Scientific Ecology Group, Inc.

Site Safety and Health Plan

for

The Twin Cities Army Ammunition Plant
Depleted Uranium Facilities
New Brighton, Minneapolis

Revision 0
May 1997

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1.0 INTRODUCTION

This Site Safety and Health Plan (SSHP) provides the basis for conducting all Scientific Ecology Group, Inc. (SEG) survey activities at the Twin Cities Army Ammunition Plant (TCAAP) in New Brighton, Minneapolis. The survey activities are described in the SEG Characterization Study Plan for the Twin Cities Army Ammunition Plant Depleted Uranium Facilities, May 1997. All activities will be performed safely and in accordance with both current Occupational Safety and Health Administration (OSHA) standards, the SEG Health and Safety Manual, and the SEG Radiation Safety Guide.

The surveys at the TCAAP Site will be performed under a reciprocal agreement with the Nuclear Regulatory Commission, Region II, using the SEG Decontamination and Decommissioning License number R-73018-E00 (Attachment 1), issued by the State of Tennessee.

2.0 MANAGEMENT COMMITMENT TO HEALTH AND SAFETY

It is SEG policy to conduct operations in a way that protects the safety and health of employees, subcontractors, the public and the environment. Accordingly, all SEG activities will comply with both the letter and the spirit of all applicable environmental safety and health regulations and requirements (including reporting requirements) of the contractor. Without exception, safety will take precedence over survey goals for the duration of this project. In addition to meeting regulatory and other requirements, SEG is committed to good health and safety practices to reduce potential safety and health risks and to reduce exposures to hazardous substances and ionizing radiation to as low as reasonably achievable (ALARA).

3.0 APPLICABILITY

This Safety and Health Plan applies to all SEG employees, subcontractors and visitors to the project site. The SSHP will be made available to all project personnel for inspection and review at any time and will be maintained by the SEG Site Project Manager for the duration of the project. All SEG employees, subcontractors and visitors will review the SSHP and sign the Acknowledgement Sign-off-sheet (Attachment 2), prior to entering any controlled area. This will indicate personnel agreement to abide by its contents.

4.0 GENERAL

4.1 Discussion

It is SEG's intent to perform all survey activities at the TCAAP site in accordance with the SEG Radiation Safety Guide, RSG-2 (Attachment 3), and the applicable portions of the SEG Health and Safety Manual (Attachment 4). The SEG Health and Safety Manual provides the rules, policies, procedures, regulations, recommended practices and other pertinent information to prevent exposure of employees to injury, illness, or work conditions that may adversely affect their health.

The SEG Health and Safety manual contains information and guidance in the following areas:

- General Safety Rules
- Responsibilities
- Organization
- Employee Training
- Injury Reporting and Investigation

The manual also contains administrative, performance and equipment operational procedures. These procedures are prepared to cover specific areas and segments of work at SEG and off-site projects. Some of the procedures included in the manual apply to all employees regardless of their job function. Others are applicable only to the work activities or equipment referenced in the procedure.

4.2 Responsibilities and Organization

It is SEG's view that ultimate responsibility for safety at SEG projects rests with SEG management and supervision; however, each employee must be willing to participate in the safety effort and integrate safety into each job function.

This section describes the responsibilities and authorities of project personnel with regard to the SSHP. All personnel shall be cognizant of the potential hazards during the project and aware of the methods implemented to reduce the risk of exposure to radioactive or hazardous materials. All personnel shall comply with the rules and procedures set forth in the SSHP. It is SEG's intent to conduct all operations in accordance with SEG and TCAAP safety plans. If a conflict should arise between SEG and TCAAP guidelines, such conflict will be mutually resolved between SEG and Alliant Techsystems.

Survey Project Manager

The Survey Project Manager will have overall responsibility for the project, and will be the principle interface with the client. The Survey Project Manager is responsible for the safe and satisfactory completion of the project by providing the leadership and direction to organize, integrate and control project activities. The Survey Project Manager will establish policy and direction, assign responsibility for technical performance and allocate resources.

Site Safety and Health Officer

The Site Safety and Health Officer (SSHO), or his designee, is responsible for the development and oversight of the SSHP. The SSHO shall be knowledgeable in the applicable safety standards and regulations and shall be trained and qualified in accordance with the requirements of Section 1.0 of the SEG Health and Safety Manual. The SSHO will ensure that the necessary radiation safety and health monitoring is performed and all required documentation is maintained. The SSHO has the authorization to stop work at any time the work conditions are considered to be dangerous to the health and safety of the community, the environment or project personnel. In addition, the SSHO is responsible for:

- Reviewing work plans and RHWPs,
- Monitoring the work place daily for safety concerns,
- Ensuring the performance of air monitoring and sampling as required,
- Requesting changes to the SSHP based on changing work conditions,
- Performing periodic safety reviews, weekly inspections and monitoring activities of project operations to ensure compliance with the SSHP,
- Documenting any overexposure to radioactive or hazardous materials,
- Ensuring that all training, medical and exposure records are complete and available for review, and
- Conducting and documenting periodic safety meetings.

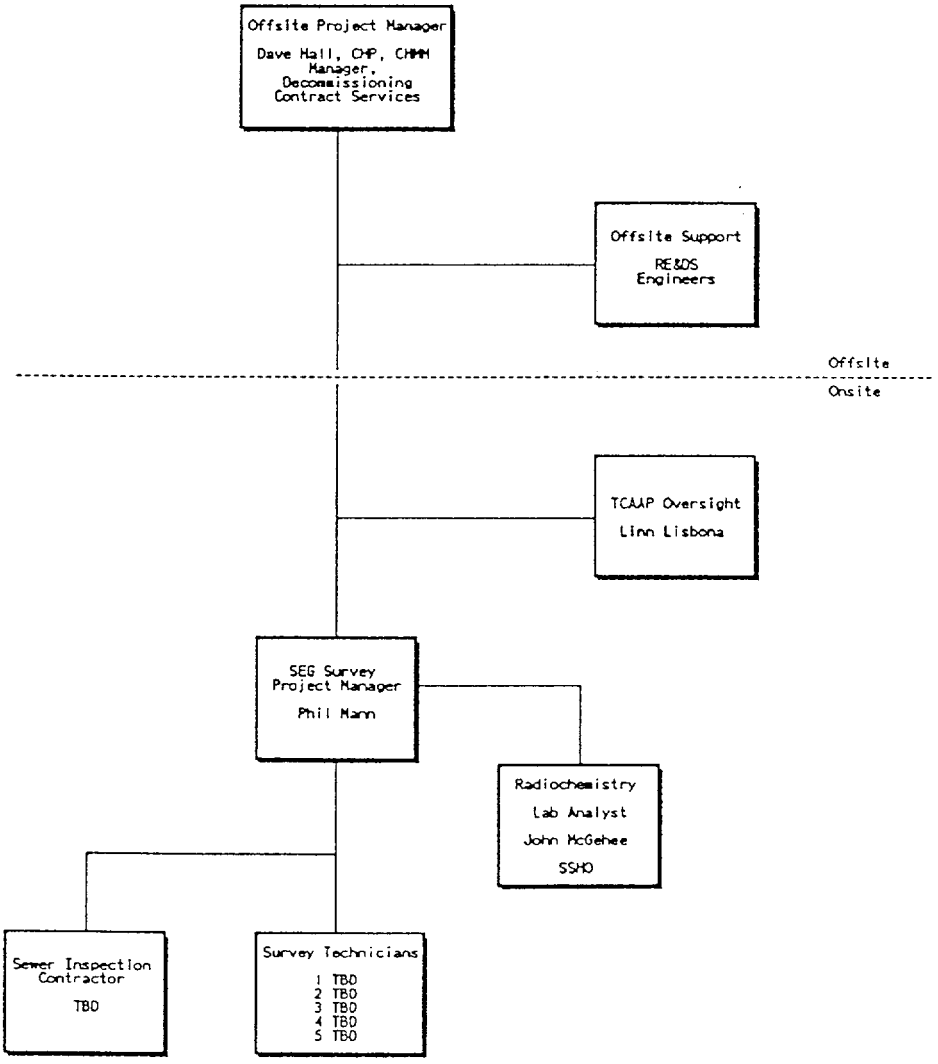
Health Physics Technicians

Health physics technicians will, in conjunction with the SSHO:

- Prepare Radiation/Hazardous Work Permits (RHWPs),
- Select proper personnel protective equipment (PPE),

- Perform radiological and industrial hygiene (IH) surveillance and monitoring as necessary,
- Ensure all monitoring equipment and instrumentation meet calibration requirements,
- Ensure traceable documentation is maintained for all calibration,
- Ensure that proper ingress and egress procedures are followed, and
- Conduct and document daily ALARA and RHWP briefings.

Figure 4.1
SEG Survey Organization



5.0 TRAINING

Training requirements for all project personnel are provided in Section 1.7 of the SEG Health and Safety Manual. Training requirements for the TCAAP project include, but are not limited to:

- Radiation Worker Training,
- 40 hr Hazwoper Training ,
- 3 Day Field Supervised Experience Training,
- 8 hr Hazardous Waste Operations Supervisor Training (SSHO),
- First Aid/CPR Training (SSHO),
- Confined Space Training

In addition to the above, all project personnel will receive documented site specific orientation. This will include any hazards, and their controls, that may be encountered during the project.

Documented daily safety (tail-gate) meetings will be conducted throughout the project.

All project personnel training records and safety meeting attendance sheets will be held in the on-site project office and will be available for review as necessary.

6.0 HAZARDS AND CONTROLS

Anticipated hazards that may be encountered during the project include:

- Confined Space Entry,
- Power Tool Operation,
- Slips,Trips and Falls,
- Heat Stress,
- Compressed Gas Cylinders,
- Overhead Scaffolding Work, and
- Lockout/Tagout of Operational Equipment

The SEG Health and Safety Manual provides the rules, procedures and guidance that will be used on this project to control the above hazards. In certain instances the TCAAP controls and procedures will be used provided they are at least as stringent as the SEG controls. Some of the specific controls are addressed as follows:

6.1 Confined Space Entry

Confined spaces are those locations with limited access/egress or unfavorable natural ventilation. Confined space entry requirements will be determined in accordance with an applicable SEG Procedure. Confined space entry permits will be issued and posted near the confined space area until the permit expires or the job is completed. Where applicable the TCAAP confined space entry procedures will take precedence.

Only trained and authorized personnel will be permitted to participate in confined space activities.

6.2 Power Tool Operation

All electrical tools and equipment in the work areas shall be intrinsically safe or grounded. All electrical equipment shall be connected through a ground fault circuit interrupter when working in a damp or conductive environment or in the immediate vicinity of standing liquids. Damaged electrical cords shall be removed from service and will not be spliced together.

6.3 Slips, Trips and Falls

Proper lighting will be provided to ensure all work areas are adequately illuminated. All power cords, air lines and vacuum hoses will be routed in the overhead to the maximum extent possible. Any cords or hoses which cannot be raised off the floor will be taped down or marked identifying a tripping hazard. Additionally, all extraneous materials will be re-located from the work area.

6.4 Heat Stress

Conditions which may increase the potential for heat-related hazards will be monitored. Personnel wearing protective clothing will be observed as appropriate, throughout each shift, taking precautions to allow personnel the opportunity to acclimate and cool down as needed. Personnel will be provided adequate rest periods and liquids deemed necessary by the work supervisor.

6.5 Compressed Gas Cylinders

Compressed gas cylinders can be extremely hazardous if mishandled. The following guidelines have been prepared to ensure that all gas cylinders are properly handled and stored.

- Cylinders will be clearly labeled as to the contents and always be considered full unless labeled as empty.
- Cylinders in use, storage or transit will be secured properly using a chain, retaining bar or structure to prevent cylinders from falling or being knocked over.
- Protective valve caps will be in place on all cylinders in storage or transit.
- A regulator, gauge or regulating manifold will be used on all cylinders. Regulators, gauges and manifolds are to be matched to the specific type of gas and the service for which the cylinders are being used.
- Cylinder contents will be identified by means of legible labels or stencils or by identifying marking embossed on the cylinder by the supplier.
- Compressed gas cylinders should not be dropped, bumped or handled roughly.

6.6 Overhead Scaffolding Work

If scaffolding is required during the surveys, it will be provided by and erected by a qualified scaffolding contractor. Erected scaffolding will comply with the applicable OSHA regulations. Erected scaffolding will be initially inspected by the scaffolding contractor. The SSHO will periodically inspect all erected scaffolding. The following guidelines have been prepared to help ensure that all erected scaffolding meet the applicable OSHA regulations.

- Scaffolds shall only be erected, moved, dismantled, or altered under the supervision of persons qualified by any combination of training and experience.

- The footing or anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.

- Unstable objects such as drums, boxes, loose brick or block shall not be used to support scaffolds or work platforms.

- Scaffolds shall be adequately anchored or braced to prevent swaying, tipping or collapsing. When the height of a free standing or rolling scaffold exceeds three times the minimum base dimension, the scaffold must be securely guyed or tied.

- Scaffolds and their components shall be capable of supporting four times the maximum intended load without failure.

- Any damaged or defective scaffold component shall be immediately repaired or replaced upon discovery.

- Erected scaffolds shall be continuously inspected during use.

- Guardrails and toeboards shall be installed on all open sides and ends of platforms more than ten feet above the ground or floor.

- A separate ladder with equally spaced rugs usually attached to the scaffold structure for climbing and descending.

- Materials being hoisted onto a scaffold shall have a tag line.

- Screen, consisting of one-half inch wire mesh or equivalent, shall be provided between the toeboard and guardrail, extending along the entire opening where persons are required to work or pass under the scaffold.

- No worker shall be permitted to work on a scaffold where slippery conditions exist, unless such conditions are a necessary part of the job.

- Tools, materials, and debris shall not be allowed to accumulate in quantities to cause a hazard.

- All scaffolding components shall be installed and used according to the manufacturer's and supplier's recommended procedure. Components shall not be altered in the field.

- Employees performing activities in excess of 6 feet from the floor will use a fall arrest system unless working on approved scaffolding.

6.7 Lockout/Tagout of Operational Equipment

The SEG project SSHO shall ensure that all affected systems will be properly isolated in compliance with the TCAAP Lockout/Tagout procedures. All SEG personnel will also be properly trained in the proper Lockout/Tagout procedures to be implemented at the TCAAP facility.

6.8 Asbestos Material

"Asbestos" is the name of a class of magnesium silicate minerals that occur in fibrous form. Minerals that are included in this group are chrysotile, crocidolite, amosite, tremolite, asbestos, anthophllite asbestos and actinolite asbestos. Building products that contain asbestos removed during building renovation or demolition activities may release respirable fibers depending on it's degree of friability. It can cause disabling respiratory disease and various types of cancers if the fibers are inhaled. Employees exposed to asbestos in the workplace or work operation are subject to the requirements in 29 CFR 1910, 1001 and CFR part 1926.1101.

SEG personnel are not asbestos trained workers and will not be allowed to enter into regulated areas wherever airborne concentrations of asbestos and/or potential asbestos containing material exist. Asbestos containing materials that are to be disposed of must be placed in leak-tight 6-mil thick plastic bags, plastic-lined cardboard containers, or plastic-lined metal containers. The following guidelines should be adhered to when working around asbestos:

- Prior to working in DU Room, the SEG SSHO will, in conjuntion with Alliant, identify and mark all asbestos materials.

- Prior to working with asbestos, individuals should be trained on its proper handling and storage.

- Warning signs shall be provided and displayed at each regulated area. In addition, warning signs shall be posted at all approaches to regulated areas so that an employee may read the signs and take necessary protective steps before entering the area.

- Warning labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers.

- The labels shall include the following information:

  DANGER

  CONTAINS ASBESTOS FIBERS

  AVOID CREATING DUST

  CANCER AND LUNG DISEASE HAZARD

- Workers whose clothing has been contaminated by Asbestos must change into clean clothing.

- Wash any areas of the body that may have contacted Asbestos at the end of each work day, whether, or not known skin contact has occurred.

- Do not eat, smoke, or drink where Asbestos is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

7.0 RADIATION SAFETY

It is SEG's intent to perform all activities involving radioactive materials in accordance with the SEG Radiation Safety Guide (RSG-2). RSG-2 was written following the State of Tennessee regulations. The purpose of the RSG-2 is to summarize the regulations, safety practices and SEG radiation protection policies that apply to the radiological field operations conducted by the SEG Radiological Engineering and Decommissioning Services (RE&DS) group. From these policies, specific procedures have been developed to assure compliance with regulations and to maintain radiation exposures, resulting from SEG operations, to a level As Low As Reasonably Achievable (ALARA). A list of the procedures that may be used during this project is provided in Attachment 5. An overview of the SEG Radiation Safety Guide, RSG-2, is provided in the following sections. These sections outline and identify the specific practices and policies to be implemented during the project.

7.1 Introduction

The policies in RSG-2 apply to all SEG operations performed under the Decontamination and Decommissioning License. All SEG employees, contractors and visitors are included within the scope of the policies within the guide. Although all elements of the radiation protection program may apply to field projects, the degree or level of implementation of these requirements and policies will be based upon the scope of work commensurate with the hazards present on site.

7.2 General Information

No radiation safety program can provide adequate protection unless all personnel are aware of the hazards present and perform their responsibilities. SEG believes that each individual shares responsibility for their own radiation protection as well as for their co-workers and individual members of the public.

Everyone is responsible for following the regulatory requirements specified in RSG-2, and the project procedures to the best of their ability and knowledge. These include the proper use of protective clothing and personnel monitoring equipment, notifying management and the SSHO of any potential hazards or improper practices and maintaining their radiation exposure ALARA.

7.3 Administration

Compliance with the radiation protection program is met through the proper implementation of procedures. The SSHO is responsible for ensuring the implementation of all radiation protection procedures. These procedures incorporate the requirements of RSG-2 and ensure compliance with all state and federal regulations. The procedures cover areas such as ALARA, personnel monitoring, instrumentation, access controls, surveys, radiation/hazardous work permits, radioactive materials management and the release of materials, equipment and structures for unrestricted use.

The radiation protection program will result in the generation of logs and records documenting all activities performed during the project. These records will be maintained and controlled in accordance with all regulatory requirements at the project site. All records will be accurate and legible and will be reviewed by project management routinely and timely to ensure compliance with all applicable regulations.

7.4 ALARA Program

All SEG operations will be performed in such a manner that doses are maintained As Low As Reasonably Achievable (ALARA). The primary implementation of the ALARA program is through the use of procedures. During the project these will consist primarily of area access controls and the use of engineering controls to maintain personnel exposure to radioactive materials ALARA.

The primary pathway for personnel exposure during the project is through inhalation or ingestion. No sources of external exposure above 0.5 mr/hr have been identified. No airborne radioactivity is suspected to be generated during survey activities and respiratory protection will not be issued for protection against radiation. If air samples do indicate the re-suspension of radioactive materials above any regulatory guideline values and limits, operations will cease and an ALARA review performed. This will involve a review of the engineering controls and the possible implementation of respiratory protection. The issue of respiratory protection will be the last resort.

7.5 Assessment Program

The radioactive protection assessment program provides a system to review project activities and the overall quality of the radiation protection program. This helps assure that current program activities comply with license and regulatory requirements. The program will also help identify and recognize good practices as well as any unsatisfactory performances and hazards needing to be addressed and corrected and any program weaknesses.

The assessment program will be implemented through the use of audits and surveillance. Routine inspections, audits and surveillance will be performed and documented. Safety audits will also be performed to supplement the radiation protection assessment program.

As necessary Radiological Occurrence Reports (ROR) will be completed to document the facts, apparent root causes and resolution of any incidents or deficiencies. All RORs will be documented and filed with the appropriate agencies as specified in SEG policies.

7.6 Personnel Monitoring

Internal and external monitoring for radiation exposure will be performed during this project.

External monitoring will be accomplished by the use of Thermoluminescent Dosimeters (TLDs). The TLDs will be issued and controlled by the SEG dosimetry department. Monitoring and reporting of external radiation exposure will be performed according to RSG-2 and applicable SEG procedures.

Internal monitoring will initially be required of project personnel assigned to the site. Urine samples will be collected prior to being assigned on site responsibilities, and at the completion of on site work. Monitoring, analysis, and reporting will be performed according to RSG-2 and applicable SEG procedures.

It is SEG policy that detectable contamination on personnel be maintained ALARA. In keeping with the spirit of this policy, efforts are made to keep personnel contamination levels at or near zero. Personnel monitoring for beta-gamma contamination will be performed with a hand held pancake type detector. The system alarm set point will be set at 50 cpm above background. This set point will provide a detection limit of approximately 400 dpm/detector area for beta-gamma contamination of 3000 dpm/100 cm^2.

7.7 Instrument Program

The instrumentation program will include the inventory, control, calibration, operation, response testing, maintenance and repair, quality control and assurance of all radiation protection instrumentation. This program will be implemented through the use of SEG project procedures and will ensure compliance with any Federal regulations, SEG policies and applicable industry standards.

All instruments will be response tested daily when in use and will be capable of detecting the isotopes of concern on the project, depleted uranium (DU), and at the levels necessary for release for unrestricted use as specified by the Characterization Study Plan. All source checks will be documented and tracked to determine any trends or problems with an instrument requiring repair to ensure quality assurance and quality control of all survey data.

7.8 Radiation/Hazardous Work Permit (RHWP) Program

Radiation/Hazardous Work Permits are required for all activities performed in a radiologically controlled area. This includes all study activities in radiologically controlled areas. General RHWPs will be generated to document routine activities performed during the project. All RHWPs will be written in accordance with SEG project procedures by Health Physics personnel and approved by the SSHO.

The RHWP should provide sufficient detail and a breakdown of the work to be performed. All personnel working to the RHWP will be required to read and understand the contents of the permit and document their understanding by signing the document. All personnel will also sign in daily on a log sheet whenever performing work under a specific RHWP.

7.9 Radiation Protection Survey Program

Radiological surveys will be performed to identify, quantify and evaluate the potential radiation hazards associated with the conditions on the project. Surveys will be performed to determine all affected areas on site requiring decontamination.

All surveys will be performed and documented in accordance with SEG project procedures. Surveys will be performed for all radiations on site in accordance with the Characterization Study Plan.

7.10 Radioactive Material Control

Radioactive material and source controls will be established to prevent the inadvertent release to unrestricted areas, ensure the protection of members of the public and to minimize the amount of radioactive waste generated. These controls will be implemented through SEG procedures.

All radioactive materials will be packaged, labeled and surveyed in accordance with all state and federal regulations and prepared for shipment for processing and/or disposal. All radioactive materials will be staged in posted areas on site and area access controlled by posted boundaries as necessary. All radioactive material will also be inventoried to ensure positive control to prevent the loss of radioactive material.

7.11 Contamination Control

Contamination controls will be established through SEG procedures and area access controls to prevent the spread of contamination to clean areas and eliminate the need for respiratory protection. Area access controls will be established, as necessary, using boundaries to prevent the inadvertent entry of personnel into a controlled area. All personnel entering posted areas will follow all posted requirements for entry and egress such as the use of personnel protective clothing. Personnel mon.toring will also be used when leaving radiologically controlled areas to ensure personnel are free of contamination.

Engineering controls will be implemented to the maximum extent practicable to ensure the control of contamination. Barriers and containments will also be used as necessary to control the spread of contamination. Prior to release of any areas or equipment, the areas will be surveyed and verified free of any loose surface contamination which could be spread. Any area and equipment released for unrestricted use will meet the survey requirement as specified in the Characterization Study Plan.

7.12 Unrestricted Use Release Program

SEG is authorized to release tools, equipment, and materials for unrestricted use provided that surface contamination limits do not exceed the limits specified in the Characterization Study Plan. Instrumentation will be selected to monitor all radiation present on site and at the required levels for unrestricted release. All materials, equipment and facility surfaces will be surveyed as necessary to support the release of the facility for unrestricted use.

7.13 Respiratory Protection

It is not anticipated at this time that respiratory protection will be required on this project for airborne radiological hazards. Engineering controls will be utilized whenever possible during survey activities that may cause an airborne radiological hazard. If, however, engineering controls are not practical, or monitoring indicates that a potential for an airborne radiological hazard exists, then respiratory protection will be provided for any worker with the potential to exceed the guidelines provided in RSG-2.

If it is determined that respiratory protection from radiological contaminates is required during the survey, then the appropriate regulatory agency will be notified of the intent to use respiratory protection. A 30 day notice period may be required for regulatory review of the SEG respiratory protection program.

SEG may require the use of respiratory protection for non-radioactive, industrial hygiene pollutants (i.e., dust, fumes).

Monitoring for airborne radiological hazards will be performed at all times when survey activities have the potential to cause the spread of an airborne radiological hazard.

7.14 Environmental Monitoring

If required, a site specific environmental monitoring program will be implemented. It is not anticipated that environmental monitoring will be required except for area air sampling where surveys involving minor building demolition are being performed.

7.15 Notices, Reports and Records

All notices, records and reports will be filled out completely in a neat and legible manner and maintained in accordance with Federal regulations and SEG policies.

8.0 EMERGENCY RESPONSE AND FIRST AID

Emergency	911

9.0 ATTACHMENTS

SEG has established a system to control the issue, use, and revision of documents. Documents are controlled to ensure that the last revisions are distributed to and used by persons performing the activity or are available at appropriate work locations. The identification, review, and approval of controlled documents is the responsibility of the Manager of each specific organization.

Attachment 1 SEG Radioactive Material License No. R-73018-E00
Attachment 2 Acknowledgement Signoff sheet
Attachment 3 Radiation Safety Guide, RSG-2
Attachment 4 SEG Health and Safety Manual
Attachment 5 List of RE&DS Procedures

ATTACHMENT 1

SEG RADIOACTIVE MATERIAL LICENSE NUMBER R-73018-E00

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH

RADIOACTIVE MATERIAL LICENSE

Pursuant to Tennessee Department of Environment and Conservation Regulations, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess and transfer radioactive material listed below; and to use such radioactive material for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules and regulations of the Tennessee Department of Environment and Conservation and orders of the Division of Radiological Health, now or hereafter in effect and to any conditions specified below.

LICENSEE	3. License number R-73018-E00
1. Name Scientific Ecology Group, Inc. (SEG)	4. Expiration date May 31, 2000
2. Address P.O. Box 2530 1560 Bear Creek Road Oak Ridge, TN 37831-2530	5. File no. R-73018

6. Radioactive Material (Element and Mass Number)	8. Chemical and/or physical form	9. Maximum Radioactivity and/or quantity of material which licensee may possess at any one time.
See Supplementary		Sheets

10. Authorized Use

See Supplementary Sheets

CONDITIONS

11. Unless otherwise specified, the authorized place of use is the licensee's address stated in item 2. above.

See Supplementary Sheets

Date of Issuance May 15, 1995

For the Commissioner
Tennessee Department of Environment and Conservation

By: Charles Arnott
DIVISION OF RADIOLOGICAL HEALTH

Charles Arnott
Health Physicist

CN-0719 (Rev. 9-92)
Form RHS 8-7

(09-92)

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH

RADIOACTIVE MATERIAL LICENSE

SUPPLEMENTARY SHEET

License Number R-73018-E00

7. Radioactive Material (Element and Mass Number)	8. Chemical and/or Physical Form	9. Maximum Radioactive Material Which Licensee May Possess at Any One Time
A. Any nuclides with atomic numbers 3-83 inclusive, excluding Carbon-14.	A. Any form suitable for transportation under U.S. Department of Transportation (DOT) Regulations (49 CFR).	A. 500 curies
B. Hydrogen-3	B. Same as in 8.A.	B. 330 curies
C. Carbon-14	C. Same as in 8.A.	C. 110 curies
D. Radium-226, 228	D. Same as in 8.A.	D. 200 curies
Thorium-230, 232	E. Same as in 8.A.	E. 200 curies
F. Uranium (Depleted and Natural)	F. Same as in 8.A.	F. 200 curies
G. Uranium-233	G. Same as in 8.A.	G. 200 grams
H. Uranium-235	H. Same as in 8.A.	H. 350 grams
I. Plutonium	I. Same as in 8.A.	I. 200 grams
J. Americium-241	J. Same as in 8.A.	J. 250 curies
K. Transuranics (Excluding Pu and Am-241)	K. Same as in 8.A.	K. 1.1 curies
L. Any nuclides with atomic numbers 84-91 inclusive, excluding Po-210, Ra-226, Ra-228, Th-230, and Th-232.	L. Same as in 8.A.	L. 1.1 curies
M. Polonium-210	M. Same as in 8.A.	M. 11 curies
Uranium (Excluding U-233, U-235, and U-238.	N. Same as in 8.A.	N. 1.1 curies

(09-92)

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH

RADIOACTIVE MATERIAL LICENSE

SUPPLEMENTARY SHEET

Page 3 of 5 Pages License Number R-73018-E00

10. Authorized use

A. through N. Assessment, decontamination, decommissioning, and remediatio operations including the possession, processing, storage, packaging, and/or shipping of radioactive materials in accordance with statements, representations, and procedures contained in application dated February 14, 1995, with attachments, and references in Condition 21 of this license.

