maintained showing the receipt, location, transfer, and disposal of each sealed source? [10 CFR 30.51(a)(1)]  
**Yes. GSRD maintains a database of all sealed sources in use or in storage.**
- B. Is material accountability program as described in application being implemented?  
**Yes.**

**Personnel Radiation Protection**

- A. Are ALARA considerations incorporated into the radiation protection program? [10 CFR 20.1101(b)]  
**Yes.**
- B. Is documentation kept showing that unmonitored individuals receive  $\leq 10\%$  of limit? [10 CFR 20.1502(a)]  
**Yes.**
- C. Did unmonitored individuals' activities change during the year which could put them over 10% of limit?  
**No. Not in the irradiator use areas covered under Part 36.**
- D. If yes to C above, was a new evaluation performed?
- E. Is external dosimetry provided to individuals as required by 10 CFR 36.55 and to individuals likely to receive  $>10\%$  of limit?  
**Yes.**
1. Irradiator Operators: Is the dosimetry supplier NVLAP approved? [10 CFR 20.1501(c)]  
**Yes. Naval Dosimetry Center is NVLAP approved.**



2. Are the dosimeters exchanged monthly for film badges and quarterly for TLDs?  
**Yes.**
  3. Are dosimetry reports reviewed by the RSO upon receipt?  
**Yes.**
  4. Are dosimeters provided to persons who enter the radiation room of a panoramic irradiator? [10 CFR 36.55(b)]  
**Yes. Observed all personnel in radiation room with dosimetry.**
  5. Annual checks of accuracy of pocket dosimeters performed? [10 CFR 36.55(b)]  
**Yes. Based on discussions with GSRD personnel.**
  6. Are the records NRC Forms or equivalent? [10 CFR 20.2104(d), 10 CFR 20.2106(c)]  
**Yes.**
    - a. NRC-Form 4 "Cumulative Occupational Exposure History" completed?  
**Yes.**
    - b. NRC-Form 5 "Occupational Exposure Record for a Monitoring Period" completed?  
**Yes.**
  7. Declared pregnant worker/embryo/fetus
    - a. If a worker declared her pregnancy, did licensee comply with [10 CFR 20.1208]?  
**N/A in the irradiator area based on discussions with the licensee.**
    - b. Were records kept of embryo/fetus dose per [10 CFR 20.2106(e)]?  
**N/A in the irradiator area based on discussions with the licensee.**
- F. Are records of exposures, surveys, monitoring, and evaluations maintained [10 CFR 20.2102, 10 CFR 20. 2103, 10 CFR 20. 2106, 10 CFR 36.57(a)]  
**Yes**

### **Public Dose**

- A. Is public access controlled in a manner to keep doses below 1 mSv (100 mrem) in a year? [10 CFR 20.1301(a)(1)]  
**Yes. The licensee uses environmental TLD system to assess public doses in areas adjacent to irradiator facilities.**
- B. Has a survey or evaluation been performed per 10 CFR 20.1501(a)? Have there been any additions or changes to the storage, security, or use of surrounding areas that would necessitate a new survey or evaluation?  
**Yes. The licensee assesses public doses in areas adjacent to irradiator facilities. No additions or changes to storage, security or use of surrounding areas have occurred to trigger a new evaluation.**

- C. Do unrestricted area radiation levels exceed 0.02 mSv (2 mrem) in any one hour? [10 CFR 20.1301(a)(2)]  
**No. Based on measurements with a calibrated ion chamber.**
- D. Is access to sealed sources controlled in a manner that would prevent unauthorized use or removal? [10 CFR 20.1801]  
**Yes. The licensee has a robust security program that meets the current IC orders.**
- E. Records maintained? [10 CFR 20.2103, 10 CFR 20.2107]  
**Yes.**

### **Operating And Emergency Procedures**

- A. Have operating and emergency procedures been developed? [10 CFR 36.53]  
**Yes. Operating and emergency procedures were examined at the irradiator console and in the GSRD offices.**
- B. Do they contain the required elements?  
**Yes.**
- C. Does each individual working with the sealed sources have a current copy of the operating and emergency procedures (including emergency telephone numbers)?  
**Yes.**
- D. Did any emergencies occur?  
**No emergencies had occurred since the last audit.**
1. If so, were they handled properly?  
**N/A**
  2. Were appropriate corrective actions taken?  
**N/A**
  3. Was NRC notification or reporting required? [10 CFR 20.2201, 2202, 2203, 10 CFR 30.50 and 10 CFR 36.83]  
**N/A. The RSO is familiar with the NRC emergency response number and the reporting requirements.**

### **Leak Tests**

- A. Were sealed sources leak tested at prescribed intervals? 10 CFR 36.59  
**Yes.**
- B. Was the leak test performed according to regulatory requirements? 10 CFR 36.59  
**Yes.**
- C. Are records of results retained with the appropriate information included?