Conditions (continued)

12. The licensee shall comply with applicable provisions of 1200-2-4, 1200-2- and 1200-2-10 of "State Regulations for Protection Against Radiation."

13. The total quantity of special nuclear material authorized for possession under this license shall not exceed the amounts as specified in 1200-2-4 -.04(1)(oo) of "State Regulations for Protection Against Radiation."

A. Radioactive material authorized by this license shall be used by, or under the supervision of, H. W. Arrowsmith, S. T. Norris, J. T. Pride, W. M. Hipsher, S. T. Clark, E. A. Lloyd, D. R. Neely, A. N. Johnson, D. M. Hall, G. V. Policastro, R. R. Shult, J. E. Parsons, or those individuals named in Section 11 of Attachment 1 to application dated February 14, 1995.

B. The Radiation Safety Officer for this license is Steven T. Norris.

C. A Site Safety and Health Officer (SSHO) will perform radiation protection functions on site for each project authorized in Condition 15 of this license.

15. Operations authorized in Item 10. of this license may be conducted at an facility or location in Tennessee. (This condition does not prohibit use in other states under reciprocity privileges which may be granted by the regulatory agency having jurisdiction.)

16. The licensee shall submit a Decontamination, Decommissioning, and Remediation (D & D) Project Work Plan for each project to be p rformed under this license. This plan will specify the types, quantities, physical/chemical forms and uses of radioactive material for the project In addition the plan shall include personnel qualifications including those of the SSHO, radiation detection instruments to be employed, a description of personnel dosimetry and bioassay procedures to be used, facilities and equipment to be used, and radioactive wastes expected to be produced during the project. Other information shall be submitted as required by the references in Condition 21 of this license.

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH

RADIOACTIVE MATERIAL LICENSE

SUPPLEMENTARY SHEET

 License Number R-73018-E00

7. The licensee shall follow the Radiation Safety Guide (RSG-2) submitted with application dated February 14, 1995 as a requirement of this license. All changes in the Radiation Protection Program of the guide as defined by the licensee as "substantive changes" in letter dared May 12, 1995, shall be submitted to the Department for approval as an amendment to the license prior to implementation.

8. The licensee shall maintain complete and accurate records of the receipt and disposal of radioactive material. The licensee shall, for radioactive material no longer useful for any purpose and for any equipment or supplies contaminated with such material for which further use and decontamination is not planned, define those materials as radioactive waste and treat them as such in accordance with the following provisions:

   A. Radioactive waste material shall not be stored with non-radioactive waste.

   B. A written record of all radioactive waste material shall be maintained until it has been determined by a suitable survey or radioassay that it has decayed to background levels or until it has been shipped to an authorized recipient in accordance with all applicable regulations. Accountability of radioactive waste material prepared for shipment but not yet shipped from the licensee's premises shall be maintained by the licensee by an internal record system such that the licensee is constantly aware of the material's location and the proposed time of shipment. Individuals who are involved in the shipping of such material and/or the storage of such material prior to shipment, shall be trained in the precautions necessary for such handling and storage.

   C. For material which has decayed to background levels as determined by radioassay or external level as measured with appropriately calibrated instruments, records shall indicate that the material was determined to be no longer radioactive and will indicate the methods and results of the survey or analysis.

   D. Shipment records of radioactive waste material shall be maintained and the licensee shall require written confirmation from the authorized recipient of such material that this material has been received.

   E. All records and written confirmations required by this condition shall be maintained for inspection by the Department.

   The requirements for this condition are in addition to any other requirements for the handling and/or disposal of radioactive material contained in this license and "State Regulations for Protection Against Radiation."

(09-92)

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH

RADIOACTIVE MATERIAL LICENSE

SUPPLEMENTARY SHEET

 License Number R-73018-E00

9.A. The licensee shall make disposal of all radioactive waste material (radioactive material no longer useful for any purpose and any equipment or supplies contaminated with radioactive material for which further use and decontamination is not planned) prior to September 30, 1995. The exceptions to this requirement are as follows:

1. Radioactive waste material with a half-life of sixty-five days or less and which is being held in storage for decay may be retained until disposal as non-radioactive material is appropriate.

2. Radioactive waste material which has been designated by another condition of this license for a timetable of disposal is authorized to be disposed of in accordance with the schedule which has been approved.

B. The licensee shall submit within thirty (30) days of the date of this license a report indicating:

1. The amount of radioactive waste material subject to this requirement, and not excepted above, which is currently in it possession, and

2. A plan for disposing of such radioactive waste material.

10. No provision of this license relieves the licensee from compliance with other Federal, State and local laws, ordinances, and regulations applicable to the licensee's activities.

11. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 6, 8, and 9 of this license in accordance with statements, representations, and procedures contained in application dated February 14, 1995, with attachments, and letters dated April 13, 1995, with attachments, and May 12, 1995.

ATTACHMENT 2

BRIEFING ACKNOWLEDGEMENT FORM

ATTACHMENT 2

BRIEFING ACKNOWLEDGEMENT FORM

Name Print	Social Security #	Signature	Date

ATTACHMENT 3

SEG RADIATION SAFETY GUIDE, RSG-2

SCIENTIFIC ECOLOGY GROUP, INC.

RADIOLOGICAL ENGINEERING AND

DECOMMISSIONING SERVICES

RADIATION SAFETY GUIDE
(RSG-2)

Reviewed by: _____ Date 5-17-95
David M. Hall, Manager
Decommissioning Contract Services

Approved by: _____ Date 5-18-95
Steve Norris,
Radiation Safety Officer

Approved by: _____ Date 5/22/95
D.R. Neely
Vice President
Radiological Engineering & Decommissioning Services

Prepared By:

The SCIENTIFIC ECOLOGY GROUP, INC.
1560 Bear Creek Road
Oak Ridge, Tennessee 37831

REVISION 2

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Section Overview

This introductory section to the Scientific Ecology Group, Inc. (SEG) Radiological Engineering and Decommissioning Services (RE&DS) group Radiation Safety Guide (RSG) is intended as an orientation to the overall purpose, scope, and layout of the guide.

1.2 Guide Purpose

The purpose of the Radiation Safety Guide is to summarize the regulations, safety practices, and SEG radiation protection policies that apply to the radiological field operations of the SEG RE&DS group. From these policies, specific procedures have been developed to assure compliance with regulations and to maintain radiation exposures, resulting from SEG operations, to a level as low as is reasonably achievable (ALARA).

In order to ensure compliance with the regulations and in the interest of maintaining doses due to operations ALARA, this guide and its implementation will be reviewed at least bi-annually by the corporate Radiation Safety Committee (RSC). The review will assess the effectiveness of the guide in providing appropriate regulatory and radiation protection direction. The review will be documented and changes to the RSG will be made based upon the recommendations of the RSC.

1.3 Enforcement

Managers and supervisors have and are expected to exercise the authority to enforce the radiation protection practices as set forth within this manual and implementing procedures. The enforcement duties of managers and supervisors include but are not limited to:

1. Taking immediate action to correct radiation safety violations which they personally observe.

2. Preparing such documentation of the violation as may be specified in implementing procedures.

3. Counseling/disciplining in accordance with site procedures and company standard personnel practices, any subordinates who have committed radiation safety violations.

1.4 Violations

Disregard for or violations of the RSG standards and policies may be grounds for disciplinary action. Also, radiation safety performance shall be taken into consideration during periodic employee evaluations.

1.5 Interpretation

In cases where questions arise about the interpretation of standards in the RSG, the RSO shall provide the official interpretation.

1.6 Precedence

In the event of a conflict between the requirements of the RSG and applicable federal or state regulations, the requirements of the applicable federal or state regulations shall take precedence.

1.7 RSG Manual Changes

Any individual or organization may request a change to the requirements of this manual. Requests shall be made in writing to the RSO stating the specific change to be made and the basis.

Change requests shall be evaluated and acted upon expeditiously. Administrative changes should be completed within 30 days; substantive changes require a license amendment and may take several months to receive approval.

The Radiation Safety Officer (RSO) shall make an initial determination whether a proposed change is administrative or substantive in nature. If the RSO concurs with the proposed change, it shall be submitted to the Radiation Safety Committee (RSC) for action. In general, administrative changes involve periodic changes and updates to organization names, position titles and other non-technical issues. Substantive changes include addition, deletion, or modification of program requirements that may be interpreted as providing a lesser degree of protection to employees or the general public.

The RSC shall make the final decision regarding whether a change is administrative or substantive. The RSC has the authority for final approval of administrative changes. Substantive changes will be submitted as a license amendment to the State of Tennessee for approval.

All administrative changes will be distributed to the State of Tennessee in the normal distribution to all holders of controlled copies of the RSG.

1.8 Temporary Changes to the RSG

To provide a means to respond quickly to changing situations, temporary changes or exceptions to the requirements in the RSG may be approved by the RSO with concurrence of the Vice President, RE&DS. The nature of and reason for the temporary change or exception shall be documented and forwarded to all manual holders immediately upon approval.

Temporary changes or exceptions shall be effective for no longer than 90 days during which time the manual should be formally revised to make the change or exception permanent. The period of time during which a change or exception is in effect may not be extended unless approved by the RSC.

1.9 Guide Scope

The policies in this Guide apply to all SEG operations conducted under the Decontamination and Decommissioning (D&D) license issued by the State of Tennessee. All SEG employees, contractors, and visitors are included within the scope of the policies in this guide. Although all elements of the radiation protection program may apply to field projects where employees may be exposed to sources of ionizing radiation, the degree or level of implemention of requirements provided

of ionizing radiation, the degree or level of implemention of requirements provided in this document will be based on the scope of work and commensurate with the hazards present at the site.

1.10 Guide Overview

This guide consists of 15 major sections designed to provide concise, logically presented information regarding the radiation safety regulations and program policies at SEG. Each section begins with a section overview that describes the section contents and introduces the reader to the concepts discussed in the section. These fifteen sections include:

1. Introduction
2. General Information
3. Radiation Protection Program Administration
4. ALARA Program
5. Assessments Program
6. Personnel Monitoring Program
7. Instrumentation Program
8. Radiation/Hazardous Work Permit Program
9. Radiation Protection Survey Program
10. Radioactive Material Control Program
11. Contamination Control Program
12. Unconditional Release Program
13. Respiratory Protection Policies
14. Environmental Monitoring
15. Notices, Reports, and Records

2.0 GENERAL INFORMATION

2.1 Section Overview

This section contains a list of radiation safety definitions, gives the responsibilities of those involved in SEG field project operations, and discusses radiation safety training requirements.

2.2 Definitions

Definitions are required to ensure that individuals understand the requirements of the regulations and the Radiation Protection Programs at SEG. SEG utilizes regulatory definitions whenever possible. In addition, SEG uses definitions that are consistent with standard industry guideline documents. Whenever SEG definitions differ from regulatory definitions, it is clearly identified as an SEG definition. Additional specific definitions necessary for implementation of procedures are provided in specific radiation protection program areas.

1. *Absorbed Dose*: Energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy).

2. *Accessible Area:* An area that can reasonably be occupied by a significant portion of an individual's body, such as the head or most of the trunk.

3. *Accuracy*: The degree of agreement of the observed value with the conventionally true value of the quantity being measured. (ANSI N42.17A-1989)

4. *Activity:* Rate of disintegration (transformation) or decay of radioactive material. The units of activity are the curie (Ci) and the becquerel (Bq).

5. *Administrative Limit*: A limit established for the purpose of maintaining radiation dose below regulatory limits.

6. *Airborne Radioactive Material or Airborne Radioactivity:* Any radioactive material dispersed in the air in the form of dusts, fumes, particulates, mists, vapors, or gases.

7. *Airborne Radioactivity Area (SEG Definition):* Defined at SEG as a room, enclosure, or area where: 1) the airborne radioactive material exceeds 25% of the Derived Air Concentration (DAC) listed in Schedule RHS 8-30, Table 1, Column 3 of the Tennessee Standards for Protection Against Radiation (1200-2-5); or 2) an individual could exceed an intake of 0.5 percent of the ALI (10 DAC-hours) in one week.

8. *ALARA*: "As Low as is Reasonably Achievable". The basic philosophy of radiation protection is to maintain radiation exposures ALARA below the regulatory requirements. "Reasonable" means the costs, benefits, and risks are considered in trying to keep doses low.

9. *Annual Limit on Intake (ALI)*: The derived regulatory limit for the amount of radioactive material that can be taken into the body of an adult worker by inhalation or ingestion in a year.

10. *Background Radiation:* Radiation from cosmic sources, unregulated naturally occurring radioactive materials, and global fallout as it exists in the environment from the testing of nuclear explosive devices. Background radiation does not include radiation from sources of radiation subject to licensing or regulation.

11. *Background (Ambient):* The radiation level within any area resulting from the combination of environmental background radiation and generally low-level radiation from radioactive materials and sources within the facility.

12. *Bioassay:* Determination of the kind, quantity, or concentration and the location of radioactive material in the human body by direct measurement (in-vivo) or by analysis of materials excreted or removed from the human body (in-vitro). (ANSI N343-1978)

13. *Calibrate:* To adjust and/or determine:

    a. The response or reading of an instrument relative to a series of conventionally true values.

    b. The strength of a radiation source relative to a standard or conventionally true value.

14. *Check Source:* A radioactive source, not necessarily calibrated, which is used to confirm the continuing satisfactory operation of an instrument.

15. *Collective Dose:* The sum of the individual doses received in a given period of time by a specific population from exposure to a specific source of radiation.

16. *Committed Dose Equivalent (CDE)*: The dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50 year period following the intake.

17. *Committed Effective Dose Equivalent (CEDE)*: The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

18. *Confidence Level*: The degree of statistical assurance that activity measured or detected by a counting instrument or system is actually related to the sample being analyzed and is not attributable to background radiation, electronic noise or other factors.

19. *Contamination:* A radioactive substance dispersed in materials or places where it is undesirable. (ANSI N1.1-1976). Radioactive contamination may be removable (loose) or fixed.

20. *Contaminated Area (SEG Definition):* Any area accessible to personnel with loose surface beta-gamma radioactivity greater than 1000 dpm/100 cm^2 or loose surface alpha radioactivity greater than 100 dpm/100 cm^2.

21. *Controlled Area:* An area outside the restricted are but inside the site boundary, access to which can be limited by SEG for any reason.

22. *Curie (Ci)*: 2.2 trillion (E + 12) radioactive disintegrations per minute (dpm). The measure of the amount of radioactive material present. One curie equals 3.7 (E + 10) becquerel.

23. *Declared Pregnant Woman (DPW):* A woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

24. *Decontamination:* The process of removing or reducing the level of contamination on an item or individual.

25. *Deep Dose Equivalent (DDE):* The dose equivalent at a tissue depth of 1 cm (1000 mg/cm^2). Applies to external whole body exposure.

26. *Derived Air Concentration (DAC)*: The concentration of a given radionuclide in air which, if breathed by the reference man for a working year of 2000 hours at 1.2 m^3/hour (light work), results in intake of approximately one ALI.

27. *Derived Air Concentration-Hour (DAC-Hour):* The product of the concentration of radioactive material in air (expressed as a fraction or multiple of the derived air concentration for each radionuclide) and the time of exposure to that radionuclide, in hours.

28. *Direct Reading Dosimeter (DRD)*: A monitoring device consisting of a collection chamber coupled with an optical lens and calibrated scale. DRD's are normally used as a secondary dosimetry device to provide individuals with an immediate estimate of their external radiation exposure.

29. *Dose or Radiation Dose:* A generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent, as applicable to context.

30. *Dose Equivalent*: The absorbed dose in tissue multiplied by a quality factor and all other necessary modifying factors to account for the differing degrees of hazard from the various types of radiations (alpha, beta, gamma).

31. *Dosimeter*: Any of several types of devices used to measure radiation doses. Common types include TLD, film, and pocket dosimeters.

32. *Dry Active Waste (DAW):* Items such as plastic, rags, paper, wood, pipe, concrete, metal, filters and filtration media, etc., which have become radioactively contaminated due to plant operations and decommissioning activities. DAW can be compactible or non-compactible, incinerable, or appropriate for metal melting.

33. *Effective Dose Equivalent (EDE):* The sum of the products of the dose equivalent to the organ or tissue and the weighing factors applicable to each of the body organs or tissues that are irradiated.

34. *Embryo/Fetus:* The developing human organism from conception until the time of birth.

35. *Engineering Controls*: The general class of devices and associated methods used to reduce personnel exposure to radiation and radioactive materials. Examples of engineering controls are: local ventilation, glove boxes, remote handling tools and enclosures.

36. *Estimated Dose:* Dose that is normally based on results obtained from secondary dosimeters or incomplete bioassay information.

37. *Exposure:* Being exposed to ionizing radiation or to radioactive material.

38. *External Dose*: That portion of the dose equivalent received from a source of radiation outside the body.

39. *Extremity*: Hand, elbow, arm below the elbow, foot, knee, or leg below the knee.

40. *Eye (Lens) Dose Equivalent (LDE):* Dose equivalent due to external exposure to the lens of the eye at a tissue depth of 0.3 cm (300 mg/cm^2).

41. *High Radiation Area*: Any accessible area where the dose to an individual can exceed 100 mrem in any one (1) hour at 30 cm from the radiation source or from any surface that the radiation penetrates.

42. *Hot Particle:* A discrete radioactive fragment that is insoluble in water and is less than 1 millimeter in any dimension. (NRC IN 90-48)

43. *Hot Particle Area:* Any room or area, accessible to personnel, in which hot particles have been detected or are suspected to be present and in which work controls and protective equipment have been prescribed.

44. *Immediately Dangerous to Life or Health (IDLH)*: Any atmosphere which poses an immediate hazard to life or produces immediate irreversible debilitating effects on health.

45. *Internal Deposition:* Radioactive material that has been taken into and deposited in the body through either inhalation, ingestion, absorption through the skin, or through wounds.

46. *Internal Dose:* That portion of the dose equivalent received from radioactive material taken into the body.

47. *In-Vitro Bioassay (in-direct):* The estimation of radioactivity in the human body based (1) on the measurement of radioactivity in excreta or other materials taken from the body **AND** (2) on a biological model for the radionuclide movement in body tissues and organs. (ANSI N343-1978)

48. *In-Vivo Bioassay (direct)*: The measurement of radioactivity in the human body using instrumentation which detects radiation emitted from radionuclides in the body. (ANSI N343-1978)

49. *Limits (dose limits):* The permissible upper bounds of radiation doses.

50. *Man-Rem:* The cumulative radiation total effective dose equivalent received by personnel while performing a job or activity.

51. *Member of the Public:* An individual in a controlled or unrestricted area who is not receiving an occupational dose.

52. *Minimum Detectible Activity:* The smallest activity of a radionuclide in a sample that will be detected with a β probability of non-detectible (Type II) error while accepting an α probability of erroneously detecting that radionuclide in an appropriate blank sample (Draft ANSI 13.30-1989).

53. *Minimum Detectible Count Rate:* The smallest quantity or concentration of radioactive material that will cause an instrument response relative to the desired level of statistical confidence.

54. *Multibadging:* The process of issuing more than one dosimeter for the purpose of accurately measuring dose in a non-uniform radiation field.

55. *Naturally Occurring Radioactive Material*: Any nuclide which is radioactive in its natural physical state (i.e., not man-made), but does not include byproduct, source or special nuclear material.

56. *Nonstochastic Effect:* Health effects which vary in severity with dose and for which a threshold is believed to exist. Radiation induced cataract formation is an example of a nonstochastic effect.

57. *Occupational Dose:* The radiation dose any individual receives in a restricted area or in the course of employment in which the individual's assigned duties involve exposure to radiation and radioactive material from licensed and unlicensed sources of radiation.

58. *Occupational Dose Limit:* The maximum legally allowable dose to individuals during a specific time period, as defined by Tennessee Regulations Chapter 1200-2-5.

59. *Official Dose (Record Dose):* The dose determined and recorded for an individual for the purpose of demonstrating compliance with applicable monitoring requirements and dose limits. The official dose is normally based on the results of primary dosimeter processing and bioassay, but could be based upon calculations from survey data or other recognized techniques.

60. *Package:* For radioactive materials, the packaging together with its radioactive contents as presented for transport.

61. *Packaging:* For radioactive materials, the assembly of components necessary to ensure compliance with the packaging requirements of 49 CFR 173. It may consist of one or more receptacles, absorbent material, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The conveyance, tie-down system, and auxiliary equipment may sometimes be designated as part of the packaging. (49 CFR 173)

62. *Performance Test/Response Test:* A procedure whereby an instrument or a component is evaluated against accepted criteria for continuing satisfactory operation.

63. *Permissible Exposure Limit (PEL):* Airborne concentrations of a substance that employees are allowed to be exposed to by law for 8 hours a day, 40 hours a week.

64. *Planned Special Exposure*: An infrequent exposure to radiation, separate from and in addition to the annual dose limits.

65. *Posting:* A standardized sign or label which bears the standard trefoil symbol in magenta or purple or black on a yellow background and information concerning a specific radiological hazard.

66. *Primary Dosimeter:* A device used to monitor and assess a single individual's records dose (e.g., Film badge or TLD).

67. *Protection Factor*: The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the worker. The protection factor is a measure of the degree of protection provided by a respirator to the wearer. (ANSI Z88.2 - 1980).

68. *Public Dose:* Dose received by a member of the public from exposure to radiation and radioactive material released by SEG, or to another source of radiation either within SEG's controlled areas or in unrestricted areas.

69. *Quality Factor*: The modifying factor that is used to derive dose equivalent from absorbed dose.

70. *Rad*: The special unit of radiation dose. One rad is equal to an absorbed dose of 100 ergs/gram or 0.01 joule/kilogram (0.01 Gy).

71. *Radiation Area:* Any accessible area where the dose equivalent to an individual could exceed 5 mrem in any one hour at 30 cm from the radiation source or surface that radiation penetrates.

72. *Radiation Worker:* An individual who is trained and qualified to access the restricted area, including the Radiologically Controlled Areas, to perform work.

73. *Radiation/Hazardous Work Permit (RHWP)*: A document or series of documents prepared by Radiation Protection to inform workers of the radiological and hazardous conditions which exist in the work area and the radiological requirements for the job.

74. *Radioactive Material*: Any solid, liquid, or gas that spontaneously gives off radiation. For the purposes of this safety guide, this includes naturally occurring and technologically enhanced radioactive material unless otherwise noted.

75. *Radioactive Material (49 CFR 173):* Any material having a specific activity greater than 0.002 microcuries per gram.

76. *Radioactive Material Label:* A marking or label used to identify items or material contaminated with or containing radioactive materials. Labels are required on all containers holding radioactive material in quantities equal to or exceeding those listed in Schedule RHS 8-31 of Tennessee Regulations 1200-2-5.

77. *Radioactive Materials Area:* An area or room in which licensed material is used or stored which contains radioactive material in an amount exceeding 10 times the quantity of such material specified in Schedule RHS 8-31 of Tennessee Regulations 1200-2-5.

78. *Radioactive Waste*: Radioactive material no longer useful for any purpose and any equipment or supplies contaminated with such material for which further use or decontamination are not planned.

79. *Radiologically Controlled Area (RCA):* Any area to which access is controlled and that is posted because of the presence of radiation or radioactive materials. Radiologically Controlled Areas include Radioactive Materials Areas, Contaminated Areas, Radiation Areas, High Radiation Areas, Very High Radiation Areas, and Airborne Radioactivity Areas.

80. *Radiological Incidents:* Problems or events that have or could have the potential for violating federal and/or state regulations or involve a serious breakdown in the effectiveness of the Radiation Protection Program.

81. *Radiological Occurrence Report (ROR):* A report generated to document the facts, record the apparent and/or root cause, track the resolution and aid in trending radiological events. An ROR is classified as either "deficiency" or "incident".

82. *Record*: A document that provides evidence of the quality of services performed, demonstrates that actions were performed in accordance with radiation protection procedures, or demonstrates conformance of actions to regulatory requirements.

83. *Reference Man:* A hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus.

84. *Rem:* The special unit for any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem = 0.01 Sv).

85. *Respiratory Equipment*: Refers to respiratory facepieces, hoods, helmets and all associated equipment such as battery packs, belts, filters, canisters, air lines, fittings and valves.

86. *Respiratory Protective Device:* An apparatus, such as a respirator, used to reduce the individuals intake of airborne radioactive materials.

87. *Restricted Area:* An area having access controlled with the intent of preventing or controlling the radiation exposure of individuals.

88. *Secondary Dosimeter*: A device used to assess an individual's unofficial dose and capable of being read directly by the individual in the field. For purposes of this program the secondary dosimeter is synonymous with a Direct Reading Dosimeter (DRD), or pocket dosimeter.

89. *Shallow-Dose Equivalent (SDE)*: The dose equivalent at a tissue depth of 0.007 cm (7 mg/cm^2), averaged over an area of one square centimeter. It applies to external exposure of the skin of the whole body or of an extremity.

90. *Shielding:* Any material used to reduce radiation exposure. Alpha radiation is usually stopped by the outer dead layers of skin, a piece of paper, or a few inches of air. A thin piece of wood or 10 to 30 feet of air will attenuate most beta radiation. Depending on the energy of gamma radiation, several inches of any heavy metal such as lead or several feet of less dense materials such as water or concrete can effectively attenuate most gamma rays.

91. *Source Material:* Uranium or thorium or any combination of uranium and thorium in any physical or chemical form; or ores that contain 0.05 percent by weight or more of uranium, thorium, or any combination.

92. *Special Form Radioactive Material:* Radioactive material which satisfies the following conditions:

    a. It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule;

    b. The piece or capsule has at least one dimension not less than 5 millimeters (0.197 inches); AND

    c. It satisfies the test conditions of 49 CFR 173.469

93. *Special Nuclear Material (SNM):*

a. Plutonium, Uranium-233, Uranium enriched in the isotope-233 or in the isotope-235, and any other material which the Nuclear Regulatory Commission determines to be special nuclear material, but does not include source material; OR

b. Any material artificially enriched by any of the foregoing, but DOES NOT include source material. (10 CFR 20.3 (a)(16))

94. *Standard (instrument or source):*

a. *National Standard* - An instrument, source, or other system or device maintained and promulgated by the U.S. National Institute of Standards and Technology (NIST).

b. *Transfer Standard* - A physical measurement standard that has been compared directly or indirectly with the national standard. This standard is typically a measurement instrument or a radiation source used as a laboratory standard.

c. *Laboratory Standard* - An instrument, source, or other system or device calibrated by comparisons with a standard other than that of a U.S. National Standard.

95. *Stochastic Effects*: Health effects that occur randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer are examples of stochastic effects.

96. *Technologically Enhanced :* Chemical properties or physical state of natural sources of radiation have been altered or the potential exposure pathways of natural sources of radiation to humans have been altered.

97. *Threshold Limit Value (TLV):* Airborne concentrations of substances (non-radiological), conditions below which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effects. TLV tables are recommendations established and published by the American Conference of Governmental Industrial Hygienists (ACGIH), and should be used as guidelines for good practices.

98. *TLD:* Thermoluminescence Dosimeter. An integrating detector where radiation energy is absorbed (trapped) and can be read out later by thermal excitation of the detector (ANSI N13.15-1985).

99. *Total Effective Dose Equivalent (TEDE):* The sum of the deep dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

100. *Total Organ Dose Equivalent (TODE):* The sum of the deep dose equivalent and the committed dose equivalent to the organ receiving the highest dose.

101. *Unconditional Release*: The removal of material and equipment from a Radiological Controlled Area to areas which do not require radiological control of the material and equipment.

102. *Unrestricted Area:* Any area to which access is not limited or controlled for purposes of protection of individuals from exposure to radiation and radioactive materials.

103. *Very High Radiation Area*: An area, accessible to individuals, in which the individual(s) could receive 500 rads in any hour at one meter from a source of radiation or from any surface that the radiation penetrates.

104. *Visitor:* An escorted individual who enters the Restricted Area.

105. *Whole Body (WB):* For purposes of whole body exposure, the head, trunk (including male gonads), arms above the elbow, or legs above the knee.

2.3 Responsibilities

No radiation safety program can provide adequate protection unless all people involved are aware of and perform their responsibilities. At SEG, responsibilities are clearly defined with respect to requirements to be met in the Radiation Protection Program areas. SEG believes that each individual shares responsibility for their own radiation protection as well as for their co-workers and individual members of the public.

Corporate Responsibilities

SEG corporate personnel and organizations are responsible for the development and implementation of the Radiation Protection Program at SEG headquarters facilities and field projects. At SEG field projects, responsibilities for program implementation are delegated to the Site Safety and Health Officer (SSHO) and specifically identified in program implementing procedures.

The President of SEG has ultimate responsibility for ensuring that the Radiation Protection Program at SEG is developed and implemented in a manner consistent with regulatory requirements and company policies.

The Vice President (VP) of Regulatory Services (RS) has responsibility for assuring that an effective Radiation Protection Program is developed at SEG. This responsibility is delegated to the Radiation Safety Officer (RSO). The RSO is also responsible for program oversight.

The VP of Radiological Engineering and Decommissioning Services (RE&DS) has responsibility for assuring that an effective Radiation Protection Program is implemented at SEG. This responsibility is delegated to the Radiation Protection Manager (RPM) for headquarters facilities and the Site Safety and Health Officer (SSHO) for field projects.

The corporate ALARA Review Committee (ARC) is responsible for reviewing, evaluating and approving operations dealing with radioactive materials and radiological controls, providing direction to the Radiation Protection Manager (RPM) for decisions involving financial solutions, ALARA goals, and methods of operations, and presenting annual departmental ALARA goals to site senior management for review and/or revision and approval.

The corporate Radiation Safety Committee (RSC) is responsible for reviewing and approving radiation safety policies and advising senior management regarding radiation safety matters.

Each Radiological Engineering and Decommissioning Services Manager and Supervisor is responsible for implementation of their program area including:

1. Compliance with the SEG Radiation Protection Program.
2. Ensuring that employees supervised by them are properly trained.
3. Ensuring that field projects and personnel receive adequate support and resources for program implementation.
4. Preparation and maintenance of procedures.
5. Accuracy and completeness of records.
6. Storage of records prior to transmittal to document control.
7. Transmittal of quality assurance records to document control in accordance with established schedules.

The Quality Assurance Records Center Specialist is responsible for the maintenance and distribution of controlled documents, and for long-term storage of quality assurance documents after they are no longer required for operational purposes.

Project Responsibilities

Each project action plan will include a description of the radiation protection program and field personnel and organizations necessary to assure adequate program implementation. The number of field personnel and program requirements will vary based on project size and staffing requirements. However, a SSHO will be designated for all projects.

The SSHO is responsible for all aspects of program implementation in the field. For large projects, the SSHO may report to the site Project Manager for action plan implementation and the VP, RE&DS for program implementation. For small projects, the SSHO may also serve as the Project Manager and report to the SEG Manager of Decommissioning Contract Services for plan and program implementation.

Other organizational requirements will be identified in the project plan. For large projects with a total estimated project exposure of 1 man-rem and project execution requires the participation of multiple disciplines (craft, trade, engineering, etc.) an ALARA committee should be formed. The committee should be composed of members or representatives of each of the major disciplines. The committee should be chaired by the SSHO and fulfill the combined responsibilities of the corporate Radiation Safety and ALARA Review Committees. The committee should have the authority to resolve all project issues, as well as approve project actions. Although, the committee may seek SEG corporate involvement and/or assistance, actions will not require corporate approval prior to implementation (unless the actions involve organization, budget or other resources under the control of the corporate office).

Small projects which do not meet the criteria stated in the previous paragraph should not require the formation of project committees. The SSHO will have the authority to fully execute program requirements, including issue resolution. The SSHO may request assistance from the SEG corporate organization for any aspect of project execution, as well as program implementation. For instance, personnel monitoring will be required for all project personnel with the potential to exceed 10% of the applicable exposure limits identified in Section 6.0. However, responsibilities for this aspect of program implementation may be shared between the SSHO and SEG corporate organizations. In this example, the SSHO may be responsible for ensuring all personnel are properly monitored, exposures are maintained below applicable limits and ALARA, and field accountability of monitoring devices. SEG corporate organizations would be responsible for overall accountability, processing, record keeping, and preparation of reports and notices.

Individual Responsibilities

Everyone at SEG is responsible for following regulatory requirements and SEG radiation safety procedures to the best of his/her ability and knowledge. These responsibilities include proper use of protective and personnel monitoring equipment, notifying management of any potential or real radiation hazards or improper practices, and maintaining his/her individual radiation exposure and that of others ALARA. SEG has an ALARA policy that is explained to individuals upon initial employment and in re-training. Employees are encouraged to submit recommendations for improvements to the work place, especially if they will result in lower doses.

Employees are requested to contact management first regarding potential regulatory or license violations before contacting the state regulatory agency. However, any employee who is not satisfied with the management response regarding the potential violation is encouraged to contact the state for resolution of the concern.

Any radiation worker who has had a medical treatment involving radioactive material shall inform his/her supervisor as soon as practical after the treatment upon returning to work to assure that the treatment is not accidentally confused with the worker's occupational exposure.

Employees desiring exposure protection for the embryo/fetus should notify their supervisor, in writing, as soon as exposure protection is desired so that appropriate controls can be instituted. SEG is required to limit the dose to an embryo/fetus when notified by the worker, in writing, of the pregnancy and the estimated date of conception.

2.4 Training Requirements and Policy

All persons who are permitted to enter the SEG restricted area shall receive information and training in radiation safety. The depth of the training will be commensurate with the potential radiation safety problems the person may face in his/her work or visit. The regulations require that workers be:

1. Informed of the storage, transfer, or use of radioactive material and sources of radiation in the restricted area;

2. Instructed in the hazards associated with exposure to radiation or sources of radiation, in precautions or procedures to minimize radiation exposure, and in the purposes and functions of protective devices used;
3. Instructed in, and instructed to observe, to the extent within the worker's control, the applicable parts of the regulations and the SEG license for protection of individuals from radiation or radioactive materials;
4. Instructed in SEG operating and emergency procedures applicable to the activities in which the individual is involved;
5. Instructed of their responsibility to report promptly to SEG management any condition that may lead to or cause a violation of regulations and the SEG license or unnecessary exposure of individuals to radiation or radioactive material;
6. Instructed in the proper response to warnings made in the event of any unusual occurrence or malfunctions that may involve exposure of individuals to radiation or radioactive material; and
7. Advised that workers may request radiation exposure reports specified in the regulations.

In addition to the above requirements, training includes instruction on radiation exposure to the unborn child as recommended in Regulatory Guide 8.13, procedures for declaration of pregnancy for females desiring protection of the embryo/fetus, and training in the requirements of Tennessee regulation 1200-2-5, "Standards for Protection Against Radiation."

The SEG training program meets these requirements using a combination of several or all of the following techniques: classroom training, videotapes, reading assignments, on-the-job training, demonstrations, drills, and informal discussions. SEG radiation workers attend an appropriate classroom training session upon employment and receive periodic review training at least annually (11-13 months from previous training). During the initial unescorted access training program, trainees are tested in their understanding of the material presented. Training records for all individuals are maintained indefinitely.

3.0 RADIATION PROTECTION PROGRAM ADMINISTRATION

3.1 Section Overview

This section describes the administration of the SEG Radiation Protection Program. Administration of the SEG Radiation Protection Program requires coordination between the RSO, the RPM, input from the Radiation Safety Committee and the ALARA Review Committee, and workers. Organization and staffing requirements of the Radiation Protection organization are presented, as well as the requirements of the Radiation Safety Committee. Relationships between documents used to achieve compliance with the regulations and SEG radioactive materials licenses are presented.

Compliance with the Radiation Protection Program is met through proper implementation of procedures. Requirements for development, review, approval, and control of procedures are also provided.

The Radiation Protection Program results in the generation of logs and records. In addition, notifications and reports are required by the regulations. Requirements for proper generation, storage, and turnover of records and notifications are described to ensure regulatory compliance.

3.2 Radiation Protection Organization

The SEG Radiation Protection Organization shall be staffed to ensure protection of workers and the general public from radiological hazards. The organization is defined and documented through the Radiation Protection Program Procedures. Duties and responsibilities shall be written to ensure proper delegation of authority. Changes to the Radiation Protection Organization require the approval of the Vice President (VP) of Regulatory Services (RS), or the VP of RE&DS, as appropriate, or the President. Changes to field project organizations require the approval of the VP of RE&DS.

Radiation Protection staffing levels shall be periodically reviewed by the VP of RE&DS, the VP of RS, RSO and RPM or SSHO, as applicable, to ensure that adequate staffing levels are maintained consistent with current and planned activities. The RSO and RPM or SSHO shall have access to engineering and other personnel needed to support the Radiation Protection Program.

3.3 Corporate Radiation Safety Committee (RSC)

SEG shall maintain a corporate RSC to ensure appropriate review of radiological concerns at facilities. The RSC shall consist of the RSO, as chairman, the RPM, as vice-chair, the VP of RS, the VP of RE&DS, and other individuals with appropriate authority and technical expertise, as deemed necessary by the chairman. Alternates shall be designated by each member and approved by the Committee. Meetings of the RSC shall be held at least once each calendar quarter. Special meetings shall be held as requested by the RSO to review specific radiation safety questions or problems.

The objectives of the RSC are:

1. Ensuring that Radiation Protection Program policies, philosophy, commitments and regulatory requirements are integrated into all appropriate work activities.

2. Reviewing and auditing the effectiveness of the Radiation Protection Program.

3. Review of written safety analyses of proposed programs, operations, and facilities where radiation and/or contamination are involved.

4. Review and approval of Radiation Protection Program documents such as the SEG Radiation Safety Guide, Radiation Protection Program Administrative procedures, and SEG Radiological Emergency Response Plans.

5. Assigning corrective actions, as necessary, to ensure accomplishment of Radiation Protection Program objectives and goals.

6. Reviewing the status of corrective actions assigned by the Committee.

Scheduling of RSC meetings is the responsibility of the RSO. At least three members of the RSC, no more than one of which is an alternate, shall be present at meetings. Approvals by the RSC require a quorum of at least three members. Alternate votes shall be less than 50 percent. Meetings should normally be held in person; however, telephone conference call meetings can be held provided that all information needed for consideration of agenda items is clearly presented or transmitted to members. Minutes of RSC meetings shall be distributed to all members within 30 days by the RSO, who shall also maintain records of meetings.

3.4 Radiation Protection Program Document Hierarchy

Hierarchy of the Radiation Protection Program documents shall be as listed below and is depicted by the flow chart included at the end of this section.

1. Federal Regulations (e.g., 49 CFR)

2. State of Tennessee Regulations (e.g., Tennessee Regulation 1200-2-5, "Standards for Protection Against Radiation").

3. Radioactive Materials Licenses and permits issued by the State of Tennessee and/or Federal government, including all documents incorporated by reference, such as the SEG Radiation Safety Guide. The Radiation Safety Guide presents SEG policies for implementation of regulatory and license requirements.

4. Radiation Safety Guide. Contains the policies, regulatory requirements, and administrative guidelines used in the Radiation Protection Program.

5. Radiation Protection Program Procedures. These procedures contain requirements and policies defined in the Radiation Safety Guide.

3.5 Radiation Protection Program Procedures

The Radiation Protection Program is specifically defined and implemented in project procedures. Implementing procedures contain specific information for achieving the requirements contained in the Radiation Safety Guide.

The Radiation Protection Program incorporates the following implementing procedures. These procedures specify the methods to achieve regulatory compliance, as well as implement self-imposed controls.

The radiation protection implementing procedures cover ALARA, Assessment, Personnel Monitoring, Instrumentation, Operations (Access Controls, Surveys, and Radiation/ Hazardous Work Permits), Respiratory Protection, and Environmental Monitoring, Radioactive Materials Management (Radioactive Material Control, Contamination Control and Unconditional Release), and Radioanalytics Laboratory Analysis.

3.6 Procedure Development

Radiation Protection Program procedures have been developed in accordance with the SEG Quality Assurance Manual, SEG/QA-5.1, Procedures, Instructions, and Drawings. In addition, procedures are prepared in accordance with regulatory requirements and the SEG Radiation Safety Guide. The review process ensures that all procedures are:

1. Clear in scope, applicability, limiting conditions and precautions.

2. Uniform in procedure identification (titling and numbering) and status (revision number).

3. Consistent in format (for organization, instruction step format, instruction step designation, caution and note format, and page format).

4. Written with clear, easily understood text, using standard grammar, nomenclature and punctuation shall present instructional steps in a concise, logical sequence.

5. Written to contain "hold points" for steps within a procedure with unique and/or high personnel or equipment risk.

6. Written using definitions that are consistent throughout the Radiation Protection Program manuals. Definitions shall be consistent with regulatory requirements. To the extent practicable, definitions shall be consistent with other technical guidance documents (e.g., ICRP, NCRP, U.S. NRC Regulatory Guides, ANSI standards, ASME standards, etc.).

3.7 Technical Verification of Procedures

Procedures shall undergo technical verification and review to ensure compliance with regulatory requirements, all applicable licenses and permits, compliance with the SEG Radiation Safety Guide, and conformance, to the extent practicable, with applicable technical guidance documents. Procedure review shall also assure compatibility with all other SEG procedure manuals and documents. Reviews shall ensure that the procedure can be performed as written and that responsibilities are clearly defined and consistent with position descriptions.

3.8 Approval and Control of Procedures and Work Plans

Radiation Protection Program procedures shall be approved by the RSO, RPM, and the Quality Assurance Department. In addition, administrative Radiation Protection Program procedures shall be approved by the Radiation Safety Committee. Project Work Plans and project implementing procedures shall be developed by the RE&DS group and approved by the VP, RE&DS. Procedures shall be issued and controlled by the Document Control Records Coordinator in accordance with SEG QA/6.1, "Quality Assurance Procedure Document Control."

3.9 Radiation Protection Logs, Records, and Turnovers

Implementation of the Radiation Protection Program results in generation of records demonstrating the quality of services performed and compliance with federal and state regulations. Examples of such records include results of radiation, contamination and airborne surveys, shipping papers for radioactive waste and materials, results of bioassay analyses, calibration records for survey and laboratory instruments, personnel monitoring and exposure records, Radiation/Hazardous Work Permits, ALARA reviews, entry, survey, and turnover logs, results of laboratory

analyses, radioactive source leak tests, and records of training. Radiation Protection records shall be controlled in accordance with regulatory requirements, the requirements of the SEG Quality Assurance Manual, Section 17, "Quality Records," the SEG Radiation Safety Guide, and ANI/MAELU Information Bulletin 80-1A, Revision 4, "Nuclear Liability Insurance Records Retention."

Records shall be accurate and legible and shall utilize standard terminology and abbreviation. Records review shall be performed by supervisors to ensure completeness, accuracy and timeliness. Temporary storage systems should be established, as necessary, to store those records needed for day-to-day functioning of the program area. Temporary storage systems shall assure safe retention with provision for retrieval and shall comply with quality assurance requirements. Records not needed for the day-to-day functioning of the program area shall be transferred to Document Control in accordance with documented transfer schedules per the SEG Quality Assurance Manual.

Records shall be retained for a minimum of ten years after license termination or ANI insurance coverage is terminated, whichever is later.

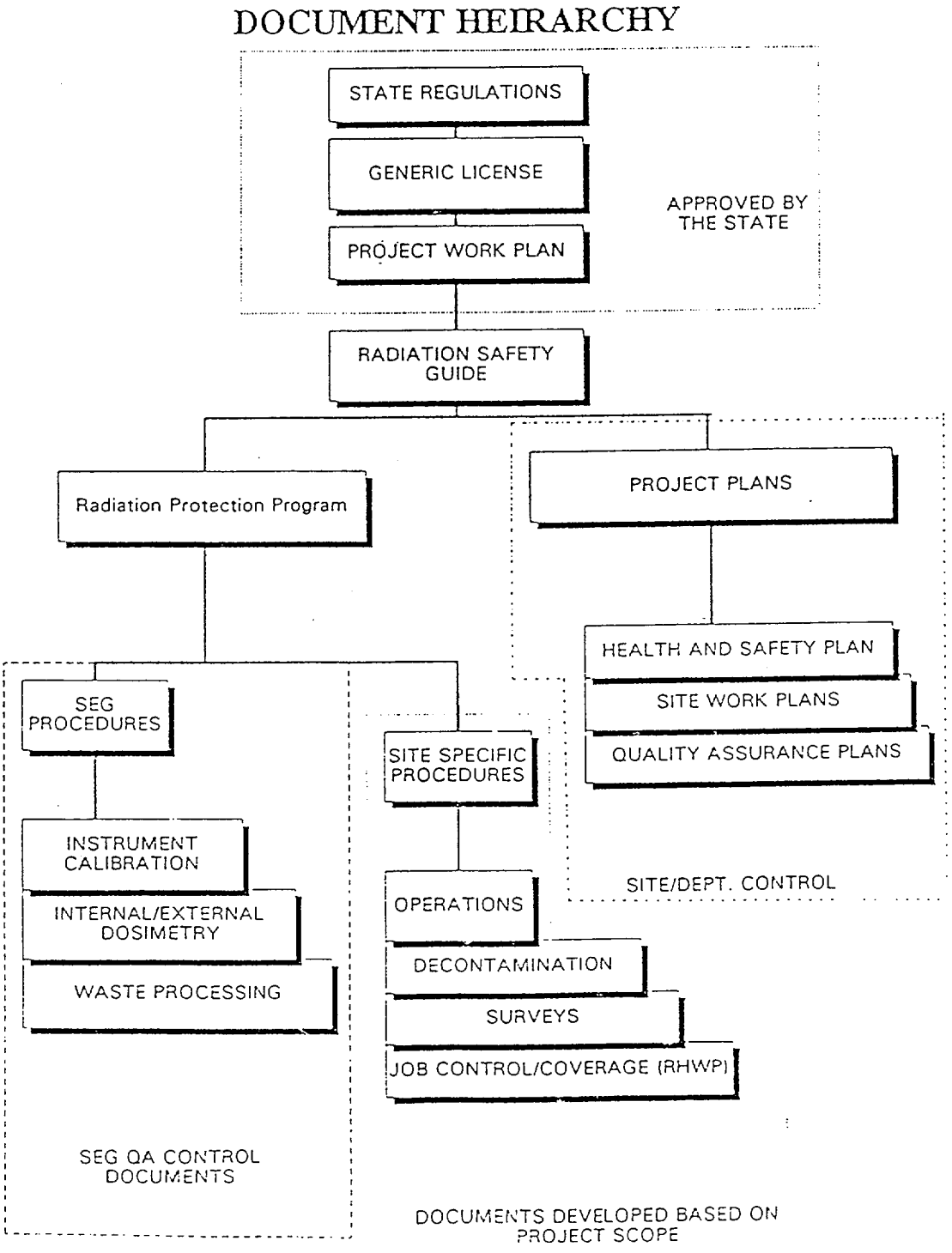
3.10 Notifications and Reports

Notifications to employees shall be made in accordance with the requirements of Tennessee Regulations. In addition, written annual reports of internal and external exposures shall be provided to workers. Workers shall receive copies of exposure reports pertaining to them that are required to be submitted to the State. Also, a summary report of exposures, by year, shall be provided to employees upon request.

SEG shall notify individuals of the purpose, estimated exposures and risks, radiation levels, and other pertinent conditions prior to allowing an individual to participate in a Planned Special Exposure.

For compliance with regulations, SEG shall notify the State of Tennessee of intent to use respiratory protective equipment, packages exceeding contamination or radiation level limitations, theft or loss of radioactive material, any incidents as described in Tennessee regulation 1200-2-5-.141, and intent to terminate the radioactive materials license.

Reports shall be made to the State for overexposures, excessive radiation levels, and concentrations exceeding limits as specified in Tennessee regulation 1200-25-.142.



4.0 ALARA PROGRAM

4.1 Section Overview

State of Tennessee regulations require that SEG develop, document, and implement a radiation protection program commensurate with the scope and extent of licensed activities. In addition, the regulations require SEG to use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable.

In order to comply with the regulations and to ensure a safe and healthy environment for workers and members of the public, SEG operations shall be performed in a manner such that doses are maintained ALARA. The ALARA Program describes the methods used to ensure that this objective is met.

4.2 ALARA Policy

The acronym ALARA, "As Low as is Reasonably Achievable", means making every reasonable effort to maintain exposures as far below the limits in Chapter 1200-2-5 of Tennessee regulations as is practical consistent with the purpose for which the licensed activity is undertaken. The economics of improvements in relation to the state of technology and in relation to benefits to the public health and safety shall be taken into account.

The ALARA concept is intended to be an optimization principle rather than an absolute minimization of exposures. The ALARA concept is set forth in the Company ALARA Policy signed by the President of SEG, Inc. and is included at the end of this section.

4.3 Corporate ALARA Review Committee (ARC)

The objectives of the corporate ARC include:

1. Reviewing plans for new licensed activities and facilities to ensure that ALARA considerations are met.

2. Review and approval of ALARA Job Reviews with collective dose estimates equal to or exceeding 10 man-rem at SEG headquarters facilities.

3. Recommending corrective actions, as necessary, to ensure accomplishment of ALARA Program objectives and goals.

4. Reviewing the status of corrective actions assigned by the Committee.

5. Recommending necessary resources to achieve the goals and objectives of the ALARA Program.

The ARC is chaired by the VP, RE& DS. The Vice-Chairman is the VP of RS. Other members of the ARC include the RE&DS Manager, Oak Ridge Operations, the RSO, and the RPM.

Each ARC member shall designate an alternate who shall be approved by the Committee and recorded by the secretary. The ARC shall meet as requested by the Chairman or Vice-Chairman to review specific ALARA issues or problems. All members should be present or represented by their alternate at each meeting. A quorum of three members or alternates is required for approvals. Approval is by consensus. Meetings should normally be held in person; however, telephone conference call meetings can be held provided that all information needed for consideration of agenda items is clearly presented or transmitted to members. Minutes of ARC meetings shall be distributed to all members by the RPM, who shall also maintain records of the meetings.

4.4 ALARA Job Reviews

An ALARA Job Review is an evaluation of a job which includes the description of the scope, the sequence of events for the job evaluation and the support groups needed. The evaluation shall include the radiological conditions expected during each phase of the job and the ALARA requirements for the job.

RHWP requests should be prepared and submitted as far in advance as possible. Consideration should be given to the total man-rem that the job may entail, as it will affect the time required for proper evaluation and preparation of RHWP's. Originators shall provide information sufficient to adequately evaluate radiological and engineering controls. The RHWP requestor should include enough information

on the request form to completely describe the scope of work including all supporting tasks which must be performed in an RCA. The requestor should provide a sufficiently detailed breakdown of work hours by task and location so that relevant man-rem estimates can be determined. The requestor should include supporting information and documentation such as work procedures, drawings and diagrams.

For each RHWP request, a man-rem estimate and ALARA job review should be performed. If the exposure estimate is less than 5 man-rem, the ALARA pre-job review may be performed by a Sr. Health Physics (HP) Technician or the SSHO. If the exposure estimate is $\geq$ 5 man-rem, the SSHO shall perform the ALARA pre-job review. ALARA Job Reviews shall ensure that the following items are determined based on the radiological hazards:

1. Radiation Protection requirements
2. Engineering controls
3. Administrative controls
4. Hold points
5. Dose reduction methods
6. Exposure estimates for job tasks

The need for specialized ALARA training will be identified during ALARA reviews and/or RHWP preparation. Specialized ALARA training may include mock-ups, dry runs, pre-job briefings and other special training classes. This training will normally be attended by all personnel involved with the task, including job supervision. Job reviews shall be approved based on the anticipated radiological hazards. Following approval, RHWP pre-job briefings should be held with all personnel involved with the task(s).

4.5 Approvals

ALARA pre-job reviews shall be approved in accordance with the following table:

Dose Estimate (man-rem)	Approval Authority Required
< 1	Sr. HP Technician or SSHO
≥ 1 and < 5	SSHO
≥ 5 and < 10	RPM
≥ 10	ALARA Review Committee

4.6 Post-Job ALARA Reviews

Post-job reviews shall be required for a job/task that meets the following criteria:

1. The actual exposure expended for a job or task exceeds five man-rem and the actual man-hours differs from the estimated man-hours by more than + or - 25% or the actual man-rem differs from the estimated man-rem by more than + or - 25%.
2. At the discretion of the SSHO.

The ALARA review shall be performed using input provided by personnel that planned and/or worked on the job.

Post-job reviews should include, but not be limited to, the following:

1. Strengths and weaknesses
2. Dose reduction methods used
3. Contamination control methods used
4. Airborne contamination control methods used
5. Man-hour reduction methods used
6. Methods that were not effective
7. Effectiveness of Special Training, mock-ups, special tools used, etc.

Post-job ALARA review documentation should be approved by the same level of authority required to approve the pre-job review. All job reviews (pre, and post) shall be filed with the RHWP package.

5.0 ASSESSMENT PROGRAM

5.1 Section Overview

The Radiation Protection Assessment Program provides a systematic approach to the review of key activities and the overall quality of Radiation Protection activities. The Radiation Protection Assessment Program helps to assure that current program activities comply with license and regulatory requirements; program activities are performed in accordance with established policies, procedures and recognized good practices; unsatisfactory performance is identified and corrected; and any programmatic weaknesses are targeted and corrected. The assessment process includes continuous performance monitoring in addition to an annual summary assessment report.

The Radiation Protection Assessment Program provides assessments of all major areas of the Radiation Protection Program. Requirements of the Radiation Protection Program are found in the regulations, radioactive materials licenses, the Radiation Safety Guide, and Radiation Protection procedures. The effectiveness of the Radiation Protection Program shall be determined through the systematic use of audits, surveillances and evaluations of radiological occurrences.

5.2 Audit Reports

Audits are used to evaluate the effectiveness of the Radiation Protection Program and to determine the adequacy of and adherence to established procedures, instructions, specifications, regulations and standards, and other applicable permitting and licensing requirements. Audits shall be performed by SEG corporate personnel and include SEG headquarters facilities, as well as some or all of the field projects. The primary purpose of the audit program is to provide a comprehensive evaluation of implementation of SEG radiation protection policies and procedures. Each of the following elements of the Radiation Protection Program shall be audited:

1. Radiation Protection Program Administration
2. Personnel Monitoring Program
3. ALARA Program
4. Radiation/Hazardous Work Permit Program
5. Radiation Protection Survey Program

6. Respiratory Protection Program
7. Radioactive Materials Control Program
8. Unconditional Release Program
9. Contamination Control Program
10. Radiation Protection Instrumentation Program
11. Environmental Monitoring Program
12. Radioactive Waste Management

Radiation Protection Program areas should be audited as directed by the RSO. Audits shall be conducted by an individual(s) approved by the RSO.

5.3 Surveillance Reports

Surveillances are job specific observations performed by the Radiation Protection Organization to evaluate the program's effectiveness and personnel performance when measured against accepted practices (e.g., procedures, management directives, etc.), industry standards and regulatory requirements. Radiation Protection Program surveillances should be performed as directed by the RPM. Surveillances conducted at SEG field projects shall be at the direction of the SSHO. The surveillance shall be conducted by any member of the applicable staff or by an individual from outside the organization as approved by the RPM or the field project SSHO.

5.4 Radiological Occurrence Reports

A Radiological Occurrence Report (ROR) is generated to document the facts, record the apparent and/or root cause, track the resolution and aid in trending radiological events. An ROR is classified as either "deficiency" or "incident."

Managers and supervisors with personnel performing activities in Radiologically Controlled Areas should periodically monitor activities to ensure compliance with the Radiation Protection Program. Personnel who do not comply with the Radiation Protection Program or who are involved in frequent or significant violations of radiological protection requirements shall be counseled and/or provided remedial training. Personnel who continue to violate radiological protection requirements may be disqualified from entering the Radiologically Controlled Area and may be subject to disciplinary action up to and including termination.

6.0 PERSONNEL MONITORING PROGRAM

6.1 Section Overview

Tennessee Regulations establish a total effective dose equivalent (TEDE) limit and a total organ dose equivalent (TODE) limit for occupationally exposed individuals.