**Yes.**

- D. Were any sealed sources found leaking and if yes, were appropriate actions taken and was NRC notified? [10 CFR 20.2201, 10 CFR 20.2203, 10 CFR 21.21, 10 CFR 30.50, 10 CFR 36.59, 10 CFR 36.83]

**No. No irradiator sources were found to be leaking during the audit period.**

### **Inspection and Maintenance Checks**

- A. Are all procedures for maintenance of the irradiator being followed where applicable?  
**Yes. Based on discussions with licensee personnel, the manufacturer's recommendations for maintenance are followed.**
- B. Are all checks to determine proper functioning and wear of the source movement systems performed at frequencies as specified in the license application?  
**Yes.**
- C. Are labels, signs, and postings clean and legible?  
**Yes. The signs in the vertical calibration range were observed as being posted, clean and legible.**
- D. Are checks for operability as required by 10 CFR 36.61(a) (not included in item 4.) performed at frequencies and according to procedures described in license application:
1. Each aspect of the access control system  
**Yes.**
  2. Emergency source return control  
**Yes.**
  3. Heat/smoke detectors, extinguisher system  
**Detection yes. Extinguishers are handheld and under surveillance.**
  4. Pool water replacement system high and low water indicators  
**N/A**
  5. For underwater irradiators, was the intrusion alarm tested for operability? (frequency of checks as specified in license application)?  
**N/A**
- E. Are checks for functioning and condition of equipment performed at required frequencies and according to procedures described in license application:
1. Assessment of the condition and operability of the source rack protector are performed at the required frequencies [10 CFR 36.61(a)].  
**N/A**
  2. Assessment of water added to the pool to determine if there is pool leakage are performed at required frequencies as required by [10 CFR 36.61(a)(14)].  
**N/A**
  3. Assessment of radiation damage to electrical wiring are performed at required frequencies as required by [10 CFR 36.61(a)(15)].

**Yes. Part of the maintenance check.**

4. Water conductivity and analysis are performed at required frequencies [10 CFR 36.63]  
N/A
5. Confirmation that water circulation system is leak tight. [10 CFR 36.61(a)(7)]  
N/A
6. Functioning of the source position indicator [10 CFR 36.61(a)(2)]  
**Yes. Part of the maintenance check.**
7. Leak tightness of water circulation system, visual inspection [10 CFR 36.61(a)(7)]  
N/A

**Repair and Preventive Maintenance**

- A. Are repair and maintenance of components related to the radiological safety of the irradiator performed by the manufacturer or person specifically authorized by the NRC or an Agreement State and according to license requirements (e.g., extent of work, procedures, dosimetry, survey instrument, compliance with 10 CFR 20.1301 limits)?  
**Yes. Based on discussions with GSRD staff, manufacturers or vendors are used to accomplish these tasks.**
- B. Malfunctions and defects found during inspection and maintenance checks are repaired without undue delay.  
**Yes.**

**Transportation**

**Note:** This section will not apply if you have not transported sealed sources during the period covered by this audit.

- A. Were sources shipped since the last audit?  
**No.**
- B. If so, were 10 CFR Part 71 requirements followed?  
N/A
- C. DOT-Type A or Type B packages used? [10 CFR Part 71, 49 CFR 173.415, 49 CFR 173.416(b)] If Type B, NRC Certificate of Compliance granted before shipment or shipper is registered as a user of the Type B package? NRC-approved QA program?  
N/A
- D. Package performance test records on file? [49 CFR 173.415(a)]  
N/A
- E. Special form sources documentation? [49 CFR 173.476(a)]  
N/A
- F. Package has 2 labels (ex. Yellow-II) with TI, Nuclide, Activity, and Hazard Class? [49 CFR 172.403, 49 CFR 173.441]  
N/A
- G. Package properly marked? [49 CFR 172.301, 49 CFR 172.304, 49 CFR 172.310, 49 CFR 172.324]  
N/A