Monitoring of an individual's external radiation dose is required by the regulations if the external occupational dose is likely to exceed 10% of any dose limit appropriate for the individual. External radiation monitoring is also required by 1200-2-5-.71(1)(c)for any individual entering a High or Very High Radiation Area.

Monitoring of the intake of radioactive material is required by regulations if the intake is likely to exceed 10% of the Annual Limit of Intake (ALI) during the year for an occupationally exposed individual, including the embryo of a declared pregnant woman.

Tennessee regulation 1200-2-5-.70(3) states "All personnel dosimeters (except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to the extremities) that require processing to determine the radiation dose and that are used to comply with 1200-2-5-.50, with other applicable provisions of these regulations or with conditions specified in a license or registration must be processed and evaluated by a dosimetry processor: (1) Holding current accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology; and (2) Approved in this accreditation process for the type of radiation or radiations included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored." Accredited dosimetry processing services shall be used at SEG.

1200-2-5-.53(1) states "For purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the licensee shall, when required under 1200-2-5-.71 take suitable and timely measurements of (a) Concentrations of radioactive materials in air in work areas; or (b) Quantities of radionuclides in the body; or (c) Quantities of radionuclides excreted from the body; or (d) Combinations of these measurements." SEG shall perform air sampling and in-vitro bioassay and/or in-vivo bioassay monitoring in order to comply with this requirement.

SEG is required to provide appropriate monitoring for the accurate determination of occupational radiation exposure to personnel who enter and/or work in the Restricted Area. Official determination of external exposures shall normally be made using primary dosimeter results except as otherwise noted. Internal exposures shall be monitored and evaluated as necessary. Any significant positive results ($\geq$ 10 mrem) are entered into the individuals official dose history.

SEG shall maintain records of occupational exposure monitoring results in accordance with 1200-2-5-.135. Reports of individual monitoring results shall be made available to monitored individuals on a annual basis. Routine personnel monitoring reports are not required to be made to the State of Tennessee, however, records shall be made available for review by regulatory personnel.

The policies outlined in this section also address requirements for protection of individual members of the public, whether living in the vicinity of project facilities or visiting. Policies are also presented for administrative dose limits, planned special exposures, emergency exposures, embryo/fetus monitoring, and dose assessments.

6.2 Occupational Dose Limits

The following annual dose limits apply to all SEG employees, contractors, and visitors who receive occupational dose at project facilities. Occupational dose is defined as the radiation dose an individual receives in a restricted area and other work-related radiation dose the person receives, but does not include medical dose, dose due to background radiation, or dose received while a member of the public.

Occupational Dose Limits for Adults are as follows:

1. *Whole Body* - The more limiting of a total effective dose equivalent (TEDE) equal to 5 rem or the sum of the deep dose equivalent and committed dose equivalent to any individual organ or tissue, other than the lens of the eye, equal to 50 rem.

2. *Skin* - A shallow dose equivalent equal to 50 rem.

3. *Lens of the Eye* - An eye dose equivalent equal to 15 rem.

4. *Extremities* - A shallow dose equivalent equal to 50 rem.

Occupational Dose Limits to Minors are as follows:

1. The dose limits for minors shall be 10 percent of the corresponding limit for adults. Minors shall not be employed to work in RCA's at project facilities although they may enter as visitors.

Occupational Dose Limits to Embryo/Fetus are as follows:

1. The dose to the embryo/fetus of declared pregnant women shall be limited to 500 mrem during the entire time of pregnancy. Substantial variations in dose rate shall be avoided.

2. The dose to the embryo/fetus shall be taken as the sum of the deep dose equivalent (DDE) to the declared pregnant woman and the internal dose (CEDE) to the embryo/fetus from radionuclides in the embryo/fetus and in the declared pregnant woman during the pregnancy.

3. Upon declaration of pregnancy, the occupational dose to the embryo/fetus from the date of conception to the date of declaration shall be determined, including any occupational dose received at other facilities (non-project facilities). The primary dosimeter shall be read and a bioassay sample obtained, if possible, on the date of declaration to determine the current dose to the embryo/fetus.

4. If the dose to the embryo/fetus exceeds or is within 50 mrem of the dose limit at the time a women declares her pregnancy, the embryo/fetus shall be allowed to receive up to an additional 50 mrem during the remainder of the pregnancy.

6.3 Dose Limits for Individual Members of the Public

The TEDE received by individual members of the public from licensed operations shall not exceed 100 mrem in a year, except as allowed based upon Tennessee regulation 1200-2-5-.60. In addition, the dose in any unrestricted area from external sources shall not exceed 2 mrem in any one hour. Tennessee regulation 1200-2-5-.60 allows SEG to apply for prior authorization to operate up to an annual dose limit of 0.5 rem for an individual member of the public.

No individual shall be considered a member of the public while in Restricted Areas. Generally, all individuals are considered members of the public while in controlled areas unless they are likely to receive an occupational dose greater than 10% of the applicable limit.

Compliance with the annual dose limits is required to be documented and based upon surveys, effluent data, and calculations as necessary. Documentation shall show that the total effective dose equivalent to the individual likely to receive the highest dose does not exceed the dose limit.

6.4 Administrative Limits for Occupationally Exposed Adults

Administrative limits are used to control doses to insure that regulatory limits are not exceeded and that occupational exposures are maintained as low as is reasonably achievable. The administrative limits also serve to alert health physics personnel to practices or trends in the work environment that are resulting in additional or excessive exposure to individuals. The company goal is that no individual shall exceed the administrative limits.

SEG Administrative Dose Limits for Occupationally Exposed Adults are as follows:

1. TEDE of 500 mrem per year if dose for the current year has not been determined (no dose extension permitted.)

2. TEDE of 4000 mrem per year.

3. TEDE of 1000 mrem in any calendar quarter, or a TODE of 10,000 mrem in any calendar quarter, whichever is more limiting.

4. Eye (lens) dose equivalent (LDE) of 3,000 mrem in any calendar quarter.

5. Shallow dose equivalent (SDE) (skin or extremity) of 10,000 mrem in any calendar quarter.

Administrative dose limit extensions for occupationally exposed adults will be considered when written justification for the need to extend the individual's dose limit is provided by the individuals' supervisor. Approval by the RPM is required to exceed quarterly administrative limits (up to but not exceeding 4,000 mrem TEDE annual limit). Extensions shall not be permitted when dose for the current year has not been determined. Approval by the Radiation Safety Committee (VP, RE&DS or ALARA Committee for field projects) is required to authorize an individual to receive more than 4,000 mrem in a year (TEDE).

SEG Administrative Dose Limits for Minors shall be controlled so as not to exceed 10% of the administrative limits for occupationally exposed adults.

6.5 Planned Special Exposures

The regulations allow licensees to authorize adult worker doses in addition to and accounted for separately from the occupational dose limits in Section 6.2. These doses fall under the regulatory category of Planned Special Exposures (PSE). PSE's are only allowed in exceptional situations when the alternatives that might avoid the higher exposure are no available or impractical. It is SEG policy not to utilize the PSE provisions of the regulations.

6.6 Determination of Prior Occupational Exposure

The occupational dose during the current year shall be determined and an attempt shall be made to obtain records of lifetime dose for all personnel who are likely to receive a dose in excess of 10% of the annual dose limit. Records shall be kept of attempts to obtain lifetime dose history, including the name, address, date, and response of the individual contacted. If the lifetime dose history cannot be obtained from the current or most recent employer, each prior employer shall be contacted individually based upon information supplied by the individual.

The prior dose history shall be documented on Form RHS 8-1H, or equivalent. The record shall show each period in which the individual received occupational dose and shall be signed by the individual who received the exposure. For each period for which a report was obtained, the dose shown on that report shall be used in preparing Form RHS 8-1H. For any period in which a report was not obtained, a written notation shall be placed in Form RHS 8-1H indicating the periods of time for which data are not available.

As a record of lifetime cumulative radiation dose, an up-to-date Form RHS 8-1H, or equivalent, signed by the individual and countersigned by the current or most recent employer shall be acceptable.

The lack of prior year dose records shall not be the basis for any restriction on the annual dose an individual may receive.

As a record of current year dose, a written, signed statement from the individual or the most recent employer may be accepted. This statement shall not include estimated doses for time periods for which a final dose value should be available.

Prior dose reports may be obtained by letter or electronic means (e.g. fax), however, if the authenticity of the data cannot be ascertained or the reliability is questionable, written verification shall be requested. Orally tran nitted dose reports shall not be accepted.

Any period for which the prior dose is not obtained must be noted on the Form RHS 8-1H or equivalent. In establishing the remaining allowable dose for the current year, assume that the individual received 1.25 rem (TEDE) in each quarter for which records are unavailable and the individual was engaged in activities that may have resulted in occupational exposure. Do not record the assumed dose values on the Form RHS 8-1H.

Records on Form RHS 8-1H shall be retained until the Department terminates each pertinent license requiring this record. All records used in preparing Form RHS 8-1H shall be retained for at least 10 years after license termination.

6.7 Personnel Monitoring for External Radiation

Regulations require the use of individual monitoring devices for any adult, minor, or embryo/fetus likely to receive a dose in excess of 10 percent of the limits for occupational exposures to sources external to the body.

All individuals entering a Restricted Area shall be considered occupationally exposed and shall be monitored by issuance of personnel monitoring equipment (e.g. Film badge, TLD, or pocket dosimeter) unless a prospective assessment has determined that the individual is not likely to receive a dose in excess of 10% of the limits for occupational exposure (monitoring is not required). dosimetry.

Primary dosimetry shall be processed by a laboratory or vendor maintaining accreditation by the National Voluntary Laboratory Accreditation Program (NVLAP). In addition, primary dosimetry devices shall be capable of measuring the deep dose equivalent (DDE) at a tissue depth of one centimeter, measuring the eye dose equivalent (LDE) at a tissue depth of 0.3 centimeter, and capable of measuring the skin dose equivalent (SDE) at a tissue depth of 0.007 centimeter.

Personnel monitoring equipment shall be placed at the location on the body expected to receive the highest whole body exposure. When exposure conditions will lead to relatively uniform whole body dose (deep dose equivalent), the dosimeter shall be worn on the front of the body between the neck and waist. If exposure conditions will lead to non-uniform dose to the whole body, the dosimeter shall either be moved to the body location of highest dose or multiple dosimeters shall be worn at body locations which will include the point of the highest dose to the whole body. When the principal source of radiation is near the foot, place the dosimeters just above the knee to monitor an adult for whole body dose (deep dose equivalent) .

Individuals working in the controlled area that are not required to be monitored (i.e. not likely to exceed 10% of the applicable dose limits) shall be subject to the dose limits for individual members of the public.

Individual monitoring is not required outside the Restricted Area, except for individuals performing duties that may directly result in occupational exposure (e.g. surveying a vehicle carrying radwaste).

If a prospective assessment determines that external monitoring is not required and a subsequent evaluation indicates that personnel monitoring is required, the unmonitored dose shall be estimated and recorded in the individuals record and individual monitoring shall be initiated.

Current year dose shall be documented prior to issuing primary dosimetry to personnel likely to exceed 10% of the applicable annual dose limit. In addition, an attempt shall be made to document lifetime dose for those individuals; however, a primary dosimeter may be issued while awaiting lifetime dose history information requested from previous employers.

Primary dosimeters should be processed monthly or as directed by the RPM or SSHO at field projects. Primary dosimetry shall be monitored for contamination when collected for processing. Primary dosimeters shall be processed under the following circumstances:

1. After routine badge exchange.

2. When individual monitoring is no longer required.

3. Upon employment termination.

4. When secondary dosimeter readings for an individual are unavailable, unreliable, or suspect, and subsequent investigations indicate that significant exposure may have been received.

5. When over-exposure of an individual has occurred or is suspected.

6. When special, non-routine circumstances (e.g. declared pregnant woman) cause the need for knowledge of an individual's current official dose.

7. As directed by the RPM or SSHO at SEG field projects.

Lost personnel monitoring equipment shall be reported immediately. An exposure investigation shall be performed in accordance with section 6.19.

When both primary and secondary dosimetry are issued, the secondary dosimeter shall be worn in close proximity to the individual's primary dosimeter to facilitate comparisons of results. If no primary dosimeter is required, the secondary dosimeter should be worn on the front of body between the neck and the waist.

Secondary dosimeter doses shall be logged for each entry or exit of the Restricted Area when the secondary dosimeter is used as the sole dose monitoring device. Secondary dosimeter doses shall also be logged for all entries and exits made under a RHWP (i.e., RCA's). Secondary dosimetry issued to monitor exposures to visitors shall be read and the results recorded.

Lost or off-scale secondary dosimeters shall be reported to the health physics control point or other health physics personnel immediately.

6.8 Visitors

Visitors are not subject to individual monitoring, record keeping, and reporting requirements of Tennessee Regulations, Chapter 1200-2-5. However, they shall be issued a secondary dosimeter for verification purposes. A permanent record shall be maintained of the individual's secondary dosimeter readings to document that monitoring was not required.

Visitors shall be escorted by a qualified escort or under the direct observation of a qualified escort at all times while in the Restricted Area. Visitors shall only perform work in the RCA when escorted and all qualifications for entry into the area as a visitor are met.

Visitors shall not receive dose greater then 100 mrem during the current year at SEG facilities without prior approval, in writing, by the RSO or RPM.

For group tours not entering the RCA, it is not required to issue a secondary dosimeter to each member of the tour, provided that all members of the tour will remain in the same vicinity. However, no more than five members of the tour shall be assigned to a single dosimeter. Dose recorded by the dosimeter shall be appropriately assigned to each member of the tour.

If a visitor later becomes an employee, then dose received as a visitor shall be added to the individual's annual dose record for the current year.

6.9 Multiple Primary Dosimeters (Multibadging)

Multiple primary dosimeters (multibadging) shall be issued to monitor whole body external dose whenever all of the following conditions exist:

1. Exposure rates to different parts of the whole body are likely to vary by more than 100 mrem/hr. Evaluations of worker habits, working positions, and the work itself should be considered in evaluating the non-uniformity of the dose.

2. Exposure rates in the work area are generally greater than 100 mrem per hour.

3. It is likely that a deep dose equivalent in excess of 300 mrem will be received.

Primary dosimeters shall be placed only at the standard multibadge body locations. The standard multibadge body locations are each arm above the elbow, each leg above the knee, the front and back trunk surfaces, head, and gonads. A secondary dosimeter shall be issued and placed with each primary dosimeter. The individual's "regular" whole body primary dosimeter shall not be worn in a multibadge set.

The record whole body dose shall be based on the highest result from the multibadge set. The highest result is summed with the regular whole body primary dosimeter for the monitoring period.

Reduction or discontinuance of multibadging shall be performed as determined by the RPM or SSHO based on an evaluation of personnel monitoring results.

6.10 Extremity Monitoring

Extremity monitoring shall be required whenever an individual is likely to receive an extremity dose that exceeds 10 percent of the quarterly administrative limit. In high extremity dose rate fields, handling tools should be used wherever possible to reduce the dose to extremities. When required, extremity dosimeters shall be placed as close as practical to the source of exposure without restricting the use of the extremity. It is important to place the dosimeter on the side of the hand or wrist facing the source.

The dose received by each appendage shall be separately determined and compared to the regulatory exposure limit. However, for normal record-keeping purposes, only the higher dose received by the right or left appendage shall be recorded. The dose to the skin of the extremities shall be considered extremity dose.

6.11 Skin Monitoring

Skin dose rates should be minimized as much as practicable by shielding or decontamination. The non-penetrating radiation energies and dose rates should be determined and sufficient protective clothing should be used to prevent substantial skin doses.

The shallow dose equivalent to the skin from external radiation sources is monitored by the primary dosimeter. The primary dosimeter may be placed in a thin plastic bag to protect it from contamination, but the beta window shall be kept facing away from the body at all times. The primary dosimeter shall not be worn inside anti-contamination clothing or placed in pockets when any bare skin is exposed to beta radiation.

The shallow dose from contamination shall be calculated for the highest exposed

square centimeter area of skin. The recording level of skin dose from contamination shall be 100 mrem. Doses below this level are not recorded in the permanent dosimetry record. The skin dose from hot particles will be included in the dosimetry record along with the skin or extremity dose from other sources. In determining whether applicable dose limits are exceeded, the dose from hot particles will not be added to skin dose from other sources, nor will hot particle exposures from different particles be summed unless the different particles result in doses to the same one square centimeter of skin.

6.12 Internal Exposure Monitoring

Internal monitoring shall be performed by in-vitro and/or in-vivo monitoring methods. In-vitro monitoring (urinalysis or fecal analysis) shall be used to monitor tritium, carbon-14, uranium and transuranic radionuclide concentrations and their elimination rates from the body. In-vivo monitoring (whole body counting or lung counting) or in-vitro may be used to monitor personnel for radionuclides that emit gamma rays or x-rays. Internal monitoring shall be performed for all project employees unless a prospective assessment has determined that monitoring is not required.

Baseline in-vivo and/or in-vitro monitoring shall be performed for all SEG employees subject to occupational exposure upon initial employment. Baseline in-vivo and/or in-vitro bioassay shall be performed for all non-SEG employees subject to work in the RCA. In addition, bioassay sampling shall be performed on all Declared Pregnant Women at the time of declaration.

Monthly random in-vivo and/or in-vitro bioassay samples shall be obtained and analyzed for approximately ten percent of all project employees issued primary dosimetry. In addition, in-vivo and/or in-vitro bioassays shall be performed at least annually for all personnel issued primary dosimetry. These samples shall be analyzed for those nuclides to which the individual may have been exposed.

In-vivo and/or in-vitro bioassay sampling shall be performed whenever an intake $\geq$ 10 DAC hours may have occurred during a 7 consecutive day period based on air sampling data, accident conditions, equipment failure, external contamination, or other conditions. Special bioassay samples will be obtained, based on facial contamination, nasal smears, air sampling data, etc., as directed by the RPM or SSHO.

In-vivo and/or in-vitro bioassay shall be performed upon termination of all individuals who have been issued a primary dosimeter. Such monitoring shall be performed whenever possible, but in cases of worker termination it is based upon worker cooperation.

Waiver of internal monitoring requirements can be approved on a case by case basis, provided the basis for the waiver is documented in writing.

6.13 Declared Pregnant Woman (DPW) xposure Policy

Based on recommendations of the National Council on Radiation Protection and Measurements (NCRP) and on regulatory requirements, controls are established for the protection of the embryo/fetus during a female workers pregnancy. These controls shall ensure compliance with regulatory requirements and protect the rights of the female worker.

Declaration of pregnancy is entirely at the discretion of the woman (medical proof is not required). To declare pregnancy, the woman shall inform the RPM, in writing, of the pregnancy and an estimated date of conception so that the estimated dose to the embryo/fetus prior to declaration can be determined. A woman may withdraw her declaration of pregnancy at any time and for any reason by notifying her supervisor or manager in writing. Any woman who does not declare her pregnancy shall be subject to the normal occupational dose limits and shall not be subject to special controls or treatment with respect to work assignments involving exposure to radiation even if she is pregnant.

SEG shall ensure the dose to the embryo/fetus does not exceed regulatory limits due to occupational dose during the pregnancy. Efforts shall be made to avoid substantial variation above a uniform monthly exposure rate to the embryo/fetus of a declared pregnant woman (e.g. exposures above about 55 mrem in any month should be avoided).

A DPW shall not be permitted to enter airborne radioactivity areas nor be assigned to tasks which could lead to internal radionuclide intakes. In addition, a DPW shall not be assigned to work in a high radiation area.

Any DPW subject to occupational exposure shall be issued a primary dosimeter and a secondary dosimeter.

6.14 Medical Radionuclide Intakes

Occupational exposure does not include exposure due to medical administration of radionuclides. Therefore, individuals shall inform the RPM or SSHO prior to entering the Restricted Areas when medical treatments involving radionuclides have been administered.

After being informed of a medical intake, documentation should be obtained, signed by the individual stating the date of treatment, radionuclide used, amount of intake, and medical procedure. An assessment should be performend to determine what work restrictions may be necessary until the medical radionuclides have cleared to avoid problems with frisking/portal monitors, exposure to co-workers, or exposure to external dosimeters.

Individuals should be reassigned to areas outside the Restricted Area (i.e. controlled areas) until the administered radionuclide is eliminated from the body to the extent that it will not significantly affect dosimeter measurements or expose members of the work force. Before allowing the individual access to the RCA, an in-vivo or in-vitro sample shall be obtained to document the current body burden. In-vivo or in-vitro sampling should continue periodically until the body burden stabilizes or is no longer measurable.

6.15 Internal Dose Assessments

An individual's internal dose should normally be determined using the methodology provided in EPA 520/1-8-020 (Federal Guidance Report No. 11). This report lists the dose equivalent per unit intake. These values shall be used directly after converting from sieverts per becquerel to rem per microcurie (Sv/Bq x 3.7×10^6 = rem/uCi).

Organ-specific committed dose equivalents shall be calculated when the committed effective dose equivalent exceeds 1 rem or if an overexposure has occurred. If the CEDE is less than 1 rem and no overexposure has occurred, the 50 rem nonstochastic organ limit cannot be exceeded. The methodology presented in Federal Guidance Report No. 11 may be used to calculate organ-specific committed dose equivalent.

Each occupational intake of radioactive material at SEG facilities that is confirmed

by a positive bioassay result shall be investigated and an estimate of the initial intake shall be performed based on standard retention models. If the estimated intake is less than 10% of the ALI, any significant ($\geq$10 mrem) internal dose shall be entered into the individual dose records, and no further bioassay measurements are necessary. If the estimated intake is greater than 10% of the ALI, additional bioassay or other monitoring may be performed to determine the radionuclide distribution and retention patterns. When radionuclides with long effective half-lives (Class Y) are internally deposited, the recording and reporting of the internal dose may be delayed for periods up to 7 months, unless otherwise required by 1200-2-5-.141 or 1200-2-5-.142, to permit the additional bioassay measurements essential to dose assessment.

Models and methods for performing internal intake estimates and dose assessments shall be approved by the RSO. The results of all intake/dose assessments shall be approved and permanently retained with the individual's dose records. Assessments of dose resulting from internally deposited radionuclides shall be based upon bioassay measurements of internal radioactivity whenever possible. Air sampling data may be used in addition to bioassay measurements for internal dose assessment.

Affected individuals shall sign dose assessments, verifying that any information they provided was accurate and that the relative significance of the dose received has been explained to them.

6.16 Summation of Internal and External Doses

Internal and external doses shall be summed whenever positive doses are measured. The dose to the lens of the eye, skin, and extremities are not included in the summation. Compliance with the summation shall be demonstrated by showing that one of the following conditions are met:

1. The deep dose equivalent divided by 5 rem plus the sum of the fractions of the inhalation ALI values for each radionuclide does not exceed unity.

2. The deep dose equivalent divided by 5 rem plus the total number of DAC-hours for all radionuclides divided by 2000 does not exceed unity.

3. The deep dose equivalent divided by 5 rem plus the sum of the committed

effective dose equivalents to all significantly irradiated organs or tissues divided by 5 rem does not exceed unity. An organ or tissue is deemed to be significantly irradiated if, for that organ or tissue, the committed effective dose equivalent is greater than 10 percent of the maximum committed effective dose equivalent for any organ or tissue.

Intakes through wounds or skin absorption shall be evaluated and, to the extent practical, accounted for in summation of internal and external doses independent of intakes by ingestion or inhalation. The intake through intact skin is already accounted for in the DAC for hydrogen-3 (tritium) and does not need further evaluation.

6.17 External Dose Assessments

The results of primary and secondary dosimeters shall be compared monthly and an investigation conducted whenever the dose indicated by either the primary dosimeter reading or the sum of all secondary readings for the corresponding exposure period is greater then 300 mrem and the percent difference between primary and secondary readings exceeds 25 percent.

Dose assessments shall be reviewed and approved by the RPM prior to assigning a dose other than that measured by a primary dosimetry device. The individual should sign the dose assessment verifying that the information provided by the individual is accurate (if the individual did not provide any information, a signature is not required). The results of the dose assessment shall be entered into the dosimetry record system and a copy of the assessment placed in the individual's exposure history file. Dose assessments shall include any contribution from airborne radioactivity.

Dose assessments should also include the following as applicable:

1. Results of dosimeters worn by other individuals working in the same work area under similar exposure conditions during the same exposure period.

2. Calculations based on measured dose rates and the estimated time spent in the work area by the individual involved.

3. Results of other dosimeters worn by the individual during the same exposure period such as secondary dosimeters.

4. Testing damaged or potentially inaccurate dosimeters to ensure the device is operational prior to returning it to service or to determine if the device failed.

5. If multiple whole body dosimetry is used, assigning the worke the highest dose any single whole body part receives within the reporting period.

6. For primary to secondary dosimeter discrepancies, interviewing the worker to identify possible causes for the discrepancy such as not wearing the dosimeters close together in fields with large gradients, not wearing the primary or secondary dosimeter for one or more job entries, or other causes.

7. Investigation of survey data and comparisons of results.

8. Evaluation of dosimetry QA program data.

9. Evaluation of all areas/RHWP's entered by the individual.

6.18 Exposures Exceeding Annual Dose Limits

The RPM or SSHO shall initiate an investigation to determine the cause for all instances where SEG administrative dose limits are exceeded without prior authorization. A copy of the investigation report shall be sent to the RSO, to the Radiation Safety Committee, to the site Project Manager and to the individual's exposure record.

If it is suspected or recognized that an individual has exceeded the annual regulatory limit, an investigation shall be initiated immediately. The objective of the initial investigation shall be to establish the sequence of events resulting in the exposure and the level of dose received. The individual shall not be allowed to enter a Restricted Area until the investigation has been completed. If the exposure exceeds regulatory limits, the RSO shall also perform an investigation in accordance with the Assessment Program.

The State of Tennessee shall be notified under the following circumstances:

1. Immediately if an individual received or may have received a total effective dose equivalent of 25 rems or more, an eye dose equivalent of 75 rems or more, or a shallow dose equivalent to the skin or extremities of 250 rads or more, or a release of radioactive material such that an individual could have received an intake of 5 ALI in 24 hours.

2. Within 24 hours if an individual received or may have received in a period of 24 hours a total effective dose equivalent exceeding 5 rems, an eye dose equivalent exceeding 15 rems, or a shallow dose equivalent to the skin or extremities exceeding 50 rems, or a release of radioactive material such that an individual could have received an intake exceeding 1 ALI.

6.19 Routine Personnel Exposure Reports

Annual exposure reports are not required to be submitted to the State of Tennessee, however, an annual preparation of Form RHS 8-2C is required. This completed form shall be available for review by regulatory personnel by April 1 of the following year.

An annual summary report of the individual radiation dose received at SEG facilities shall be sent to each worker who was issued primary dosimetry during a calendar year by April 1 of the following year.

When requested by an individual, a written exposure report shall be provided to each such individual within 30 days of the request or within 30 days of exposure determination, whichever is later.

6.20 Radiation Exposure Record Keeping

Records of individual monitoring shall be kept in accordance with the instructions on Form RHS 8-2C, or clear and legible records containing all information required by RHS 8-2C. These records shall be updated at least annually.

All radiation exposure records shall use the units curie, rem, rad, or multiples thereof and shall clearly and specifically indicate the quantities (e.g. deep dose equivalent) and units (e.g.. rem or mrem) of all recorded values.

Records of embryo/fetus dose shall be maintained with those of the mother, and the declaration of pregnancy.

6.21 Privacy Protection

Personnel radiation exposure records shall be maintained in locked, fireproof file cabinets. Access by other personnel shall be authorized by the RPM or SSHO only for legitimate business needs.

7.0 INSTRUMENTATION PROGRAM

7.1 Section Overview

Many different types of radiological measurement instrumentation are utilized at SEG for radiation support purposes. This section addresses the requirements for implementation of an instrumentation program. The program shall include criteria for inventory, control, calibration, operation, response testing, maintenance, repair, quality control, and quality assurance of radiation protection instrumentation and equipment. The criteria shall ensure compliance with State of Tennessee regulations and SEG policies and shall conform, to the extent practicable, with applicable industry standards.

7.2 Instrument Inventory and Control

Issue, control and accountability of radiation protection instrumentation shall be performed in accordance with established procedures and shall be consistent with regulatory requirements. In addition, equipment issue, control, and accountability should conform to industry standards and guidance.

A sufficient inventory and variety of operable and calibrated portable, semi-portable and fixed radiological instrumentation shall be established and maintained to satisfy the following considerations:

1. Effective measurement of radiation exposure and control of radioactive material with equipment appropriate to enable the assessment of gamma, beta, alpha and neutron radiation at the energies and intensities anticipated.

2. Maximum number of personnel and separate work areas requiring surveillance.

3. Frequency and types of surveys or measurements required to support normal and anticipated activities.

4. Allowance for repair and calibrations.

5. Efforts to minimize delays in personnel access and egress from radiologically controlled areas.

Equipment shall be identified and tracked by means of a serialized inventory system. As a minimum, this inventory should provide a distinct identifying number, the most recent calibration date, the next calibration due date, and the location of the instrument (out for repair, ready issue, etc.). Issuance and return of radiation protection instrumentation shall be documented.

A maintenance history program, keyed by instrument identification number, shall be developed and maintained to track the maintenance and repair history of each instrument. Instruments that are broken, fail the response test, or require calibration shall be tagged out-of-service. Out-of-service instruments shall be segregated from operable instruments and placed in a designated location until they can be repaired and/or calibrated.

7.3 Calibration

Calibration of radiation monitoring, counting and air sampling instruments shall be performed in accordance with ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration" and shall be performed in accordance with specific written procedure. In addition, calibration shall be consistent with regulatory requirements and should conform to industry standards and guidance.

All instruments shall be calibrated prior to first use, following any repair, maintenance, or modifications that could affect calibration, and after failure of a response test requiring adjustments or repair that could affect calibration.

The calibration frequency for portable radiation monitoring instruments and portable air sampling equipment shall be at least every 6 months. Semi-portable (e.g., continuous air monitors, personnel contamination monitors) and fixed (e.g., count room/laboratory instrumentation, portal monitors) instrumentation shall be calibrated at least annually.

Offsite calibration of radiation protection instrumentation by an approved vendor is acceptable if calibration certification is supplied by the vendor including traceability of calibration sources and such calibration certification is reviewed for completeness and accuracy prior to use of the instrument.

Radiation protection instrumentation and laboratory analysis equipment shall be calibrated using National Institute of Standards and Technology (NIST) traceable sources, or equivalent. The sources shall be of the type, energy and geometry representative of the radiation to be measured. Calibrations shall be performed by personnel trained in the use of applicable procedure and test equipment.

Calibration procedures should include, as appropriate:

1. Instrument specification and limitations
2. Frequency of calibration
3. Description of operating settings/parameters
4. Environmental limitations (if appropriate)
5. Procedural, regulatory and instructional references
6. Required equipment (e.g., sources, tools, jigs, test equipment)
7. Applicable drawings and schematics
8. Calibration data forms (including As Found/As Left data, instrument and source identification, charts, comments, etc.)
9. Calibration tolerances and response to out-of-tolerance "As Found" data

7.4 Operation and Response Tests

Operation of radiation monitoring, counting and air sampling instruments shall only be performed by personnel qualified in the use of the instrument. Additionally, operation shall be performed in accordance with the operational procedure for each type of instrument in use. Operation shall be performed in accordance with regulatory requirements and should conform to industry standards and guidance.

Operation procedures shall include response test requirements and shall be consistent with ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration."

Operating procedures should include, as appropriate:

1. User responsibilities
2. Instrument and detector description
3. Precautions and limitations
4. Preoperational and operational instructions
5. Identification of proper check sources and associated jigs
6. Performance of response test and/or operational checks
7. Methods for documenting response checks

Response testing of portable radiation monitoring instruments shall be performed and documented daily or prior to use on each scale the instrument is to be used. Any scale not checked shall be clearly labeled.

New and special use instruments, whose use has not been proceduralized, shall not be used for performance of documented surveys.

7.5 Maintenance and Repair

Maintenance and repair of radiation protection instrumentation shall be performed by qualified personnel or an approved vendor. Only modifications approved by the instrument vendor should be made to an instrument. All maintenance and repair shall be documented.

7.6 Quality Control/Quality Assurance

A Quality Control (QC) Program for counting instruments shall be established and maintained to ensure reliability of counting results and sensitivities. QC for counting instruments shall be proceduralized and shall be consistent with ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration" and regulatory requirements. In addition, QC should conform to industry standards and guidance.

The QC Program should include for each counting instrument, as appropriate:

1. Daily background and source checks and associated control charts.
2. Chi-Square test during calibration to verify variations in counting results are of a statistical nature.
3. Confidence level requirements.
4. Maximum allowable background and minimum counting times necessary to meet a desired Minimum Detectable Activity (MDA).

QC of portable survey instruments shall be performed by the use of preoperational and response checks in accordance with specific procedures.

The Quality Assurance (QA) Program shall be consistent with the requirements of USNRC Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment."

Review and evaluation of the instrumentation program shall be performed annually, at a minimum, to ensure program effectiveness.

8.0 RADIATION/HAZARDOUS WORK PERMIT PROGRAM

8.1 Section Overview

An RHWP is a document or series of documents to inform individuals of the radiological and non-radiological conditions that exist in the work area and the safety requirements for the job. This program describes initiation, preparation, approval, use, and termination of RHWP's. The ALARA review process is an integral part of the RHWP process and is performed prior to completing a RHWP.

8.2 Request and Initiation of RHWP's

RHWP's are required for all activities performed in RCA's. Job Supervisors shall obtain and complete RHWP requests. RHWP request forms should completely describe the scope of work including all supporting tasks which must be performed in a RCA.

The RHWP requestor should provide a sufficiently detailed breakdown of work hours by task and location so that relevant man-rem estimates can be determined. The requestor should include, as necessary, supporting information and documentation such as work procedures, drawings and diagrams. Job Supervisors shall route the completed RHWP request to the appropriate group or individual responsible for RHWP preparation (Health Physics personnel at SEG headquarters facilities; SSHO at SEG field projects).

The lead time required for the submission of an RHWP request is dependent on the anticipated exposure commitment for the job. RHWP requests should be submitted as far in advance as possible. Consideration should be given to the total man-rem that the job may entail, as it will affect the time required for proper evaluation, preparation, and approval of RHWP's.

8.3 RHWP Preparation

RHWP's shall contain the following information as applicable:

1. Estimated man-rem for the activity.
2. Actual man-rem for the activity (to be completed upon task completion).
3. Initiator name and date of request.
4. Unique identifying number.
5. A description of the work to be performed on the RHWP.
6. The location at which the work will be performed.
7. Desired date(s) for work and date approval is needed.
8. Radiological conditions in the area.
9. Other hazards and safety concerns (e.g., non-radiological).
10. Dosimetry requirements.
11. Protective clothing requirements.
12. Engineering controls, if required.
13. Special work procedures, if required.
14. Airborne radioactivity concentrations.
15. Required radiological and non-radiological monitoring.
16. Special monitoring requirements for personnel or equipment.
17. Briefing requirements (e.g., pre-job ALARA briefs).
18. Name, signature or initials of preparer, and date of preparation.
19. Approval by the authorized individual and date.

Radiological conditions and requirements specified on RHWP's shall reflect actual or anticipated conditions. An exposure estimate and ALARA review shall be performed for all RHWPs.

8.4 Approval of RHWP's

An escalating system of approvals based on anticipated radiological hazards, estimated exposure, and overall project staffing shall be used for RHWP's.

Dose Estimate (man-rem)	Approval Authority Required
< 1	Sr. HP Technician or SSHO
≥ 1 and < 5	SSHO
≥ 5 and < 10	RPM
≥ 10	ALARA Review Committee

8.5 RHWP Requirements

The RHWP job description shall be consistent with the activities or task to be performed. The location identified on the RHWP shall be consistent with the location entered.

The RHWP shall normally be posted at the RCA main access point for each radiological facility.

All persons entering a RCA shall log-in on a valid RHWP. The log-in entry shall include the social security number and/or name, RHWP number, and initial pocket dosimeter reading. Individuals logging on to an RHWP shall read the RHWP, and understand the requirements of the RHWP.

Work supervisors shall review the provisions of specific RHWP's with their workers prior to work starting. HP personnel or the SSHO may conduct a briefing prior to the start of the job to explain special requirements, engineering controls, or work restrictions.

If the scope of the job changes due to any unexpected conditions, the work supervisor shall notify HP or the SSHO so that the impact on the provisions of the job can be evaluated.

8.6 Revising an RHWP

When conditions change in an area to the extent that a change in protective measures is required, the RHWP shall be revised. When it becomes apparent that an RHWP revision is required, the RHWP shall be removed from the work area and shall be suspended until completion of the revision.

8.7 Temporary RHWP Revisions

A temporary RHWP revision may be implemented for a maximum period of 48 hours when an unexpected, short-term change in radiological conditions necessitates a change in radiation protection requirements or a revision to the RHWP is required, but the job must continue.

If the job being performed under the temporary RHWP is not completed within 48 hours, the RHWP shall be revised to reflect the changes or the changes shall be rescinded and work can continue under the original RHWP.

8.8 RHWP Review

HP or the SSHO shall review all active RHWP's on a weekly basis. This review shall include an evaluation of the continuing adequacy of prescribed controls and verification that surveys have been performed at the designated frequency.

8.9 Extending the Expiration Date

Job supervisors or other cognizant supervisors shall inform HP or the SSHO of the need for an extension of the RHWP. If the provisions of the RHWP remain valid, the expiration date can be extended for up to 30 days in accordance with the original approval of the RHWP.

8.10 Stoppage of Work on a RHWP

HP personnel or the SSHO shall stop work whenever work being performed on an RHWP is outside the scope of the RHWP, workers are not complying with the provisions of an RHWP, or conditions vary from those described on the RHWP and pose an immediate hazard to individuals in the area. A "stop work" order given shall only be overruled or rescinded by the individual issuing the order or an equivalent level of authority, based on the project organizational chart.

8.11 Suspension of RHWP's

RHWP's may be suspended pending revision or termination when:

1. Conditions change such that protective clothing or equipment requirements have to be changed.

2. The man-rem estimate for the job has been exceeded by more than 25 percent.

3. The man-hour estimate for the job has been exceeded by more than 25 percent.

4. The provisions of the RHWP have been violated.

8.12 Termination of RHWP's

RHWP's shall be terminated when work scope changes or the job or activity has been completed. The Job Supervisor shall notify HP or the SSHO upon job completion. RHWP's shall be terminated and dated by HP or the SSHO.

9.0 RADIATION PROTECTION SURVEY PROGRAM

9.1 Section Overview

This section provides a general description for the Radiation Protection Survey Program, as required by Tennessee Regulations, Chapter 1200-2-5, Parts -.70 and -.132. It is also intended to provide a basis for the development and maintenance of implementing procedures.

Radiological surveys are performed in order to identify, quantify and evaluate the potential hazard associated with the radiological conditions in the area. Survey information is used to inform an individual of the radiological conditions/hazards in the area, to determine area postings (if required), to determine the type(s) of personnel protective equipment necessary, and to ensure personnel exposures to radiation and radioactive materials are maintained ALARA.

The performance frequency and detail level of surveys should consider the likelihood of changing conditions, the radiological hazard of specific areas and the personnel occupancy within various areas in order to anticipate personnel radiation doses and to ensure and verify that personnel exposure to radiation or radioactive materials are adequately controlled and monitored. Surveys of personnel contamination are considered an element of the Survey Program.

9.2 General

Specific implementing procedures shall be developed to:

1. Identify situations and conditions requiring surveys, including routine surveys.
2. Perform specific radiation, contamination and airborne surveys, including the monitoring of contaminated personnel.
3. Analyze samples of airborne radioactivity and loose-surface contamination.
4. Document and review survey results.
5. Provide instruction for basic skills and techniques for performing surveys.

Radiation surveys shall be performed for beta, gamma and/or alpha radiations, based upon the radionuclides and types of radiation to which workers are anticipated to encounter. General area surveys shall be used to assess the nominal radiation fields, to verify that radiological conditions have not changed, and to establish specific radiological controls for work to be performed. Beta dose rates shall be measured when the potential for skin exposure exists from radioactive materials or when radioactive systems or equipment are opened and accessible.

Contact dose rates shall be used to locate and identify the maximum radiation levels to which personnel could be exposed as well as localized sources of radiation which present unique radiological concerns. Procedural guidance shall address instrument responses to highly radioactive sources significantly smaller than the detector.

Neutron surveys shall be performed when the presence of neutron-emitting radionuclides (e.g. PuBe, AmBe, etc.) is known or suspected.

Contamination surveys shall be performed to detect and quantify beta-gamma and alpha emitting radioactive contaminants. All loose-surface contamination samples should be evaluated for gross beta-gamma and alpha activity, as appropriate, based on the types of radiation present or anticipated. Qualitative (large area) loose-surface contamination surveys should be periodically performed to ensure that radioactive contamination (including hot particles) has not inadvertently spread.

Direct contamination surveys shall be performed, as necessary, to determine whether radioactive material is embedded (fixed) in a surface.

Samples for airborne radioactivity shall be collected to monitor for and evaluate conditions which may result in internal personnel exposures. Localized air samples, including breathing zone air samples, shall also be collected where it is expected that the concentrations of airborne radioactivity may require monitoring for internal personnel exposures. A grab sample (e.g. high volume) shall be collected when increases in airborne radioactivity are suspected. Continuous Air Monitors (CAMs), or fixed-position air samplers, may be used to monitor the concentrations of airborne radioactivity where there is a potential for airborne radioactivity to occur in general areas (e.g. ventilation changes, uneven airflows,etc.).

Air sample collection media shall be appropriate to address the radionuclide mixture(s) present. The analysis of air samples (including preliminary field screening) shall be performed in a timely and expeditious manner.

Appropriate instrumentation for common survey and analyses shall be procedurally addressed. Instruction and criteria for conducting surveys not routinely performed should be identified on the RHWP so that important guidance is properly communicated.

9.3 Survey Frequencies

Surveys shall be conducted at a frequency commensurate with the hazard(s) present and the personnel occupancies in a given area. A routine survey program shall be implemented which consists of daily, weekly, monthly, quarterly and semi-annual surveys to monitor the radiological conditions. Routine survey frequencies shall be augmented under the direction of the RPM or SSHO when:

1. The gross loose-surface activity exceeds a predetermined threshold. Action-level thresholds shall be proceduralized.

2. Contamination above action levels is found outside of a Radiologically Controlled Area.

3. Unexpected, significant increases in radiation levels, contamination levels or airborne radioactivity levels occur.

4. Increased maintenance activities or changes in work scope which may change radiological conditions (i.e., plant shutdowns, system breeches or other operations which may increase personnel dose rates, loose-surface contamination or airborne radioactivity, etc.).

Survey frequencies should be conducted so that personnel exposures are ALARA. Temporary changes to established survey frequencies shall require approval from the RPM or SSHO and shall be documented so as to communicate such changes to personnel responsible for performing the surveys.

9.4 Survey Documentation And Review

Surveys shall be legibly and accurately documented in a timely manner. Survey documents shall identify:

1. The date, time and location of the survey.
2. The instrument(s) used, including the calibration status.
3. The name of the surveyor(s).
4. The results of the measurements and analyses.
5. The RHWP(s) applicable to the area surveyed.

Documentation of surveys performed by non-qualified personnel (i.e. trainees) shall be approved by a qualified individual. Documentation methods, supervisory reviews and the distribution of data shall be standardized.

9.5 Radionuclide Analysis

A radionuclide profile of the radioactive materials being handled shall be routinely reviewed to ensure survey performance and protective measures are adequate.

9.6 Personnel Contamination Monitoring

All personnel exiting the RCA when work is complete shall log out of the applicable RHWP at the RCA access control point and monitor if applicable, at the nearest PCM or frisker prior to exiting.

Personnel exiting a contaminated area shall perform a "frisk" at the nearest frisker or PCM.

Personnel who require immediate egress from a Radiologically Controlled Area during an emergency situation may exit without monitoring. Subsequently, appropriate surveys shall be performed by HP personnel or the SSHO.

Guidance for the performance of routine personnel monitoring shall be addressed in the Training Program.

10.0 RADIOACTIVE MATERIAL CONTROL PROGRAM

10.1 Section Overview

Radioactive material (RAM) controls are established to provide positive control of radioactive material, prevent inadvertent release of radioactive material to unrestricted areas, ensure protection of members of the public and workers, and to minimize the amount of radioactive waste generated.

10.2 Receipt of RAM

Packages containing quantities of RAM shall be received when offered for delivery by the carrier. When necessary, arrangements shall be made to receive notification of the arrival of packages containing RAM upon arrival of the package at the carriers terminal.

Receipt surveys for radiation level and contamination shall be conducted on exterior surfaces of any package known to contain radioactive material. Radiation and contamination surveys shall be performed on all packages marked or labeled as containing radioactive material. Radiation and contamination surveys shall also be performed on all packages with evidence of potential contamination. Surveys shall be performed as soon as practicable after receipt of the package. Packages received during normal working hours shall be monitored within 3 hours. If the package is not received during normal working hours, monitoring shall occur no later than 3 hours after the beginning of the next business day. Receipt surveys shall be documented.

The RPM or SSHO shall immediately notify the final delivery carrier and the Tennessee Division of Radiological Health by telephone, telegram, mailgram, or facsimile when:

1. Removable radioactive surface contamination on external surface of packages exceeds 2,200 dpm/100 cm^2 β-γ activity or 220 dpm/100 cm^2 α activity when averaged over 300 cm^2 of package surface.

2. For non-exclusive use shipment:

   a. External radiation levels exceed 200 millirem per hour at any point on the external surface of the package, or;

   b. Radiation levels at three feet from the external surface of the package exceed 10 millirem per hour.

3. For a package transported as exclusive use by rail, highway, or water, radiation levels external to the package may exceed the limits in 2.a and 2.b above, but must not exceed any of the following:

   a. 200 millirem/hour on the external surface of the package unless the following conditions are met, in which case the limit is 1,000 millirem/hour.

      1) The shipment is made in a closed vehicle;

      2) Provisions are made to secure the package so that its position within the vehicle remains fixed during transportation; and

      3) There are no loading or unloading operations between the beginning and end of the transportation;

   b. 200 millirem/hour at any point on the outer surface of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle;

      1) 10 millirem/hour at any point two meters from the vertical planes represented by the outer lateral surfaces of the vehicle, or, in the case of an open vehicle, at any point two meters from the vertical planes projected from the outer edges of the conveyance; and

2) Two millirem/hour in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when persons occupying these positions are provided with special health supervision, personnel radiation exposure monitoring devices, and radiation worker training.

All shipments shall comply with packaging, labeling, placarding, and transport requirements in 49 CFR.

10.3 Labeling of RAM

Each container of radioactive material shall bear a durable, clearly visible label showing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL" unless one of the following exemptions is met:

1. The container holds a quantity of radioactive material less than the quantities listed in Tennessee Regulation 1200-2-5, Schedule RHS 8-31, "Quantities of Radioactive Material Requiring Labeling."

2. The container holds radioactive materials in concentrations less than those specified in Table 2, Column 2 of Schedule RHS 8-30, "Annual Limits on Intake (ALI's) and Derived Air Concentrations (DAC's) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage" of Tennessee Regulation 1200-2-5.

3. The container is continuously attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the exposure limits given in the Personnel Monitoring Program.

4. The container (package) is in transport (i.e., not yet received or material awaiting transport that is marked and labeled in accordance with DOT regulations) and is marked and labeled in accordance with the regulations of the U.S. DOT. (Labeling or marking of packages containing radioactive materials is required by the DOT if the amount and type of radioactive material exceeds the limits for a limited (excepted) quantity or instrument article as defined in 49 CFR 173.403 (m) and (w) and 173.421-424.)

5. Containers are accessible only to individuals authorized to handle, use, or be in the vicinity of the containers, if the contents are identified to these individuals by a readily available written record.

6. Installed manufacturing or processing equipment, such as process components, piping, and tanks.

Labels or markings shall contain information to permit individuals handling, using, or in the vicinity of containers to take precautions to avoid or minimize exposures. Information should include radionuclides, estimated activity of each radionuclide, total estimated quantity of radioactivity, date for which activity was estimated, radiation levels, material type/form, quantity and type of Special Nuclear Material (SNM), if applicable, and waste generator name. Waste generator name can be provided through bar coded material tracking. It is not necessary for individual precautions.

Labels and marking shall be removed or defaced when no longer applicable. Health Physics approval is required prior to removal of radioactive material labeling. Used labels shall be destroyed or defaced prior to disposal in unrestricted areas. Site personnel should notify HP or the SSHO of any items or containers with damaged radioactive material labels.

10.4 Movement of Radioactive Material Within Restricted Areas

Radioactive material shall be properly contained (i.e., strong tight) to prevent spread of contamination. Lifting and rigging equipment used for radioactive material shall be compatible with the physical dimensions of the material to ensure safe movement. After movement of radioactive materials, surveys should be performed, when deemed necessary, to ensure proper radiological postings and controls are established.

10.5 Storage of Radioactive Material

Radioactive material shall be secured against unauthorized access or removal. Radioactive material storage areas shall be posted and controlled using appropriate barriers and/or radiological signs. RAM should be stored in designated areas.

The external removable contamination level on packages to be placed in storage

shall not exceed 1000 dpm/100 cm^2 beta-gamma and 20 dpm/100 cm^2 alpha. In addition, outside storage containers shall be locked DOT intermodal containers as described in Title 49 CFR Part 101-3.61, or strong tight. Containers stored outside shall be capable of withstanding environmental conditions. Wooden containers are NOT considered suitable for long term outside storage (greater than 15 days). Wooden strong tight containers containing RAM can be stored outside for periods up to 15 days provided the container is covered with a plastic tarp so as to prevent the infiltration of rainwater. After 15 days, the material must be moved inside or repackaged in a container suitable for outside storage.

10.6 Transfer of Radioactive Material

Radioactive material shall be transferred in accordance with Tennessee Regulation 1200-2-10-.22, only as follows:

1. To the Tennessee Department of Environment and Conservation (DEC) provided such transfer is accepted by the DEC in writing.

2. To the U. S. Department of Energy.

3. To recipients authorized to receive the material under the terms of a specific license, or equivalent, issued by the state of Tennessee, the U.S. Nuclear Regulatory Commission, any agreement state or a licensing state.

4. As otherwise authorized in writing by the DEC.

Verification shall be obtained that the consignee is authorized for the receipt of the type, form, and quantity of the radioactive material prior to transfer of the material. SEG shall verify possession authorization by obtaining and reading a current copy of the consignee's specific license, or by written certification by the consignee that he is authorized by license or registration certificate to receive the type, form, and quantity of the source of radiation to be transferred. For emergency shipments, SEG may accept oral certification containing all information specified above regarding authorization and type, form, and quantity of the RAM to be transferred provided that written certification is forwarded to SEG within ten days following the oral communication. SEG can obtain other information compiled by a reporting service from official records of the Tennessee Department of Environment and Conservation, the U.S. NRC, or the licensing agency of any state

as to the identity of licensees and the scope and expiration dates of licenses and registrations. When none of the above verification methods are readily available or in order to verify the authenticity of represented information, SEG may obtain and record information from the Tennessee Department of Environment and Conservation, the U.S. NRC, or from the licensing agency of any state that the transferee is authorized to receive the source of radiation. SEG shall maintain verification records on file. Complete records of RAM transfer shall be maintained.

10.7 Shipment of Radioactive Material

RAM shipments shall comply with State of Tennessee and U.S. Department of Transportation Regulations. In addition, packaging shall comply with regulatory requirements and labels shall be applied in accordance with regulatory requirements. Package marking and vehicle placarding shall also be applied in accordance with regulatory requirements. Advance notifications of shipments shall be made when required. Low-level radioactive waste shipments transferred for disposal shall be accompanied by a shipment manifest prepared in accordance with Tennessee Regulation 1200-2-5, Schedule RHS 8-33.

Waste shipments shall be investigated if receipt notification has not been received within 20 days after transfer. The RSO shall be notified when receipt notification has not been received within 20 days. The investigation shall include shipment tracing and notification to the Division of Radiological Health within 2 weeks. The supervision of shipping shall ensure complete records of RAM shipments are maintained.

10.8 Controls for Radioactive Sources

The RSO shall approve all requisitions for radioactive sources. HP or the SSHO shall be notified upon receipt of a radioactive source. Receipt surveys shall be performed on all packages labeled as containing radioactive material.

Sealed sources shall be controlled through the use of implementing procedures. The Site Health & Safety Officer or designee shall perform source inventories monthly. Sealed sources in any form other than gas shall be tested for leakage and/or contamination upon receipt and at intervals not to exceed six months, except that any sealed source is exempt from leak tests if the source contains less

than 100 microcuries of beta and/or gamma emitting material or 10 microcuries of alpha emitting material. The leak test shall be capable of detecting a minimum of 0.005 μCi of radioactive material (beta-gamma plus alpha), or in the case of radium, the escape of radon at the rate of 0.001 μCi per 24 hours. The test sample shall be taken from the sealed source or from the surface of the device in which the sealed source is permanently mounted or stored on which one might expect contamination to accumulate.

Records of leak tests shall be kept in units of microcuries and maintained for inspection by the Department. If the test reveals the presence of 0.005 microcurie or more of removable contamination, or in the case of radium, 0.001 microcurie or more per 24 hours, the sealed source shall be immediately withdrawn from use and decontaminated and repaired or disposed of in accordance with Tennessee regulations. A report shall be filed to the Division of Radiological Health within five days describing the equipment involved, the test results, and the corrective action taken.

Sources shall be used in accordance with the requirements of the applicable RHWP. In addition, users of radioactive sources shall be trained in proper handling techniques, inventory, sign-out logs, lost source reports, etc.

The RPM or SSHO shall approve locations for storage of radioactive sources at the project site. Source storage areas shall be locked and posted as Radioactive Material Storage Areas with the appropriate radiological signs in accordance with access control requirements.

10.9 Radioactive Liquid Releases

All radioactive liquid releases at SEG field projects shall be coordinated with site personnel and shall be within the limitations of the site license. In most cases, site procedures shall direct the method and process for release, approved by site licensee personnel.

Releases of radioactive material to sanitary sewerage systems shall meet the following conditions:

1. Material shall be readily soluble in water or a readily dispersible biological material.

2. The quantity of radioactive material released in any one month divided by the average monthly volume of water released into the sewer by SEG shall not exceed the concentration listed in Table 2, Column 2 of Schedule RHS 8-30.

3. If more than one radionuclide is released, the sum of fractions shall be obtained by dividing the average monthly release concentration for each radionuclide by the concentration for the radionuclide in Table 2, Column 2 of Schedule RHS 8-30, and summing the results obtained for each radionuclide.

4. The sum of fractions shall not exceed unity.

5. The total quantity of licensed and other radioactive material released in a year shall not exceed five 5 curies of H-3, one curie of C-14, and one curie of all other radioactive materials combined.

Radioactive liquid releases to the environment shall be minimized to the extent practical. All liquid releases shall be discharged to the sewer system (not to open bodies of water) and only if alternate methods are impractical. The RPM, SSHO or Project Manager shall be informed prior to any potentially radioactive liquid discharges and shall approve all radioactive liquid releases to the sewer system. Radioactive liquid discharges shall be performed in accordance with approved procedures. Activity release through sanitary sewerage shall be tracked by HP or the SSHO to ensure compliance with regulatory limits.

10.10 Theft or Loss of Radioactive Material

Any individual who discovers that radioactive material is lost, stolen, or missing shall immediately notify the RPM or SSHO. The RSO or SSHO shall evaluate the physical and radiological characteristics of the missing material and the potential hazards to workers and the general public, initiate an investigation to locate the material, perform a root cause evaluation of the incident, and notify the RSO of results. The RSO shall make an immediate telephone report to the Tennessee Division of Radiological Health for lost, stolen, or missing RAM in an aggregate quantity equal to or greater than 1,000 times the quantity specified in Tennessee Regulation 1200-2-5, Schedule RHS 8-31, and when the missing RAM could result in exposure to persons in unrestricted areas.

The RSO shall make a telephone report to the Tennessee Division of Radiological Health within 30 days after learning of any lost, stolen, or missing RAM in a quantity greater than ten times the quantity specified in Tennessee Regulation 1200-2-5, Schedule RHS 8-31, provided that the material is still missing. The RSO shall make a written report to the Tennessee Division of Radiological Health within 30 days whenever an immediate telephone report was required as described above. Reporting shall be in accordance with Tennessee regulation 1200-2-5-.140.