- H. Package closed and sealed during transport? [49 CFR 173.475(f)]  
N/A
- I. Shipping papers prepared, used, and maintained? [49 CFR 172.200(a)]  
N/A
- J. Shipping papers contain proper entries? {Shipping name, Hazard Class, Identification Number (UN Number), Total Quantity, Package Type, Nuclide, RQ, Radioactive Material, Physical and Chemical Form, Activity, category of label, TI, Shipper's Name, Certification and Signature, Emergency Response Phone Number, Cargo Aircraft Only (if applicable)} [49 CFR 172.200, 49 CFR 172.201, 49 CFR 172.202, 49 CFR 172.203, 49 CFR 172.204, 49 CFR 172.604]  
N/A
- K. Secured against movement? [49 CFR 177. 834 ]  
N/A
- L. Placarded on vehicle, if needed? [49 CFR 172.504]  
N/A
- M. Proper overpacks, if used? [49 CFR 173.25]  
N/A
- N. Any incidents reported to DOT? [49 CFR 171.15, 49 CFR 171.16]  
N/A

### Auditor's Independent Survey Measurements

- A. Describe the type, location, and results of measurements. Does any radiation level exceed regulatory limits [10 CFR 20.1501(a) & 1502(a)]?  
**No. The area immediately adjacent to the entrance of the vertical beam calibration facility was measured with a calibrated ion chamber. Radiation levels did not exceed 0.02 mSv (2 mrem) in any one hour.**

### Notification and Reports

- A. Was a telephone report made within 24 hours as described in 10 CFR 36.83(b), 10 CFR 30.50(c)(1), and a written report within 30 days as described in 10 CFR 30.50(c)(2) of any of the following:
  - 1. Source stuck in an unshielded position  
N/A
  - 2. Any fire or explosion in a radiation room  
N/A
  - 3. Damage to the source rack  
N/A
  - 4. Failure of the cable or drive mechanism used to move the source racks  
N/A
  - 5. Inoperability of the access control system  
N/A
  - 6. Detection of radioactive contamination attributable to licensed radioactive material  
N/A
  - 7. Detection of radioactive contamination attributable to licensed radioactive material  
N/A
  - 8. Structural damage to the pool liner or walls

- N/A
9. Abnormal water loss or leakage from the source storage pool  
N/A
10. Pool water conductivity exceeding 100 microsiemens per centimeter.  
N/A
- B. Was any radioactive material lost or stolen? Were reports made? [10 CFR 20.2201, 10 CFR 30.50]  
**No. Based on reports from GSRD staff, no irradiator sources were reported as lost or stolen.**
- C. Did any reportable incidents occur? Were reports made? [10 CFR 20.2202, 10 CFR 30.50]  
**No. Based on reports from GSRD staff, no reportable incidents occurred with irradiators.**
- D. Did any overexposures and high radiation levels occur? Reported? [10 CFR 20.2203, 10 CFR 30.50]  
**No. Based on reports from GSRD staff, no over exposures or high radiation levels occurred with irradiators.**
- E. If any events (as described in items a through c above) did occur, what was root cause? Were corrective actions appropriate?  
N/A
- F. Is the management/RSO/shift foreman licensee aware of telephone number for NRC Emergency Operations Center? [(301) 816-5100]  
**Yes. Based on discussions, the RSO is keenly aware of the telephone number for the NRC EOC.**

### Posting and Labeling

- A. NRC-Form 3 "Notice to Workers" posted? [10 CFR 19.11]  
**Yes. Observed at the entrance to Building 245.**
- B. NRC regulations, license documents posted or a notice posted? [10 CFR 19.11, 10 CFR 21.6]  
**Yes. Observed posting with this information at the entrance to Building 245.**
- C. Other posting and labeling? [10 CFR 20.1902, 10 CFR 20.1904]  
**Yes. Caution Radioactive Materials (posted on pool deck vice door), Radiation Area, High Radiation Area posted appropriately.**

### Record Keeping for Decommissioning

- A. Records kept of information important to decommissioning? [10 CFR 30.35(g)]  
**Yes. GSRD maintains a database of all locations of use, records of spills, and**

**amounts of materials authorized.**

- B. Records include all information outlined in [10 CFR 30.35(g)]?  
**Yes.**

**Bulletins And Information Notices**

- A. NRC Bulletins, NRC Information Notices, NMSS Newsletters, received?  
**Not reviewed. Licensee staff were very familiar with the NRC website which contains this information.**
- B. Appropriate training and action taken in response?  
**No. There were no specific IN's issued applicable to Part 36 during the audit period.**