11.0 CONTAMINATION CONTROL PROGRAM

11.1 Section Overview

The purpose of the Contamination Control Program is to set forth the requirements for identifying, evaluating, and maintaining control of radioactive material and contamination of areas, equipment, and trash. Radioactive material and contamination control measures are established to prevent the spread of contamination to clean areas, minimize the need for respiratory protection devices, and maintain personnel exposures (internal and external) as low as is reasonably achievable (ALARA). The primary means of preventing the spread of contamination is to contain it at its source and to minimize the number of contaminated areas and the amount of loose surface contamination in those areas. Control of radioactive contamination is accomplished by:

1. Identifying and minimizing sources of contamination and radioactive materials.

2. Evaluating radioactive contamination survey results to determine the appropriate type and level of personnel protective equipment.

3. Establishing limits in implementing procedures for radioactive contamination levels and establishing boundaries for contaminated areas.

4. Planning and performing work to minimize the spread of contamination to areas and personnel including the use of containments when practical.

5. Monitoring personnel, material, and equipment as soon as possible as they leave contaminated areas and RCA's.

6. Implementing effective "good housekeeping" practices.

11.2 General

The size and number of Contaminated Areas should be minimized in order to reduce the amount of materials which become contaminated during use and reduce the resources which are expended to decontaminate contaminated items and areas. Make full use of tools or equipment which are within the RCA rather than introducing additional tools or equipment to the RCA. Contamination control measures such as bagging, sleeving, covering, or coating shall be considered prior to bringing items into a contaminated area. Materials brought into the RCA should be minimized to the extent practicable. The RCA shall not be used as a storage area for non-radioactive materials. Pre-plan work activities such that only the required materials are brought into the RCA. Packaging material shall be removed from items prior to introduction into the RCA. The use of wooden pallets and other hard to clean materials inside RCA and/or contaminated areas should be minimized. Items brought into the RCA should be removed as soon as practical in order to reduce the likelihood for the item(s) to become inadvertently contaminated.

11.3 Contamination Limits

It is the SEG policy that detectable contamination on personnel be maintained ALARA. The monitoring requirements will be dictated by the individual site conditions and isotopes of concern. The contamination limits shall be specified in the site specific license amendments based upon site conditions, instrumentation and isotopes of concern.

Areas shall be identified and controlled as contaminated when removable contamination levels exceed 1000 dpm/100 cm^2 of beta/gamma emitting radionuclides or 100 dpm/100 cm^2 of alpha emitting radionuclides. Equipment, materials, and tools shall be controlled when total contamination exceeds 100 cpm above background using a detector at least as sensitive as a pancake GM detector or removable contamination exceeds 1000 dpm/100 cm^2. These limits are for beta/gamma emitting radionuclides. For alpha emitting radionuclides, 300 dpm/100 cm^2 total and 100 dpm/100 cm^2 removable shall be used. Internal surfaces that have been exposed to radioactive contamination shall also meet these limits.

The fixed contamination limit for protective clothing to be reused shall be 42,000 dpm/100 cm^2 averaged over 300 cm^2 and for scrubs shall be 5,000 dpm/100 cm^2 averaged over 300 cm^2.

Clothing that exceeds this limit shall be removed from service and discarded as radioactive waste or stored separately for use as an outer layer of protective clothing while working in high contamination areas or mixed hazardous areas requiring multiple layers of protective clothing and shall be discarded after such use.

11.4 Release Criteria

"Clean" waste removed from the RCA destined to be disposed of as "clean" waste shall be surveyed in a low background area with a gammma sensitive instrument (e.g. a μR meter with a NaI detector), and the results must indicate no detectible activity above the statistical variation in background.

11.5 Contaminated Area Controls

Controls shall be applied to an area where removable contamination is in excess as listed in USNRC Regulatory Guide 1.86 and any area posted as an airborne radioactivity area. The controls shall include conspicuously identifying the area. Unless the area is bounded by a set of walls and doors, a tent, or containment, entrances to the area shall be marked with magenta/yellow rope or tape to signify the presence of contamination.

The exits of contaminated areas shall be provided with a step-off pad, and all protective clothing shall be removed prior to exiting onto the step-off pad. Placement of step-off pads should take into consideration the dose rate in the area. Step-off pads shall be treated as non-contaminated. In areas where more than one set of protective clothing is used, additional step-off pads may be used to prevent the spread of contamination. Receptacles shall be placed at or near step-off pads for the collection of reusable protective clothing and trash.

Contaminated or unmonitored items shall be bagged and properly labeled prior to removal from contaminated areas unless otherwise directed by Health Physics personnel. The bag shall indicate the presence of contaminated or potentially contaminated materials.

11.6 Controlling the Sources of Contamination

Sources of radioactive contamination shall be controlled to minimize the number and extent of contaminated areas. Elements of a contamination source control program include identifying, controlling, and repairing radioactive leaks, use of good radiological work practices, prevention and prompt cleanup of radioactive spills, area decontamination and adequate surveying and monitoring. Work areas should be prepared so the spread of contamination is minimized during work. Planning should include such actions as use of plastic sheets or absorbent material, use of strippable coatings, or containers to collect leakage or drippage of radioactive materials.

Precautionary measures shall be implemented to reduce contamination of areas, personnel, and objects and to limit the spread of contamination. Personnel shall be instructed in work techniques to minimize the spread of contamination and to minimize the generation of radioactive waste. Protective clothing shall be required for all work in contaminated areas. Specific protective clothing requirements shall be included on the RHWP.

Personnel shall be instructed in the proper use of protective clothing and proper monitoring techniques. Instructions for donning and removal of protective clothing should be provided. Work activities should be pre-planned to minimize the number of tools and/or equipment and quantity of material taken into RCA's. Hoses or electrical leads which cross contaminated area boundaries should be secured to prevent the hose or lead from being inadvertently pulled out of the contaminate ' area and spreading contamination. Prior to taking items into a contaminated area, bag, sleeve, cover or coat tools or equipment, as appropriate.

Proper ventilation is necessary to control the movement of airborne radioactivity in order to prevent or minimize the spread of contamination within the facilities. Operations that routinely produce airborne contamination should utilize engineered containment and ventilation systems to prevent airborne releases. The design of the ventilation system should provide for proper air flow under all conditions including open and closed positions of doors and windows and changes in setup. The flow should always be from clean areas to contaminated areas and recirculation of air should be avoided unless the system is specifically designed for such use with appropriate filtration systems. Ventilation systems shall be routinely checked for proper operation and air flow.

Individuals should be trained to use containment devices for routine maintenance procedures such as replacement of radioactive filters. These devices should be used when significant contamination does not already exist in the work area. Good housekeeping practices shall be used at all times. Work areas should be cleaned up after each job is completed.

Personnel should identify and report to their supervisor radioactive leaks during routine surveillance. The leaks should be identified in the work control system for repair. Priority should be given to leaks that spread significant contamination. Drip pans, containment devices, or drain hoses to divert or collect leakage should be used whenever maintenance cannot be performed quickly.

11.7 Contaminated Area Set-Up/Removal

Contaminated areas should be established with the assistance of the work crew, as necessary. Job Supervisors should interface with HP personnel or the SSHO to determine requirements for floor coverings, etc., based on the type of work to be performed and its location.

An entry/exit point shall be established at the boundary of a contaminated area and a clean area to physically separate these areas. The entry/exit point should be positioned as close to the actual boundary of the contaminated area as possible. Entry/exit points should be positioned in areas with ambient radiation levels as low as possible. Contaminated areas shall be designated with yellow and magenta floor tape, rope, ribbon, barricades, or other suitable identifier. Where stanchions and rope are used, an entry/exit control point should be established (i.e., swing gate or rope between two stanchions). A step-off-pad shall be provided at each entry/exit control point. Appropriate receptacles shall be provided to collect used protective clothing. Radioactive or contaminated trash should not be allowed to accumulate and increase the ambient radiation levels.

Multiple egress points, (i.e., two step-off-pads in series) should be used if the contamination levels in the work area mandate the use of multiple layers of protective clothing. Suitable radiation detection instruments shall be provided at or near the step-off-pad or work area and at the RCA exit point. Contamination monitors should be provided at the RCA exit point. Personnel monitoring instructions should be provided, including actions to take when an alarm sounds, at the personnel monitoring points.

Upon work completion, a radiological survey shall be conducted to determine the extent, nature, and magnitude of the contamination, prior to de-posting a contaminated area.

As a general rule, decontamination should be performed by working from areas of low contamination to areas of high contamination. If a localized area has significantly higher contamination levels, which may result in significant radiation exposure, those areas should be decontaminated. The amount of decontamination agent used should be limited to the minimum required for the task. All decontamination agents shall be collected, monitored, and properly dispositioned. Contaminated equipment and tools should be brought to a designated area for decontamination.

11.8 Hot Particle Control

Hot particle, fuel flea, and discrete radioactive particle are terms used to describe similar types of radioactive contamination. Hot particles are small in physical size, at times with a rough diameter as small as approximately 3 microns. They have high specific activity, sometimes in the millicurie range and have high local dose rates. Some have exceeded 20,000 rad/hr surface dose rate.

Once aware of hot particle contamination, enhanced survey techniques such as masslin, tape, tacky rollers, etc. shall be used to locate and isolate the hot particles. Dose determination of hot particles is calculated by using health physics instrumentation and applying specific empirical equations and calibration factors as described in Section 6.

Methods to control the spread of hot particles shall be established including the use of hot particle areas. Hot particle areas shall be established where hot particles are suspected or known to exist, or where hot particles may be released during planned activities. Buffer areas should be established adjacent to hot particle areas to prevent migration of hot particles into clean areas. Step-off pads, trash and protective clothing receptacles should be placed at the egress point at each hot particle and buffer area.

Maintenance and operations activities that have a high potential for hot particle contamination shall be identified to minimize the production and spread of hot particles. All radioactive waste originating in hot particle areas shall be isolated, bagged, and labeled "Hot Particle Waste".

Once hot particle contamination has been detected, a percentage of processed protective clothing shall be surveyed to ensure, to the extent possible, the absence of attached particles. Hot particles detected on the skin or clothing shall be removed and saved for radiological analysis and dose calculations, as appropriate.

General Employee Training for all radiation workers shall include instruction on the protection from, monitoring of, and special problems associated with hot particle contamination. Hot particle area entries shall only be allowed for workers who have received adequate training in hot particle control. Workers shall be briefed on the specific hot particle controls as part of their pre-job briefing.

11.9 Contamination Surveys

Routine contamination surveys shall be conducted at established frequencies and locations. Non-routine contamination surveys are conducted as deemed necessary by the RPM or SSHO to detect the presence of or prevent the spread of contamination and is necessary to prepare RHWP's and monitor associated work. Contamination surveys shall be conducted in accordance with established methodology.

11.10 Control and Decontamination of Tools, Equipment, and Materials

Procedures shall be established for control and use of radioactive contaminated materials, tools and equipment. A dedicated supply of tools and equipment should be established for exclusive use within the RCA. Each worker should obtain RCA tools and equipment from the designated tool room or storage boxes within the RCA and return them to the decontamination room.

The use of temporary tool cribs and mobile cabinets should be planned as an effective method for supporting work at specific locations. Tools and equipment should be returned to their normal storage location immediately upon completion of use or after decontamination.

All potentially contaminated tools and equipment shall be wrapped or bagged until determined by survey that removable contamination levels do not require decontamination. All containers of temporarily stored RCA tools and equipment such as tool boxes, crates, shall be labeled as Radioactive Materials.

Fixed contamination levels on items returned to use should be maintained as low as practicable based on the decontamination effort needed versus the amount of dose rate reduction.

11.11 Control and Use of Radiological Containments

HP personnel or the SSHO shall determine the need for a particular type of containment, if deemed necessary, and any modification required in order for the work to be performed. HP personnel or the SSHO shall inspect and approve the installation of the containment before use. Use of a glove bag or other containments should be discouraged when:

1. Internal system contamination is approximately equal to that already existing in the work area and the potential to increase that contamination level is small.

2. The exposure expenditure due to the installation of glove bag is large when compared to the exposure due to the job performance and the consequence of reduced contamination control.

A slight negative pressure, if possible, should be maintained on containments when in use. Tents should be constructed of material such as polyethylene or herculite for impermeability. If a material like opaque herculite is used, clear plastic windows should be installed. Containment materials should be placed on the inside of support structures to minimize waste generation and decontamination. Routine inspections on containments should be performed.

11.12 Spill of Radioactive Material

A spill of radioactive material requires immediate actions which include:

1. Stop the spill.

2. Warn other personnel nearby and use the intercom system, if needed and available.

3. Isolate the area with barrier tape or rope, use available personnel to guard the spill area and control all entries and exits.

4. Minimize radiation exposure by donning respiratory equipment as appropriate, use time, distance, shielding, and performing radiological surveys. Removing and decontaminating potentially contaminated personnel from the spill area.

Supplementary actions should consist of radiological surveys in immediate and adjacent areas, including downwind.

11.13 General Decontamination Practices

Procedures shall contain action levels and survey schedules to ensure that non-contaminated areas which are normally traveled are maintained clean. The selection of decontamination equipment and technology should be evaluated considering cost, radiation exposure, efficiency and scheduling impact on site operations.

Numerous decontamination techniques are available, such as: low pressure spray (power wash), high pressure spray (hydrolaser), ultra high pressure, scabbling, scarification, abrasive blast methods, needle gun and strippable coatings.

Health Physics personnel shall perform surveys and air samples as required to support decontamination activities. Personnel performing decontamination activities shall interface with Health Physics to determine the location and level of contamination.

11.14 Control of Vacuum Cleaners

Only HEPA filtered vacuum cleaners shall be used in the RCA. The use of non-HEPA filtered vacuum cleaners in the RCA is strictly prohibited. Maintenance (emptying, filter changing, etc.) on vacuum cleaners used within the RCA shall be performed under an appropriate RHWP. Vacuum cleaners used within the RCA shall be posted (labeled) as Radioactive Material and units suitable for wet work shall be appropriately identified. If a vacuum cleaner is used in a RCA for asbestos control, in addition to being labeled as Radioactive Material it shall be identified and controlled as containing asbestos.

12.0 UNCONDITIONAL RELEASE PROGRAM

12.1 Section Overview

SEG is authorized to unconditionally release tools, equipment, parts, and materials provided that surface contamination (i.e., non-irradiated materials) levels do not exceed the limits contained in the radioactive materials licenses or USNRC Regulatory Guide 1.86.

Material to be unconditionally released from RCA's shall be surveyed to ensure compliance with the unconditional release criteria. Radiological characterization is performed to identify the radionuclides present, so that proper survey methods, instrumentation and release limits are selected to ensure the material meets the unconditional release criteria for fixed and removable alpha and beta-gamma contamination.

12.2 Survey Instrumentation Requirements

The energy dependence of the monitoring instruments for alpha, beta, and gamma radiation shall be known and documented in accordance with the Instrumentation Program. Instrumentation used to perform direct alpha measurements shall be capable of detecting the required release limits at greater than 50% confidence level. Instrumentation used to perform direct beta measurements shall be capable of detecting all beta emitters with maximum beta energy $\geq$ 150 keV within the established release limits at the 90% confidence level. Hand held instruments used to survey for fixed contamination should be equipped with an audible response or an audible alarm and should be operated with the audible response or alarm active. Instruments used to survey material for unconditional release shall be calibrated in accordance with the Instrumentation Program. Instruments used to survey material for unconditional release shall be source checked and verified operational prior to performing a survey for unconditional release.

12.3 Radiological Characterization

Radiological characterization of material is performed to identify the radionuclides that are present, so that proper survey methods, instrumentation, and release limits are selected to ensure the material meets the unconditional release criteria for fixed and removable alpha and beta-gamma contamination. Radiological characterization can be accomplished by performing radiological analysis to determine the radionuclides present. Radiological analysis shall be performed to identify radionuclides present or as directed by Health Physics management. Radiological analysis shall consist of collecting samples from the material and analyzing the samples to determine what radionuclides are present.

12.4 Unconditional Release Criteria

Surface contamination levels of material to be unconditionally released for unrestricted use shall be less than the most restrictive values listed in SEG radioactive material licenses or Regulatory Guide 1.86. Special procedures and techniques shall be required for unconditional release of material contaminated with transuranics, NORM, TERM, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125 or I-129.

12.5 Unconditional Release of Materials

Personnel shall monitor for contamination on hand carried items in accordance with posted instructions when exiting Contaminated Areas and RCA's. Tools, equipment, and materials to be released for unrestricted use from the RCA shall be surveyed by a qualified decontamination technician or by health physics personnel. These surveys shall be performed in such a manner and with appropriately sensitive instrumentation to ensure the tools, equipment or material meets the unconditional release limits. Only health physics personnel shall authorize the release of material for unrestricted use.

12.6 Unconditional Release Surveys

Unconditional release surveys shall consist of both direct and indirect monitoring methods to assess the residual surface contamination of the material being monitored. Radiation detection instrumentation used for direct monitoring shall be checked for proper operation prior to use of monitoring operations. Radiation detection instrumentation used for direct monitoring shall be positioned at a predetermined fixed distance from the surface of any item being surveyed and moved with a scanning speed that will provide a detection capability to reliably meet the unconditional release limits. Direct monitoring of items or material shall be performed in areas where background radiation levels will not interfere with the detection capability to meet unconditional release limits for the instrumentation being used.

Indirect survey techniques utilized shall provide consistency and reproducibility and shall be representative of the surface being evaluated. A sufficient number of smear samples shall be obtained and counted to properly evaluate the material for loose-surface contamination. Instrumentation used to count smear samples shall be of a type that provides a reasonable geometry and counting efficiency for the radionuclides characterized as being present. Smears shall be counted for a sufficient period of time to provide for counting accuracy, reliability and acceptable MDA.

Items or material with inaccessib'e surfaces shall be evaluated by surveying the accessible external surfaces and openings to internal surfaces provided the contamination at the accessible locations can be demonstrated to be representative of the inaccessible surfaces. Surfaces of equipment or material which are likely to be contaminated but are of such size or construction as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the unconditional release limits.

Results of unconditional release survey for surface contamination shall be documented. Documentation shall be clear, legible and contain all the applicable information. Documentation of surveys performed shall be retained for the appropriate time period specified in the current SEG records management system.

13.0 RESPIRATORY PROTECTION POLICIES

13.1 Section Overview

Respiratory protection measures shall be employed to protect workers from a variety of airborne hazards. The hazards may be of a radiological or non-radiological nature. Radiological airborne hazards include particulate materials and gases. Non-radiological hazards include oxygen deficient atmospheres, airborne asbestos fibers, particulates, and vapors. This program for respiratory protection is based on requirements in Tennessee Chapter 1200-2-5-.90 through .93 for radiological hazards and the Code of Federal Regulations Title 29 Part 1910.134 for non-radiological hazards.

The Respiratory Protection Program includes the following elements as recommended by NUREG 0041, "Manual of Respiratory Protection Against Airborne Radioactive Material":

1. Written standard operating procedures and policy statement;
2. Proper selection of equipment, based on the hazard;
3. Proper training and instruction of users;
4. Proper fitting, use, cleaning, storage, inspection, quality assurance, and maintenance of equipment;
5. Appropriate surveillance of work conditions, degree of employee exposure to stress;
6. Regular inspection and evaluation to determine the continued program effectiveness;
7. Program responsibility vested in one qualified individual;
8. An adequate medical surveillance program for respirator users;
9. Use of only Bureau of Mines/National Institute of Occupational Safety and Health (NIOSH) certified equipment; and
10. Maintenance of a bioassay program.

Respiratory requirements are determined by assessing work plans, evaluating conditions in the work area and reviewing available historical data on the airborne hazards for a particular job. The evaluations include measuring airborne concentrations or oxygen content prior to working in an area. Follow-up measurements are made to evaluate airborne concentrations during work. Respiratory protection equipment is selected using allowed respiratory protection factors to ensure that individual limits on intake or exposure are not exceeded.

13.2 Respiratory Protection Policy Statement

Scientific Ecology Group's Respiratory Protection Policy Statement is included as an attachment at the end of this section. This policy statement is to be provided and explained to respirator users during Respirator Users Training.

13.3 Use of Respirators

Routine operations are planned activities that are generally repetitive and occur with various frequencies. For such operations, potential sources of airborne contaminations should be identified so that respiratory protection may be accomplished by the use of process, containment, and ventilation measures and by preplanning of work. The use of respirators as a substitute for engineering controls in routine operations is inappropriate.

Non-routine operations are activities that are either non-repetitive or else occur so infrequently that adequate limitation of exposures by engineering controls is impractical. To the extent that process, containment, and ventilation controls are not reasonably feasible in non-routine operations, the use of respirators to avoid excessive exposure to airborne contaminations is appropriate.

Emergencies are unplanned events characterized by risks sufficient to require immediate action to avoid or mitigate an abrupt or rapidly deteriorating situation. Although emergencies are unplanned, preparations will be made for coping with potential emergencies by providing necessary and sufficient respiratory protection for use in potential emergencies that are likely to entail respiratory hazards.

The periods of time respirators are worn continuously and the overall durations of use shall be kept to a minimum. It is difficult to realistically assign specific time limits on respirator use because of the wide variations in job requirements and in the physical capacities and psychological attitudes of individuals. Provision is to be made by supervision, for the respirator users to leave areas where respirator use is required for relief in case of equipment malfunction, undue physical or psychological distress, procedural or communication failure, significant deterioration of operational conditions, or any other condition that might require relief.

13.4 Engineering and Administrative Controls

Respirators shall be used to control personnel exposure to airborne radioactive materials when administrative and engineered controls are not effective and the use of respirators result in Total Effective Dose Equivalent (TEDE) being ALARA. Administrative controls shall be used to limit personnel access to or time spent in an area. Engineered controls shall be used to limit production of airborne contaminants and to control distribution of airborne radioactive materials.

Appropriate respiratory protection shall be prescribed when personnel are exposed to atmosphere Immediately Dangerous to Life or Health. Respirators may also be prescribed when personnel may be exposed to contaminants at or in excess of the appropriate TLV as established by the American Conference of Government and Industrial Hygienists. As with the radiological use of respiratory protection equipment, primary reliance will be placed upon administrative controls to limit personnel access to hazardous areas and engineered controls to limit production of toxic or nuisance atmospheres or to "clean" up contaminated atmospheres. When such methods are not practical, respiratory protection equipment shall be used as necessary.

13.5 Determination of Respiratory Protection Requirements

Determination of respiratory protection requirements and selection of equipment shall be made by trained and qualified individuals only. Training and qualifications shall be documented. Respiratory protection devices are permitted for jobs where an ALARA evaluation has been conducted and it has been demonstrate ! that the use of respirators will maintain the Total Effective Dose Equivalent (TEDE) ALARA. Determination of respiratory protection requirements and selection of equipment for non-radiological contaminants shall be made by the Industrial Hygiene and Safety Department.

13.6 Selection of Respiratory Devices

The proper selection of a respiratory protection device is possible only when consideration of the factors involved indicates that the device selected will provide satisfactory protection when properly used. The selection of respiratory protection equipment, therefore requires knowledge of such factors as:

1. The chemical, physical and toxicological properties of the substance against which protection is required.

2. The processes occurring during the work activity and conditions of the work area, as they relate to the dissemination of contaminants.

3. Actual and potential hazards to determine whether conditions Immediately Dangerous to Life or Health exist or whether health effects would result only after prolonged or repeated exposures.

4. The nature of duties to be performed by the user, particularly as they relate to restriction of movements and worker efficiency.

5. An understanding of the principles, design, scope of use, limitations, advantages and disadvantages of the equipment.

6. The external radiation hazards.

Respiratory protection equipment will normally be selected that has a protection factor greater than the anticipated peak airborne concentration expressed as a multiple of total DAC. Respiratory protection equipment may be selected that has a protection factor less than the anticipated peak airborne concentration expressed as a multiple of total DAC provided that use of that equipment is expected to result in a lower TEDE. This evaluation should be documented in the RHWP package. Protection factors for respiratory protection equipment shall be assigned in accordance with Schedule RHS 8-32 of Tennessee regulations 1200-2-5.

13.7 Facial Hair Policy

Individuals using tight-fitting respirators shall not have any facial hair that interferes with the sealing surface of the respirator. Any intrusion of facial hair into the sealing surface of the respirator can result in air in-leakage. Any worker who has facial hair that intrudes into the area where the respirator seals against the face shall not be fitted with a tight fitting respirator. Additionally, any worker who is not clean-shaven shall not be issued a respirator, even though he has previously obtained a satisfactory fit with the particular device.

13.8 Medical Requirements

Personnel who require the use of respiratory protection equipment in the course of work at SEG shall receive a physical examination, and be certified by a physician as qualified to wear respiratory protective equipment prior to wearing any respiratory protection device. Physical examinations shall be required at least annually (every 11-13 months) thereafter. Personnel shall be medically evaluated to ensure they posses the physical and psychological capabilities necessary to perform tasks while wearing a respirator. This medical evaluation shall use Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection" as guidance in determining if an individual is medically qualified to wear respiratory protection equipment.

13.9 Training

Respirator users shall be trained at least annually (every 11-13 months) in the proper use and maintenance of respiratory protection equipment. Training of personnel in the use of respiratory protective equipment shall be performed by a knowledgeable instructor. The instructor shall have a thorough knowledge of the application and use of respiratory protective equipment and the hazards associated with radioactive airborne contaminants. Training shall include, but is not limited to, the following:

1. Presentation of SEG Respiratory Protection Policy Statement.

2. Discussion of the airborne contaminants against which the wearer is to be protected.

3. Discussion of the construction, operating principles and limitations of the various respirators.

4. Explanation of why more positive control measures are not always feasible. This shall include recognition that every reasonable effort is being made to reduce or eliminate the need for respirators

5. Instructions for assuring that respirators are in proper working condition.

6. Instructions in donning and removing the respirator properly.

7. Instructions in the proper method for checking to ensure an adequate face to facepiece seal.

8. Instruction in the proper use and maintenance of the respirator, including assurance to the user that he or she will be issued a sanitized and properly operating respirator.

9. Discussion of the types of cartridges and filters commonly used and the application for each type.

10. Instruction in emergency action to be taken in the event of a malfunction, including the appraisal of possible hazard in the event the respirator were to be removed in the hazardous area.

Personnel responsible for the cleaning and maintenance of respiratory protection equipment shall receive training necessary for fulfilling their responsibilities. This training shall include, but not be limited to the following:

1. Maintenance, inspection, and issuance of respiratory protection equipment.

2. Maintenance and repair of respiratory protection equipment in accordance with manufacturer's instructions.

3. Respiratory protection theory.

4. Properly cleaning and disinfecting respiratory protective equipment.

5. Proper storage of respirators.

13.10 Respirator Fit Testing

Respirators with a tight-fitting facepiece shall be fit tested to each individual to verify that an adequate seal can be obtained. The fit-testing shall be performed prior to first use for all users and shall be repeated at a frequency not to exceed 6 months for asbestos and lead workers and at a frequency not to exceed 12 months for all other users. Fit-testing shall be performed only on individuals who have a current medical approval, have received respiratory protection training within the past year and are clean shaven.

13.11 Respirator Maintenance

Respirators shall be cleaned and disinfected after each use. Respirators shall be inspected after each cleaning and necessary maintenance shall be performed. Maintenance shall be documented by the individual performing the maintenance. Respirators shall be stored in clean sanitary conditions. Storage locations shall be located free from chemical or physical agents which could be harmful to the respirator construction materials.

Respirators ready for issue shall be have no detectable beta-gamma or alpha loose surface contamination. Fixed contamination shall be < 100 cpm beta-gamma above background on sealing and interior surfaces, and <500 cpm beta-gamma above background on the exterior surfaces as measured with a pancake type G-M detector. A satisfactory rating also indicates that the respirator meets all other inspection criteria.

13.12 Corrective Lenses

Personnel requiring corrective lenses when wearing a full-face respirator should wear prescription eye glasses approved for use inside a full-face respirator. Contact lenses shall not be used when wearing a full-face respirator without prior approval of the RPM or SSHO.

13.13 Supplied Breathing Air

All sources of breathing air shall meet the requirements for Grade D breathing air as specified in ANSI/CGAG-7.1 - 1989, "Commodity Specification for Air." Fittings to supplied air systems manifolds and cylinders shall be unique such that the introduction of gases other than pure breathing air is prohibited. Sources of breathing air shall be approved by the RPM or SSHO. If sources other than air cylinders are utilized, the source shall be sampled for Grade D breathing air prior to use and once every 6 months and after any maintenance on a breathing air system.

HP technicians or the SSHO shall perform smear surveys of breathing air manifolds, including airline connections, at least weekly while in use. Supplied air systems shall be assembled in the certified configuration, using only hose types, hose lengths and fittings approved for the device.

13.14 Program Quality Assurance

The radiological bioassay program is part of the Personnel Monitoring Program, but certain aspects of the bioassay program are pertinent to the Respiratory Protection Program. Personnel bioassay results shall be used to verify the respiratory protection program's effectiveness for selection of adequate respiratory protection devices and provision of properly functioning respiratory protection devices.

The Site Safety and Health Officer shall determine non-radiological bioassay requirements to verify the effectiveness of the Respiratory Protection Program for non-radiological exposures.

Stored respirators shall be inspected periodically to verify they have been properly cleaned, inspected, maintained and stored. Respiratory protection issuance records shall be reviewed periodically to verify only trained and qualified individuals are issued respirators. Respiratory protection training courses shall be reviewed periodically to assure adequacy of respirator training. In addition, maintenance and inspection records of respiratory protection equipment shall be reviewed to assure equipment is maintained in accordance with NIOSH certification.

ATTACHMENT 13.1
Respiratory Protection Policy Statement

It is the SEG policy to maintain personnel exposure to both internal and external hazards as low as is reasonably achievable (ALARA). Personnel exposure to airborne contaminants shall be limited by process and engineered controls whenever possible. However, under some conditions, process and engineered controls may not be feasible or provide adequate assurance that exposure to contaminants will be maintained ALARA. In such instances, respiratory protection devices may be required for individuals performing work in areas containing airborne contaminants. The selection and use of respiratory protection equipment shall be balanced against the potential for causing increased external exposure or other health and safety concerns. The use of respiratory protection equipment must be consistent with maintaining the total effective dose equivalent ALARA.

The routine use of respirators for radiological protection purposes will be prescribed by Health Physics usually on an RHWP. Concurrence by Health Physics shall be obtained prior to the non-routine use of respiratory protection equipment. Use of respiratory protection equipment during emergency conditions shall be in accordance with established procedures and should not hinder major medical or accident mitigation activities.

When respirators must be used, appropriate rest or relief periods shall be provided. An individual wearing a respirator may leave the work area at any time for relief in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of work area conditions, or any other condition that might require relief.

SEG is committed to establishing and maintaining a respiratory protection program consistent with the goal of protecting its employees. It is therefore the policy of this company that all employees, when using respirators in the work place, or administering the Respiratory Protection Program, shall adhere to the principles established in the written procedures.

_____

H. W. Arrowsmith Date
President
Scientific Ecology Group, Inc.

14.0 ENVIRONMENTAL MONITORING

14.1 Environmental Monitoring

If required, a site specific environmental monitoring program will be established to document compliance with Tennessee Regulation 1200-2-5 at each site prior to beginning operations at that site. The site specific environmental monitoring program shall be reviewed and approved by the Radiation Safety Committee and a copy submitted to the State of Tennessee.

Environmental conditions, as appropriate, will be monitored through measurements performed on air samples, surface water samples, sanitary sewerage discharge, soil samples, and ambient radiation, etc. Results from these measurements, if positive, can be utilized to calculate potential doses to individual members of the public. Measurements also serve to identify potential areas of concern and shall trigger appropriate radiological response or process changes in the event that unanticipated radiological conditions are identified.

Analysis of environmental samples and environmental media will be through the SEG laboratory at SEG's Bear Creek Facility or a qualified outside laboratory.

14.2 Environmental Action Levels

Air, water, and sanitary sewerage action levels shall be set at 10 percent of the applicable Table 2 values in Tennessee Schedule RHS 8-30. Soil and sediment action levels shall be set at 5 pCi/g for man-made radionuclides. Ambient gamma action levels shall be set at 25 millirem in any quarter, and 1 millirem in any one hour for individuals in unrestricted areas.

Immediate notification shall be made to the RSO or SSHO of any samples or doses exceeding action levels. The RSO or SSHO shall initiate or perform an investigation and response consisting of one or more of the following actions:

1. Verify of laboratory data and calculations;
2. Analyze and review probable causes;
3. Evaluate need for reanalysis or additional analyses on original sample;
4. Evaluate need for re-sampling;
5. Evaluate need for sampling of other pathways;

6. Evaluate need for notifications in accordance with Section 15;
7. Document all actions, analysis, and evaluations in logs or files; or
8. Perform dose assessment

14.3 Quality Control Requirements

Laboratory counting performed for purposes of environmental or effluent stream monitoring shall comply with the requirements of U.S. NRC Regulatory Guide 4.15.

Steps should be taken to ensure that samples collected are representative of the material sampled. Replicate samples should be taken periodically to determine the reproducibility of sampling.

Sample integrity should be maintained from the time of collection to time of analysis. Procedures shall contain requirements to ensure sample integrity.

Quality control sample analysis provides a means to determine the precision and accuracy of the monitoring process. SEG shall utilize both intralaboratory and interlaboratory measurements to verify the quality of its analysis methods.

Intralaboratory analyses shall consist of replicate sample analy s of environmental media, reference test materials, or both. The size and other physical and chemical characteristics of the replicate samples should be similar to those of samples that are routinely analyzed by the lab. If possible, replicate samples should be analyzed as blind samples. Simulated samples can be prepared when true replication or splitting of samples is not possible (e.g. air samples).

Analysis of intralaboratory blank and spiked samples should be performed on a regular basis to provide a basis for estimating the accuracy of analytical results.

Interlaboratory analyses provides a means to detect errors in measurement that might not be detected by intralaboratory measurements. SEG shall participate in the EPA Environmental Radioactivity Laboratory Intercomparison Studies (Cross-Check) Program, or other suitable program. Participation shall be for all of the determinations offered by EPA that are included in SEG's environmental monitoring program.

14.4 Operating Procedures and Instructions

SEG shall have written procedures for sample collection; packaging, shipment, and receipt of samples for off-site analysis; preparation and analysis of samples; maintenance, storage, and use of reference standards; calibration and checks of radiation and radioactivity measurement systems; and reduction, evaluation, and reporting of data.

14.5 Records

Records necessary to document the activities performed in support of the environmental program shall be maintained. Provision for tracking and control of laboratory samples through the sequence of monitoring processes shall be available. Documentation of sample collection shall include description, location, date, and time of sample; receipt and laboratory identification of the sample; preparation and processing of the sample; and analysis of the sample. In addition, background samples, analytical blank samples and data reduction and verification for those samples shall be documented.

Quality control records for laboratory counting systems shall include the results of measurements of radioactive check sources, calibration sources, backgrounds, and blanks.

Records shall be kept indefinitely after license termination until they are determined to be of no further use by management. The minimum time period for record retention shall be ten years after termination of the licenses.

14.6 Reference Standards

All standards used for calibration of laboratory equipment shall be NIST traceable when such standards are available. Preparation of working standards and standard geometries from certified standard solutions should be documented. The working standard should be prepared in the same manner as the unknown samples, to the extent practical.

Efficiency calibrations should be checked at least quarterly using reference standards. Calibrations should also be checked whenever a significant change or repair is made to the measurement system, or when changes are detected as a result of check source measurements.

14.7 Performance Checks of Radiation Measurement Systems

Scheduled checks should be performed on laboratory equipment to determine background counting rate and response to check sources. Results of these checks should be documented in laboratory logs and plotted on control charts. Investigations shall be performed and corrective actions taken whenever measurement values fall outside of predetermined control values.

Background counting should normally be performed daily or before each use. Check source measurements are usually measured daily or with each batch of samples counted on automated equipment.

Energy calibration checks on gamma spectrometry systems should normally be performed on a daily to weekly frequency. Results of measurements should be recorded and compared to predetermined limits to determine if adjustments to the counting are necessary.

Energy resolution measurements should normally be performed on a weekly to monthly frequency and check source counting rate on a daily frequency for gamma spectroscopy systems. These measurements should also be made after any significant changes to the system.

Results of all quality control measurements should be documented in laboratory logs or files.

14.8 Calculations and Computations

Calculations and computations used in determining concentrations of radioactive materials shall be independently checked prior to implementation. The calculations shall be proceduralized and implemented in accordance with quality assurance requirements for procedure development.

14.9 Data Review and Analysis

Review and analysis of data at SEG shall be performed on a timely basis in order to identify concentrations of radioactive materials in environmental media that are of concern or problems with laboratory equipment.

15.0 NOTICES, REPORTS, AND RECORDS

15.1 Section Overview

This section provides summary information regarding the radiation protection notices, reports, and records required by regulations and for purposes of insurance liability protection. This section also provides information about additional radiation protection records maintained for the radiation protection program at SEG.

The SSHO at SEG field projects is delegated full authority to perform or fulfill the responsibilities of the RSO. Notifications required for SEG field projects may be performed by the SSHO or by the RSO through coordination and communication with the SSHO.

15.2 Record Quality Assurance

All records required for license and regulatory compliance must be legible throughout their required lifetime, which is generally 10 years or more after the license is terminated. Records can be originals, microfilms, or copies provided that microfilms and copies are authenticated by authorized personnel and are capable of producing legible, accurate, and complete records during the required retention period. Records shall include all pertinent information, such as stamps, initials, and signatures. Safeguards against tampering and loss of records will be taken to ensure record security. Quality Assurance of records will be maintained in accordance with the SEG QA procedures manual.

15.3 Units of Measurement for Notices, Reports, and Records

The regulations require use of certain units for all quantities in radiation program records. SEG will use the units curie, rad, rem, and multiples thereof and will clearly indicate the units of all quantities on all required records. In addition, it is required that clear distinction be made among the quantities entered on records. For example, dose equivalent quantities shall be clearly defined as total effective dose equivalent, shallow dose equivalent, eye dose equivalent, deep dose equivalent, committed dose equivalent, and committed effective dose equivalent.

15.4 Notices and Reports to Employees

Regulations require that the following items be posted conspicuously so that workers can observe them as they go to or return from radiation work:

1. State Regulations for Protection Against Radiation, Radioactive Materials License and documents incorporated into the license by references or amendment,

2. Operating and Emergency Procedures,

3. Notice to Employees (RHS 8-3), and

4. Notices of Violation and responses concerning the regulatory violations.

In lieu of posting of the regulations, licenses, and procedures, a notice describing the document and the location where it can be examined is allowed. Notices of violation of the regulations and responses to such notices shall be posted within two working days after receipt or dispatch of the documents. These documents shall remain posted for a minimum of five working days or until the violation has been completely corrected, whichever is later.

It is the SEG policy that a written annual report of internal and external exposure be provided to workers. Regulations also require SEG to copy the effected individual(s) on any reports that are required to be submitted to the State. Information regarding administrative overexposures (those exceeding SEG administrative limits) is reported to employees as a regular part of SEG dose control practices. At the request of former employees, a summary report of exposures by year, must also be provided within 30 days from the request or within 30 days after the exposure has been determined. In addition, workers terminating employment may request a report or estimate of the dose received during the current quarter or calendar year.

15.5 Notification of Respiratory Protection Use

At least 30 days before SEG first uses respiratory protection equipment, the state shall be notified in writing of that intent. SEG interprets such equipment to include any kind of personal respiratory or breathing mask but not temporary or permanent engineering controls such as ventilation or other engineering techniques used to provide respiratory protection.

15.6 Notification of Packages Exceeding DOT Limits

The RSO shall immediately notify the final delivery carrier and the Tennessee Division of Radiological Health by telephone, telegram, mailgram, or facsimile when:

1. Removable radioactive surface contamination on external surface of packages exceeds 2,200 dpm/100 cm^2 β-γ activity or 220 dpm/100 cm^2 α activity when averaged over 300 cm^2 of package surface.

2. For non-exclusive use shipment:

   a. External radiation levels exceed 200 millirem per hour at any point on the external surface of the package, or;

   b. Radiation levels at three feet from the external surface of the package exceed 10 millirem.

3. For a package transported as exclusive use by rail, highway, or water radiation levels external to the package may exceed the limits in 2.a and 2.b above, but must not exceed any of the following:

   a. 200 millirem/hour on the external surface of the package unless the following conditions are met, in which case the limit is 1,000 millirem/hour.

      1. The shipment is made in a closed vehicle;

      2. Provisions are made to secure the package so that its position within the vehicle remains fixed during transportation; and

3. There are no loading or unloading operations between the beginning and end of the transportation;

b. 200 millirem/hour at any point on the outer surface of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected form the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle;

c. 10 millirem/hour at any point two meters from the vertical planes represented by the outer lateral surfaces of the vehicle, or, in the case of an open vehicle, at any point two meters from the vertical planes projected from the outer edges of the conveyance; and

d. Two millirem/hour in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when persons occupying these positions are provided with special health supervision, personnel radiation exposure monitoring devices, and radiation worker training.

15.7 Notification of Theft or Loss of Radioactive Material

If radioactive material exceeding 1,000 times the quantities in Schedule RHS 8-31 or any quantity of an unlisted material is lost or stolen, the regulations require immediate telephone notification to the Division of Radiological Health ( ):30 am - 4:30 pm, Monday -Friday) or the Tennessee Emergency Management Agency (after working hours). Lost or stolen quantities exceeding 10 times those listed in Schedule RHS-31 require a report by telephone within 30 days. In addition to the verbal notification, a written report will be made within 30 days after the telephone report. The report will include:

1. Description of the radioactive material
2. Circumstances of the loss
3. Disposition of the material
4. Exposure assessment
5. Actions taken to recover the material
6. Measures taken to prevent recurrence of the theft or loss

Exposures to individuals from loss or theft of radioactive materials shall be provided in a separate and detachable part of the report.

15.8 Notification of Incidents

The regulations divide radiological incidents into two notification classes: immediate notification and 24-hour notification. Immediate notification by telephone is required if any incident involving an SEG radiation source may have caused or threatens to cause:

1. A TEDE of 25,000 mrem or greater;
2. An eye dose equivalent of 75,000 mrem or greater;
3. A shallow dose equivalent to skin or extremities of 250,000 mrad or greater; or
4. Release of radioactive material such that an individual could have received an intake of 5 ALI in 24 hours.

Notification to the Division within 24 hours is required if any incident involving an SEG radiation source may have caused or threatens to cause:

5. A TEDE exceeding 5,000 mrem;
6. An eye dose equivalent exceeding 15,000 mrem;
7. A shallow dose equivalent to the skin or extremities exceeding 50,000 mrem; or
8. Release of radioactive material such that an individual could have received an intake exceeding 1 ALI.

The above notifications are not applicable to doses received from planned special exposures that are within the limits for planned special exposures. Reports made to the Division shall be made in a manner such that names of individuals are stated in a separate and detachable portion.

15.9 Reports of Overexposures, Excessive Radiation Levels, and Concentrations Exceeding Limits

SEG shall issue a written report to the state within 30 days for:

1. Any incident requiring notification in Section 15.9;

2. Exceeding dose limits for any occupationally exposed adult;
3. Exceeding dose limits for any occupationally exposed minor;
4. Exceeding dose limits for an embryo/fetus of a declared pregnant woman;
5. Exceeding dose limits for an individual member of the public;
6. Radiation levels or concentrations in the restricted area exceeding the state regulatory or license limits; or
7. Radiation levels or concentrations in the unrestricted area exceeding 10 times any state regulatory or license limit.

Each report shall describe the extent of exposure of individuals to radiation or radioactive material and include:

1. Estimates of each individual's dose;
2. Levels of radiation and concentrations of radioactive material involved;
3. Cause of the elevated exposures dose rates, or concentration; and
4. Corrective actions taken to ensure against recurrence, including a schedule for achieving conformance with requirements.

Reports shall provide descriptions of each involved individual by name, social security number and date of birth such that the information on individuals is stated in a separate and detachable portion.

15.10 Notice of License Termination

If SEG should ever decide to terminate the radioactive materials license, the regulations require written notification of that intent no less than 30 days prior to the license termination.

15.11 Recordkeeping Requirements and Policy

The regulations require SEG to document compliance with the radiation protection program in almost all aspects that could be related to health and safety of radiation workers or individual members of the public. At SEG, records shall be maintained indefinitely. The recordkeeping requirements are important due to the regulations requiring them as well as the potentially high liability issues that can arise. Demonstration of regulatory compliance and ALARA practices is also valuable from a public relations viewpoint. All records shall be prepared and maintained in accordance with Section 15.2 of this guide.

15.12 Documentation of the SEG Radiation Protection Program

The regulations require that the radiation protection program at SEG be documented. This Radiation Safety Guide, Health Physics Procedures, the SEG Quality Assurance Manual, and other records such as surveys, training records, audits, and radiation safety meeting minutes will be maintained to document the implementation of the radiation protection program at SEG. In addition, annual reviews and implementation and compliance audits will be documented and records kept of these reviews. Records of the radiation protection program will be retained indefinitely in accordance with regulatory and insurance coverage requirements.

15.13 Records of Prior Occupational Dose

The regulations require SEG to determine occupational dose for the current year and to attempt to obtain records of lifetime cumulative occupational dose for each individual who is likely to receive an occupational dose requiring monitoring (see Section 3.1). In addition, any individual who is to participate is a planned special exposure (PSE) shall have a complete dose history on file of all previous PSE's as well as all doses in excess of the limits received during the individuals lifetime.

For occupational exposures during the current year other than PSE's, SEG can accept a written statement disclosing the nature and amount of occupational dose. The statement must be signed by the individual or the individual's most recent employer for work involving radiation exposure. For lifetime cumulative dose SEG can accept an up to date Form RHS 8-1 or equivalent that is signed by the individual and the most recent employer for work involving radiation exposure. Reports can be provided via letter, telegram, or electronic media provided that the authenticity of the information can be established.

SEG will record the exposure history of occupationally exposed individuals on Form RHS 8-1, or equivalent. After recording the information, the form is to be signed by the individuals who received the exposure.

Records on Form RHS 8-1 are retained indefinitely after the SEG license is terminated and until a determination is made by SEG management that the records are no longer needed.

15.14 Records of Current Occupational Dose

SEG is required to maintain records of doses for all individuals that are required to be monitored. Records shall include, when applicable:

1. The deep dose equivalent to the whole body, eye dose equivalent, shallow dose equivalent to the skin, and shallow dose equivalent to extremities;

2. The estimated intake or body burden of radionuclides;

3. The committed effective dose equivalent (CEDE) and specific information used to calculate the CEDE;

4. The total effective dose equivalent, when required; and

5. The total organ dose equivalent (TODE), which is the sum of the deep dose equivalent and the committed dose to the organ receiving the highest dose (maximally exposed organ).

Some examples of specific information used to calculate the CEDE are measurements of airborne concentrations and quantities of radionuclides in the body or excreted from the body. In addition, respiratory protection equipment will reduce the intake of airborne contaminants into the body. The regulations also give a specific extension of time for recording and reporting of assessment of doses due to intake of Class Y material using bioassays. Recording and reporting of such material can be delayed for up to 7 months, unless specific notification is required as described in Section 16.8 and 16.9.

The TEDE will be reported when both internal and external monitoring are performed. The records require entries of the above records on at least an annual basis.

All records shall be maintained on Form RHS 8-2 or equivalent. Individual dose records are private and shall be protected from public disclosure. The above records shall be retained indefinitely.

Monthly results from personnel dosimeters, dose calculations, overexposure investigations and reports shall be maintained as backup for the current dose records. Self-reading dosimeter results shall be maintained at least until the official (TLD or film) dosimeters are read. After that, the temporary self-reading results may be discarded if desired, but will generally be kept for backup.

Backup information and data for internal doses shall also be maintained. These records include results of bioassays, DAC-hr calculations, internal dose assessments, investigations of daily intakes exceeding 2 DAC-hours and weekly intakes exceeding 10 DAC-hrs, overexposure investigations and reports, and related records. Bioassay records shall be kept indefinitely.

Additionally, as a part of the SEG ALARA practices, periodic reports are prepared showing the accumulated dose for the monitoring period (quarter and year-to-date). These reports are used internally for ALARA planning and dose control and may be discarded, if desired, after the official current dose records are updated.

15.15 Records of Doses to the Embryo/Fetus

Records of doses to the embryo/fetus shall be maintained in accordance with the current occupational dose records requirements and policy in Section 15.14. The records shall be kept with the records of dose to the declared pregnant woman. The declaration of pregnancy shall also be kept on file with the dose records.

15.16 Records of Doses from Accident and Emergency Conditions

Dose records for individuals due to accident and emergency conditions shall be maintained in accordance with the requirements and policy for current occupational dose records.

15.17 Records of Dose to Individual Members of the Public

SEG is required to maintain records sufficient to demonstrate compliance with the dose limit for individual members of the public. These records shall be retained indefinitely.

In accordance with this requirement, all records of measurements and evaluations including TLD's, air samples, effluent data and calculations, NESHAP compliance reports, environmental samples, swipes, surveys, calibrations of equipment, and any other supporting information shall be retained indefinitely.

15.18 Records of Surveys

Survey records include any surveys that are made to comply or to show compliance with the regulations. Examples include surveys for radiation, surface contamination, and airborne radioactivity. Other survey records include results of environmental surveys, transportation surveys (incoming and outgoing), surveys of packages containing radioactive materials, monitoring and sampling results from plant releases to the unrestricted area, and related calibration and QC records. SEG policy is to retain all survey records indefinitely after license termination and until a determination is made by management that the records are no longer needed.

15.19 Transportation Records

Transportation records include surveys, 10CFR61 classification determinations, transportation classification determinations, copies of shipping forms, and reference documents. All records associated with transport for purposes of waste processing or disposal shall be maintained indefinitely or until their disposition is otherwise authorized by the DEC. Other transportation records are not required to be maintained; however, SEG policy is to maintain transportation records until the RSO and other appropriate SEG management determines them to be of no further value. The minimum time period for records retention shall be ten years after termination of the licenses.

15.20 Records of Training

Training records consist of copies of course outlines, lists of trainees attending training, trainee checkoff sheets, retraining records, test results, and test examples. The regulations do not set a specific retention time for training records; however, SEG policy is to maintain training records indefinitely after license termination until determination is made by management that the records are no longer needed. The minimum time period for records retention shall be ten years after termination of the licenses.

15.21 Records of Waste Disposal

Waste disposal records include documentation of all environmental releases and shipments of waste off-site. Survey results and shipping documents are used to the extent possible to document disposal. The regulations require that copies of original shipment manifests from waste generators as well as manifests of processed and repackaged wastes be retained until disposition is authorized by the DEC. In addition, all records of transfer or disposal of licensed material shall be retained. Records shall be retained until the SEG radioactive materials licenses are terminated and authorization from the DEC is obtained for their disposition. It is SEG policy to maintain records of waste disposal for an indefinite period after termination of the radioactive license. The minimum time period for records retention shall be ten years after termination of the licenses.

15.22 Radioactive Material Inventory Records

Radioactive material inventory is maintained by a tracking system. When radioactive material is received, it shall be logged into the system with the date received, its radionuclide activity and an identifying code.

Check sources and standards shall be controlled and inventoried in accordance with the Radioactive Materials Controls Program; that is, they are logged into the inventory system, stored, and individually logged out when disposed of appropriately.

The regulations do not set a specific retention time for inventory records; however, SEG shall maintain inventory records until the RSO determines them to be of no further value. Retention is expected to be on the order of many years. The minimum time period for records retention shall be ten years after termination of the licenses.

15.23 Records of Exemptions to Container Labeling Requirements

Containers that are accessible only to individuals authorized to handle or use them, or to work in the vicinity of them, are exempted from the requirements for labeling provided that a written record of the container contents is provided to the individuals. The records shall be retained as long as the containers are in use for the purpose indicated on the record.

15.24 Miscellaneous Records

Certain other records are also maintained. These include all instrument logs, calibrations and repairs, procedure violation and variations, RHWP logs, investigations, audits, inspections, related correspondence, and any other documentation the RSO considers it prudent to maintain. The minimum time period for records retention shall be ten years after termination of the licenses.

ATTACHMENT 4

SEG HEALTH AND SAFETY MANUAL

SEG HEALTH AND SAFETY POLICY

The Scientific Ecology Group (SEG) is dedicated to the task of providing employees with a safe working environment. SEG recognizes that the health and safety of employees are of the greatest importance, ranking ahead of productivity and quality.

The success of the safety effort at SEG depends upon a thorough understanding and acceptance of the following principles upon which this effort is based:

1. ALL INJURIES CAN BE PREVENTED. Accidents do not just happen; they are caused.

2. MANAGEMENT, WHICH INCLUDES ALL LEVELS OF SUPERVISION, IS RESPONSIBLE FOR THE PREVENTION OF INJURIES. Since line organization has the responsibility for every operational activity of SEG, each member of management must accept their share of the responsibility for the safety of their employees.

3. ALL HAZARDS CAN BE SAFEGUARDED. While it is preferable to eliminate workplace hazards entirely, where this is not reasonable or practical, physical safeguards or operating procedures shall be used to prevent injury.

4. TRAINING IS ESSENTIAL TO THE SUCCESS OF THE SAFETY EFFORT. Employees cannot be expected to be capable of working safely without being trained about the hazards of the job and the rules and procedures created to avoid injuries from the hazards.

5. SAFETY IS GOOD BUSINESS. A positive safety culture reflects the quality of management, supervision and the work force. It serves to promote business and thereby contributes to the continuing growth and success of SEG. No venture, regardless of profitability, is worth it if it should cause human suffering through injury or illness.

6. WORKING SAFELY IS A CONDITION OF EMPLOYMENT. Although management has the ultimate responsibility for safety, each employee must be willing to participate in the safety effort and integrate safety into each job function.

By establishing and operating within these principles, SEG can live up to its' vision to be "the safest, highest performing, innovative waste management company in the world...".

DATE OF ISSUE

AUG 16 1994

CONTROL NO.

1017

H.W. Arrowsmith

H.W. "Bud" Arrowsmith
President

HEALTH AND SAFETY MANUAL

FOR

THE SCIENTIFIC ECOLOGY GROUP, INC.

OAK RIDGE, TENNESSEE

TABLE OF CONTENTS

1. ADMINISTRATION

1.1 PURPOSE AND SCOPE

It is the purpose of this manual to provide the rules, policies, procedures, regulations, recommended practices and other pertinent information to prevent exposure of employees to injury, illness, or to work conditions adversely affecting their health.

The manual is a written document containing company safety rules and regulations providing employees with written guidance to perform safe job tasks.

Each member of management has a personal responsibility to implement the provisions of this manual as it applies to his or her assigned functions and responsibilities. Each employee is obligated to comply with these policies and procedures in order to meet the overall objective.

1.2 OBJECTIVE

The objective of the SEG health and safety program is to provide employees with a safe work place. This will be accomplished by establishing and implementing appropriate policies and programs with support and participation of management and all employees. The management of SEG is responsible for providing planned and systematic programs to integrate health and safety measures into the methods and procedures of all processing, engineering, construction, and service operations.

1.3 MAINTENANCE

This manual shall be reviewed periodically for corrections/additions and updated as needed. Any changes to this document shall be reviewed by the Industrial Hygiene and Safety Manager and approved by SEG management.

Each manual holder is responsible for maintaining the manual and entering each new release or correction as it is received from Document Control. This manual shall be made readily available to all employees.

1.4 GENERAL SAFETY RULES

Safe employee behavior is fundamental to avoiding injuries and damage to facilities and the environment. The establishment and enforcement of these rules are a reminder that each employee is responsible for his or her own behavior. Employees are subject to preventive measures including suspension of employment for the disregard of safety rules and procedures. These are general rules which are applicable to all SEG employees. Employees should be aware of other safety-related rules which may exist for a particular location or job.

- Report all injuries or suspected injuries, regardless of how slight, to supervision immediately.
- Report all off-the-job injuries that have the potential to be aggravated by work-related activity to supervision upon return to work following the injury.
- Report all incidents that have the potential for serious injury, health effects, significant property damage, and adverse impact on the environment.
- Operate all machines and equipment with guards and safety devices in place and in operating condition.
- Practice good housekeeping at all times. Keep aisles, walkways, stairways, and exits clear of materials.
- Properly wear and care for all personal protective equipment required and provided by the company.
- Obey all posted safety warnings, cautions, and instructions.
- Keep all tools and equipment in safe working condition. Replace defective tools and equipment before using.
- Operate only that equipment and processes for which you been properly trained.
- Use only those chemicals and products for which a Material Safety Data Sheet has been obtained and provided. Read and understand information contained on MSDS for chemicals in your work area.
- Store flammables, combustibles, and chemicals in proper containers and cabinets with appropriate labels.