**Special License Conditions or Issues**

- A. Did auditor review special license conditions or other issues (e.g., non-routine operations)?  
**Yes.**

License conditions 11, 12, 14, 15, 16, and 17 are exemptions from selected portions of Part 36 and were therefore not examined as part of the audit

License condition 13 states, in part, that:  
*"The licensee shall comply with 10 CFR 35.615(b)"*

License condition 18 states, in part, that:  
*"The licensee shall comply with the radiation monitor requirements of 10 CFR 35.615(d) under all conditions of operation."*

The current version of 10 CFR 35.615 does not apply to these license conditions. The license was issued in 1997 when a different version of 10 CFR 35.615 was in effect.

**10 CFR 35.615**

- (b) A licensee shall equip each entrance to the teletherapy room with an electrical interlock system that will:
- (1) Prevent the operator from turning the primary beam of radiation on unless each treatment room entrance door is closed;
  - (2) Turn the primary beam of radiation off immediately when an entrance door is opened; and
  - (3) Prevent the primary beam from being turned on following an interlock interruption until all treatment room entrance doors are closed and the beam on-off control is reset at the console.

**10 CFR 35.615**

- (d) A licensee shall install in each teletherapy room a permanent radiation monitor

capable of continuously monitoring beam status.

- (1) A radiation monitor must provide visible notice of a teletherapy unit malfunction that results in an exposed or partially exposed source, and must be observable by an individual entering the teletherapy room.
- (2) A radiation monitor must be equipped with a backup power supply separate from the power supply to the teletherapy unit. This backup power supply may be a battery system.
- (3) A radiation monitor must be checked with a dedicated check source for proper operation each day before the teletherapy unit is used for treatment of patients or human research subjects.
- (4) A licensee shall maintain a record of the check required by paragraph (d)(3) of this section for three years. This record must include the date of the check, notation that the monitor indicates when it detector is and is not exposed, and the initials of the individual who performed the check.
- (5) If a radiation monitor is inoperable, the licensee shall require any individual entering the teletherapy room to use a survey instrument or audible alarm personal dosimeter to monitor for any malfunction of the source exposure mechanism that may result in an exposed or partially exposed source. The instrument or dosimeter must be checked with a dedicated check source for proper operation at the beginning of each day of use. The licensee shall keep a record as described in paragraph (d)(4) of this section.
- (6) A licensee shall promptly repair or replace the radiation monitor if it is inoperable.

## **Discussion**

### **License condition 13**

Based on observations and discussions with licensee personnel (GSRD and the operator), the facility is equipped with an interlock system that meets the requirements of 10 CFR 35.615(b).

### **License condition 18**

Monitors in the facility meet the requirements of 10 CFR 35.615(d)(1) and (2).

As the facility does is not used for treatment of patients or human research subjects, 10 CFR 35.615(d)(3) and (4) cannot apply.

There are redundant systems in place for radiation monitors (at least 3 in each facility). The operator takes a survey meter into the room when entering. It is not clear if the meter at the control console of the facility is equipped with a dedicated check source, however, the operator did demonstrate and explain that the meter could be show to be functioning by placing it close to the shielded source. 10 CFR 35.615(d)(5) would appear to apply only if all installed radiation monitor systems failed.

Based on discussions with facility personnel, 10 CFR 35.615(d)(6) would be met when a



device is found to be inoperable.

### **Deficiencies Identified in Audit; Corrective Actions**

- A. Summarize problems/deficiencies identified during audit.

**No apparent violations of 10 CFR 36 were identified.**

- B. If problems/deficiencies identified in this audit, describe corrective actions planned or taken. Are corrective actions planned or taken at ALL licensed locations (not just location audited)? Include date(s) when corrective actions are implemented.

**N/A**

- C. Provide any other recommendations for improvement.

### **Evaluation of Other Factors**

- A. Senior licensee management is appropriately involved with the radiation protection program and/or Radiation Safety Officer (RSO) oversight?

**Yes. Based on discussion, observations and records review, it appears that senior licensee management is highly engaged and appropriately involved.**

- B. RSO has sufficient time to perform his/her radiation safety duties?

**Yes.**

- C. Licensee has sufficient staff to support the radiation protection program?

**Yes. The RSO is supported by an experienced staff of technicians and health physicists who use the appropriate equipment to make radiation safety assessments, responses and decisions.**