- Wear selt belts or personal restraint devices while operating company vehicles and personal vehicles on company property.
- Report spills of radioactive and nonradioactive materials immediately.
- Report unsafe acts and conditions to your supervisor immediately.
- Comply with SEG Standards of Behavior as outlined in the SEG Employee Handbook.

1.5 RESPONSIBILITIES

At SEG, safety is everyones' responsibility. All employees have the responsibility to contribute toward a safe work environment. Everyone must realize that it takes the commitment of all employees to have an effective health and safety program.

1.5.1 Management

Management is ultimately responsible for the implementation of health and safety measures to control losses. This responsibility is clearly that of direct supervision and cannot be delegated. Responsibilities for management include:

- Develop and implement company health and safety policies.
- Periodically review company safety procedures and policies.
- Provide and maintain safe facilities and equipment.
- Initiate programs to assure compliance with all applicable laws and regulations pertaining to environmental and occupational health and safety.
- Provide personal, financial, and moral encouragement for implementation of company safety programs and procedures.
- Perform the annual safety program evaluation.
- Utilize or adopt safety promotions and ideas.
- Promote a continued safety awareness among employees to augment the safety culture.

1.5.2 Supervisors

Supervisors must realize that safety performance is a key factor in the overall performance of their work group. Injuries frequently result from the same deficiencies that impact productivity, quality, cost, and scheduling. Responsibilities of the supervisors are:

- Ensure that safety is designed into each operation or procedure.
- Accept as part of their responsibility, not only the safety of employees reporting directly to them, but also of those whose duties from time to time place them in proximity to the areas, operations, and equipment, under their direction.
- Instruct each employee concerning the hazards of their job and the equipment necessary to perform the job tasks safely.
- Conduct periodic safety inspections of the work areas.
- Ensure all new or relocated equipment has been reviewed by the HS Department and the Radiation Safety Officer before it is placed in operation.
- Impart to each employee the understanding that willful violation of established safety rules will not be tolerated and administer appropriate corrective action when health and safety rules are violated.
- Ensure all employee injuries and illness are properly treated and reported.
- Investigate and find the contributing factors of all incidents, even those which result in minor injuries, and make reports when required.
- Install a safety awareness in each employee through personal periodic safety contacts and by conducting group safety meetings.
- Give personal support to all safety activities and safety procedures.
- Take prompt corrective action whenever unsafe conditions and unsafe acts are identified.
- Become personally familiar with emergency first-aid practices and procedures.

- Provide employees with the proper personal protective equipment, instruct them in its proper use, and enforce the wearing of such equipment.
- Maintain a work environment that assures the safety of each employee.
- Ensure new and reassigned employees have received the proper training for their job assignment.
- Seek the assistance and advice of the HS department on matters concerning safe practices, policies, or procedures.

1.5.3 Employees

Each employee is responsible for contributing their part to the success of the SEG health and safety program. These responsibilities include:

- Realize that safety is a condition of their employment.
- Familiarize themselves and comply with all company health and safety rules, policies, and procedures.
- Properly use prescribed personal protective equipment.
- Follow proper job procedures, minimize risks, and take care of equipment.
- Immediately report all unsafe working conditions and unsafe acts.
- Report all incidents, injuries, illnesses, exposures, and near misses
- Maintain work areas clean and free of potential fire, spill, or tripping and falling hazards.
- Participate in safety training and safety meetings.
- Learn the hazards of the processes and equipment used on the job.
- Know what to do in case of emergencies involving fire, evacuation, spills, and medical situations.
- Report any defective, malfunctioning, or suspicious tool, machine, or protective device immediately.

- Be aware of what constitutes a safety hazard and constantly on the lookout for job hazards.
- Always look for ways to make the job safer.
- Be mindful of the safety of fellow employees.

1.5.4 Health and Safety Department

The primary function of the Health and Safety Department is to provide the technical expertise and guidance essential to the effective administration of the company health and safety programs. This includes:

- Assisting management and employees in implementing an effective safety program by the educational and technical activities related to the health and safety program.
- Recommend changes in safety policies, procedures, rules, and regulations to keep pace with technological advancements.
- Assist supervisors in providing job-related employee safety training.
- Correlate the accident prevention program with the standards established by the Occupational Safety and Health Act (OSHA) and state government agencies.
- Maintain liaison with federal, state and local regulatory authorities on environmental health and safety issues.
- Provide technical assistance to safety committees and supervisory personnel.
- Conduct health and safety surveys and recommend corrective action as needed.
- Investigate all fatal and multiple injury accidents, and any medical treatment injuries that appear to require technical attention.
- Prepare and maintain incident injury/illness data and records.
- Review, new, altered, or relocated equipment and processes prior to operation. Provide recommendations for safe operation.

- Review company procurement procedures to determine that appropriate equipment, chemicals, and personal protective equipment are purchased.

- Develop employee safety training programs and provide new or specialized safety training programs as required.

- Review and make recommendations on employee safety suggestions.

- Represent the company for safety in the business and safety community.

- Participate in special task force committees related to safety and industrial hygiene (i.e. Westinghouse Corporate Industrial Hygiene and Safety Policy Committee, Legislative Committee, etc.) .

1.6 ORGANIZATION

The center piece of the "organization for safety" is the SEG safety committee. This group, and its subcommittees, provide an organizational structure through which the goals and objectives of the company safety program can be achieved.

1.6.1 SEG Safety Committee

This committee is the SEG central safety committee responsible for establishing company policy for environmental health and safety issues. It is essentially a decision-making body on the health and safety policies and procedures affecting the well-being of all SEG employees. This committee shall oversee and provide continuity between general safety, accident prevention, and emergency response.

1.6.1.1 Responsibilities

- Provide the central leadership for the organization through which safety missions, goals, and standards are established and maintained.

- Review incident/injury/illness reports and worker compensation statistics.

- Review job practices and operating procedures to ensure that safety is well integrated into all aspects of SEG operations.

- Initiate programs to ensure compliance with all applicable laws and regulations pertaining to the environment and occupational safety and health.
- Review reports of subcommittees and initiate responses, corrective action, and recommendations.
- Address concerns of the employees related to environmental health and safety issues.
- Encourage and promote a positive safety culture throughout the company.
- Actively participate in safety and health instruction programs and evaluate the effectiveness of these programs.
- Regularly inspect the facility to detect unsafe conditions and practices.
- Recommend improvements to existing health and safety rules, regulations, and procedures.
- Recommend suitable hazard elimination, reduction, or control measures.
- Periodically review and update existing work practices and hazard controls.
- Assess the implications of changes in work tasks, operations, and processes.
- Monitor and evaluate the effectiveness of safety and health recommendations and improvements.
- Compile and distribute safety and health hazard information to the employees.

1.6.1.2 Participation

Membership in the committee is voluntary and shall be comprised of employees representing each work area and each level of employment.

1.7 TRAINING

1.7.1 Purpose

The success achieved in preventing injuries is largely dependent upon the actions of people. These actions are influenced by the information passed on to the employee from management and, as part of the total safety effort, should be initiated for the purpose of:

- Influencing the attitude of managers and supervisors concerning their health and safety responsibilities.
- Stimulating employee interest in health and safety.
- Providing specific job-related health and safety instruction to allow employees to avoid injury.

1.7.2 Types of Training

Training is the means by which management relates the skills and knowledge required to accomplish the work of the organization including accomplishing it without injury. In providing this training, it is the expectations of management that employees will have the responsibility for both learning and skill development.

The types of training essential to accomplish a well-balanced health and safety program at SEG include, but are not limited to, the following:

- New Employee Safety Orientation
- Annual Safety Training
- STOP
- Managing For Safety - Management/Supervisor Training
- Office Safety
- Workplace Meetings
- First Aid/Cardio-Pulmonary Resuscitation (CPR)

- Radiological Safety
- Respiratory Protection
- OSHA HAZWOPER Training (40-hour, 24-hour, 8-hour, Supervisor, and annual up-dates)
- First Responder

1.7.3 Training Description

1.7.3.1 New Employee Safety Orientation

This training is required for all newly hired or transferred employees and designated as "Radiation Workers". This training is normally conducted by the Health and Safety (HS) department following successful completion of the Basic Radiation Safety course. The subjects included in this training are:

1. Introduction To Safety
2. Responsibilities
3. Accident Prevention
4. Injury Reporting and Workers Compensation
5. Personal Protective Equipment
6. Hazard Communication/Right-To-Know
7. Emergency Response
8. Material-Handling
9. Lockout/Tagout
10. Hearing Conservation
11. Heat Stress Prevention
13. Bloodborne Pathogens
15. Safety Awareness and Participation

1.7.3.2 Annual Safety Training

This training is required annually for all employees designated as Radiation Workers. This training is used to refamiliarize the employee with information provided in the orientation course and new subjects pertinent to SEG operations.

1.7.3.3 Safety Training Observation Program (STOP)

STOP is a behavior modification program based on basic safety principles and observation techniques. The objective of this training is to reduce injuries by enabling all employees to recognize and eliminate unsafe acts and unsafe conditions in the workplace.

1.7.3.4 Managing For Safety

This course is designed primarily for managers and supervisors. To have an effective safety program, management must have a clear understanding of their responsibilities and the knowledge to perform their duties.

1. SEG Policies and Procedures
2. Managers and Supervisors Responsibilities and Liabilities
3. Safety Objectives
4. Injury/Illness Causes
5. Job Safety Analysis
6. Incident Investigation
7. Inspecting for Unsafe Acts and Conditions
8. Communication

1.7.3.5 Office Safety

This course is primarily for nonradiation workers who do not receive the rad worker health and safety training. The main objective is acquaint employees with the potential hazards which occur in the office environment. This training is usually provided by managers or supervisors.

1. Ergonomics
2. Lifting Safely
3. Trips and Falls
4. Hazard Communication
5. VDT Hazards

1.7.3.6 Workplace Meetings

Safety meetings are an integral part of establishing a work environment in which employees work safely free of injury and illness. Workplace safety meetings are meetings of recognized work groups which include the supervisor and all the employees for whom he or she is responsible. A well conducted group safety meeting focuses on the central theme of safety for each member to enhance the team or community within the group. These meetings should be held weekly, as a minimum.

1.7.3.7 First Aid/CPR

The need exists for trained personnel to render basic medical treatment in response to accidents with injury. The basic first aid training will follow the format developed by the American Red Cross and be conducted by the Training Coordinator or his representative. Until this training becomes a permanent segment of the initial worker training, all employees are encouraged to participate in this training and recertify each year.

1.7.3.8 Radiological Safety

Radiological safety training is provided for new employees with required annual requal training. Other forms of radiological training is available and conducted by the Health Physics department. Refer to the SEG Radiation Protection Manuals for details concerning these training requirements.

1.7.3.9 Respiratory Protection

The use of respiratory protection by employees at SEG is necessary and required for some work activities. Approval for using this equipment requires the appropriate training in the use and selection of respirators. The Health Physics department is currently responsible for the respiratory protection program and performs the training in conjunction with the new employee orientation training. Refer to the SEG Radiation Protection Manuals for details of these training requirements.

1.7.3.10 OSHA HAZWOPER (Hazardous Waste Management)

Federal and state regulations require employees involved with handling, storing, or treating hazardous waste to have specific job related training. The 40-hour course is required for all employees involved in off-site remediation of hazardous and mixed waste sites. Employees which handle SEG hazardous or mixed waste are required to attend the 24-hour course. Annual updates are required for each class.

1.7.3.11 First Responder

The First Responder training is a more intensive first aid course and is part of the local Emergency Medical Services System. This training is usually provided through Roane State Community College and certification is available through the State of Tennessee Division of Emergency Medical Services.

1.8 INCIDENT/INJURY REPORTING AND INVESTIGATION

Unexpected occurrences, whether or not they result in injury to personnel, but which had the potential for serious injury are called Incidents. Regardless if an injury is involved, it is important that these incidents be investigated promptly. Useful lessons can be learned from these investigations and publicizing them throughout the location may prevent a similar incident from occurring elsewhere. If incidents are not thoroughly investigated and reported, an important safety tool is lost which could result in a recurrence of the event possibly leading to an injury to someone else.

1.8.1 Purpose

Incident investigations are designed to discover and correct the conditions within the organization which permitted the incident to occur. These investigations should lead to the recognition of the need to correct portions of the safety management process.

The primary basis for performing an incident investigation is to analyze the incident as an undesirable event and determine what can be done to correct contributing factors of the incident. The purpose of investigating incidents is not to find fault or determine blame, but discover defects in the safety system and how it can be improved.

Reporting injuries resulting from an incident is also a requirement under the law. Federal and state OSHA regulations and Workers' Compensation laws require employers to report workplace injuries and illnesses.

1.8.2 Objectives

To be effective and to improve the safety management process, then these investigations should direct attention to the following objectives:

1. Examine the circumstances or operation in which the incident occurred in order to determine safety strengths and weaknesses.
2. Determine what changes or strategies appear necessary to reinforce strengths and correct weaknesses.
3. Take steps designed to prevent reoccurrences of similar injuries by bolstering the safety management process.
4. Demonstrate management's commitment to the welfare of employees, the public, and the environment.

1.8.3 Injury Reporting

The reporting of incidents resulting in injury shall comply with SEG procedure HS-ADM-004, Injury Reporting. The following steps should be observed anytime an injury occurs:

1. *Care for the injured.* The injured employee, if able, should notify his or her supervisor immediately. The supervisor shall determine the extent of the injury and determine that the injured is receiving appropriate medical attention. The objective is to obtain the best possible medical treatment available in a timely fashion.

2. *Notification of Family and/or Government Agencies.* The supervisor, with assistance from the injured, if able, should determine if family notification is necessary. If the incident involves a fatality, multiple hospitalizations, or an environmental impact, notification of appropriate governmental agencies is required.

3. *Preliminary Fact Finding.* Preliminary discussions with the injured employee assists in obtaining a brief understanding of the incident events and others involved. This information establishes the framework for which a thorough investigation, if warranted, can be conducted.

1.8.4 Investigations

As soon as possible after the incident has occurred, it is the responsibility of the group supervisor to investigate the circumstances surrounding the event and prepare a report of the findings, including recommendations to prevent recurrence. Comments from the employees directly involved in the incident are usually very important and the employees' input should be included in the investigation findings.

After the investigation is completed, the supervisor shall issue an Incident Report using the format outlined in SEG procedure HS-ADM-005, Incident Investigation and Reporting, and include the following:

1. Nature of the Incident
2. Description of Incident
3. Facts of the Incident
4. Corrective Action
5. Investigation Participants

Each department shall receive a copy of the report and inform those members of their department they believe will profit by the information.

1.8.5 Off-The-Job Injuries

All injuries or illnesses received off-the-job which could affect job performance shall be reported to the appropriate supervisor. It is possible these injuries may be aggravated by work activities or adversely influence employee effectiveness. As such, no employee injured off-the-job shall be returned to work unless evaluated as fit for duty and able to perform normal job functions of the position as determined by the SEG company physician.

1.9 REGULATIONS, STANDARDS, AND GUIDELINES

The safety management process at SEG is directed by the principles of the SEG Health and Safety Policy to provide a safe working environment for all employees. In fulfilling this commitment, the company must also observe and comply with all applicable government rules and regulations. SEG must also consider the influence and resources of those non-regulating agencies which impact environmental health and safety regulations.

1.9.1 Regulations

1.9.1.1 Occupational Health and Safety

Regulations governing the health and welfare of working employees are contained in Title 29 Code of Federal Regulations Parts 1910 and 1926. These regulations are enforced by the Tennessee Department of Labor, Occupational Safety and Health Administration.

The state also has jurisdiction over Workers' Compensation laws for employees injured on the job.

1.9.1.2 Environmental

There are several regulations and agencies which have jurisdiction for environmental issues. Some of these rules also contain specific issues concerning the health and safety of employees. These include hazardous and solid waste, air and water quality, and radiation protection. Tennessee is an agreement state with the EPA and regulates these areas through these divisions of the Department of Environment and Conservation:

- Division of Solid Waste Management
- Division of Air Pollution Control
- Division of Water Quality
- Division of Radiological Health

1.9.1.3 Other

Other regulatory agencies which may impact SEG operations include:

- Department of Transportation
- Nuclear Regulatory Commission

1.9.2 Standards and Guidelines

These agencies develop and publish references and guidelines which at times are incorporated into applicable federal and state regulations or become accepted standards for certain industries.

- American Conference of Governmental Industrial Hygienists- ACGIH
- American National Standards Institute - ANSI
- National Fire Protection Association - NFPA
- National Institute for Occupational Safety and Health - NIOSH
- Compressed Gas Association - CGA
- National Electrical Code- NEC

1.10 REFERENCES

The following are SEG documents with references to environmental safety and health which all employees should be familiar.

- Spill Prevention Countermeasures and Control Plan (SPCC)
- Hazardous Waste Contingency Plan
- Operation and maintenance procedures for waste processing operations
- Radiation Protection Manuals
- Quality Assurance Manual

1.11 PROCEDURES

Procedures are prepared to cover specific areas and segments of the work at SEG. Some of those included in this manual apply to all employees regardless of the particular job function. Others are applicable only to those work activities or equipment referenced by to the specific procedure. In addition to the procedures included in this manual, other departments and sections may have standard operating procedures which include specific job-related safety guidelines.

Employees are advised to study and become familiar with the rules and procedures contained in this manual and the other SEG documents which contain standards of performance for employees.

12.0 UNCONDITIONAL RELEASE PROGRAM

12.1 Section Overview

SEG is authorized to unconditionally release tools, equipment, parts, and materials provided that surface contamination (i.e., non-irradiated materials) levels do not exceed the limits contained in the radioactive materials licenses or USNRC Regulatory Guide 1.86.

Material to be unconditionally released from RCA's shall be surveyed to ensure compliance with the unconditional release criteria. Radiological characterization is performed to identify the radionuclides present, so that proper survey methods, instrumentation and release limits are selected to ensure the material meets the unconditional release criteria for fixed and removable alpha and beta-gamma contamination.

12.2 Survey Instrumentation Requirements

The energy dependence of the monitoring instruments for alpha, beta, and gamma radiation shall be known and documented in accordance with the Instrumentation Program. Instrumentation used to perform direct alpha measurements shall be capable of detecting the required release limits at greater than 50% confidence level. Instrumentation used to perform direct beta measurements shall be capable of detecting all beta emitters with maximum beta energy $\geq$ 150 keV within the established release limits at the 90% confidence level. Hand held instruments used to survey for fixed contamination should be equipped with an audible response or an audible alarm and should be operated with the audible response or alarm active. Instruments used to survey material for unconditional release shall be calibrated in accordance with the Instrumentation Program. Instruments used to survey material for unconditional release shall be source checked and verified operational prior to performing a survey for unconditional release.

12.3 Radiological Characterization

Radiological characterization of material is performed to identify the radionuclides that are present, so that proper survey methods, instrumentation, and release limits are selected to ensure the material meets the unconditional release criteria for fixed and removable alpha and beta-gamma contamination. Radiological characterization can be accomplished by performing radiological analysis to determine the radionuclides present. Radiological analysis shall be performed to identify radionuclides present or as directed by Health Physics management. Radiological analysis shall consist of collecting samples from the material and analyzing the samples to determine what radionuclides are present.

12.4 Unconditional Release Criteria

Surface contamination levels of material to be unconditionally released for unrestricted use shall be less than the most restrictive values listed in SEG radioactive material licenses or Regulatory Guide 1.86. Special procedures and techniques shall be required for unconditional release of material contaminated with transuranics, NORM, TERM, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125 or I-129.

12.5 Unconditional Release of Materials

Personnel shall monitor for contamination on hand carried items in accordance with posted instructions when exiting Contaminated Areas and RCA's. Tools, equipment, and materials to be released for unrestricted use from the RCA shall be surveyed by a qualified decontamination technician or by health physics personnel. These surveys shall be performed in such a manner and with appropriately sensitive instrumentation to ensure the tools, equipment or material meets the unconditional release limits. Only health physics personnel shall authorize the release of material for unrestricted use.

12.6 Unconditional Release Surveys

Unconditional release surveys shall consist of both direct and indirect monitoring methods to assess the residual surface contamination of the material being monitored. Radiation detection instrumentation used for direct monitoring shall be checked for proper operation prior to use of monitoring operations. Radiation detection instrumentation used for direct monitoring shall be positioned at a predetermined fixed distance from the surface of any item being surveyed and moved with a scanning speed that will provide a detection capability to reliably meet the unconditional release limits. Direct monitoring of items or material shall be performed in areas where background radiation levels will not interfere with the detection capability to meet unconditional release limits for the instrumentation being used.

Indirect survey techniques utilized shall provide consistency and reproducibility and shall be representative of the surface being evaluated. A sufficient number of smear samples shall be obtained and counted to properly evaluate the material for loose-surface contamination. Instrumentation used to count smear samples shall be of a type that provides a reasonable geometry and counting efficiency for the radionuclides characterized as being present. Smears shall be counted for a sufficient period of time to provide for counting accuracy, reliability and acceptable MDA.

Items or material with inaccessible surfaces shall be evaluated by surveying the accessible external surfaces and openings to internal surfaces provided the contamination at the accessible locations can be demonstrated to be representative of the inaccessible surfaces. Surfaces of equipment or material which are likely to be contaminated but are of such size or construction as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the unconditional release limits.

Results of unconditional release survey for surface contamination shall be documented. Documentation shall be clear, legible and contain all the applicable information. Documentation of surveys performed shall be retained for the appropriate time period specified in the current SEG records management system.

13.0 RESPIRATORY PROTECTION POLICIES

13.1 Section Overview

Respiratory protection measures shall be employed to protect workers from a variety of airborne hazards. The hazards may be of a radiological or non-radiological nature. Radiological airborne hazards include particulate materials and gases. Non-radiological hazards include oxygen deficient atmospheres, airborne asbestos fibers, particulates, and vapors. This program for respiratory protection is based on requirements in Tennessee Chapter 1200-2-5-.90 through .93 for radiological hazards and the Code of Federal Regulations Title 29 Part 1910.134 for non-radiological hazards.

The Respiratory Protection Program includes the following elements as recommended by NUREG 0041, "Manual of Respiratory Protection Against Airborne Radioactive Material":

1. Written standard operating procedures and policy statement;
2. Proper selection of equipment, based on the hazard;
3. Proper training and instruction of users;
4. Proper fitting, use, cleaning, storage, inspection, quality assurance, and maintenance of equipment;
5. Appropriate surveillance of work conditions, degree of employee exposure to stress;
6. Regular inspection and evaluation to determine the continued program effectiveness;
7. Program responsibility vested in one qualified individual;
8. An adequate medical surveillance program for respirator users;
9. Use of only Bureau of Mines/National Institute of Occupational Safety and Health (NIOSH) certified equipment; and
10. Maintenance of a bioassay program.

Respiratory requirements are determined by assessing work plans, evaluating conditions in the work area and reviewing available historical data on the airborne hazards for a particular job. The evaluations include measuring airborne concentrations or oxygen content prior to working in an area. Follow-up measurements are made to evaluate airborne concentrations during work. Respiratory protection equipment is selected using allowed respiratory protection factors to ensure that individual limits on intake or exposure are not exceeded.

13.2 Respiratory Protection Policy Statement

Scientific Ecology Group's Respiratory Protection Policy Statement is included as an attachment at the end of this section. This policy statement is to be provided and explained to respirator users during Respirator Users Training.

13.3 Use of Respirators

Routine operations are planned activities that are generally repetitive and occur with various frequencies. For such operations, potential sources of airborne contaminations should be identified so that respiratory protection may be accomplished by the use of process, containment, and ventilation measures and by preplanning of work. The use of respirators as a substitute for engineering controls in routine operations is inappropriate.

Non-routine operations are activities that are either non-repetitive or else occur so infrequently that adequate limitation of exposures by engineering controls is impractical. To the extent that process, containment, and ventilation controls are not reasonably feasible in non-routine operations, the use of respirators to avoid excessive exposure to airborne contaminations is appropriate.

Emergencies are unplanned events characterized by risks sufficient to require immediate action to avoid or mitigate an abrupt or rapidly deteriorating situation. Although emergencies are unplanned, preparations will be made for coping with potential emergencies by providing necessary and sufficient respiratory protection for use in potential emergencies that are likely to entail respiratory hazards.

The periods of time respirators are worn continuously and the overall durations of use shall be kept to a minimum. It is difficult to realistically assign specific time limits on respirator use because of the wide variations in job requirements and in the physical capacities and psychological attitudes of individuals. Provision is to be made by supervision, for the respirator users to leave areas where respirator use is required for relief in case of equipment malfunction, undue physical or psychological distress, procedural or communication failure, significant deterioration of operational conditions, or any other condition that might require relief.

13.4 Engineering and Administrative Controls

Respirators shall be used to control personnel exposure to airborne radioactive materials when administrative and engineered controls are not effective and the use of respirators result in Total Effective Dose Equivalent (TEDE) being ALARA. Administrative controls shall be used to limit personnel access to or time spent in an area. Engineered controls shall be used to limit production of airborne contaminants and to control distribution of airborne radioactive materials.

Appropriate respiratory protection shall be prescribed when personnel are exposed to atmosphere Immediately Dangerous to Life or Health. Respirators may also be prescribed when personnel may be exposed to contaminants at or in excess of the appropriate TLV as established by the American Conference of Government and Industrial Hygienists. As with the radiological use of respiratory protection equipment, primary reliance will be placed upon administrative controls to limit personnel access to hazardous areas and engineered controls to limit production of toxic or nuisance atmospheres or to "clean" up contaminated atmospheres. When such methods are not practical, respiratory protection equipment shall be used as necessary.

13.5 Determination of Respiratory Protection Requirements

Determination of respiratory protection requirements and selection of equipment shall be made by trained and qualified individuals only. Training and qualifications shall be documented. Respiratory protection devices are permitted for jobs where an ALARA evaluation has been conducted and it has been demonstrate ! that the use of respirators will maintain the Total Effective Dose Equivalent (TEDE) ALARA. Determination of respiratory protection requirements and selection of equipment for non-radiological contaminants shall be made by the Industrial Hygiene and Safety Department.

13.6 Selection of Respiratory Devices

The proper selection of a respiratory protection device is possible only when consideration of the factors involved indicates that the device selected will provide satisfactory protection when properly used. The selection of respiratory protection equipment, therefore requires knowledge of such factors as:

1. The chemical, physical and toxicological properties of the substance against which protection is required.

2. The processes occurring during the work activity and conditions of the work area, as they relate to the dissemination of contaminants.

3. Actual and potential hazards to determine whether conditions Immediately Dangerous to Life or Health exist or whether health effects would result only after prolonged or repeated exposures.

4. The nature of duties to be performed by the user, particularly as they relate to restriction of movements and worker efficiency.

5. An understanding of the principles, design, scope of use, limitations, advantages and disadvantages of the equipment.

6. The external radiation hazards.

Respiratory protection equipment will normally be selected that has a protection factor greater than the anticipated peak airborne concentration expressed as a multiple of total DAC. Respiratory protection equipment may be selected that has a protection factor less than the anticipated peak airborne concentration expressed as a multiple of total DAC provided that use of that equipment is expected to result in a lower TEDE. This evaluation should be documented in the RHWP package. Protection factors for respiratory protection equipment shall be assigned in accordance with Schedule RHS 8-32 of Tennessee regulations 1200-2-5.

13.7 Facial Hair Policy

Individuals using tight-fitting respirators shall not have any facial hair that interferes with the sealing surface of the respirator. Any intrusion of facial hair into the sealing surface of the respirator can result in air in-leakage. Any worker who has facial hair that intrudes into the area where the respirator seals against the face shall not be fitted with a tight fitting respirator. Additionally, any worker who is not clean-shaven shall not be issued a respirator, even though he has previously obtained a satisfactory fit with the particular device.

13.8 Medical Requirements

Personnel who require the use of respiratory protection equipment in the course of work at SEG shall receive a physical examination, and be certified by a physician as qualified to wear respiratory protective equipment prior to wearing any respiratory protection device. Physical examinations shall be required at least annually (every 11-13 months) thereafter. Personnel shall be medically evaluated to ensure they posses the physical and psychological capabilities necessary to perform tasks while wearing a respirator. This medical evaluation shall use Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection" as guidance in determining if an individual is medically qualified to wear respiratory protection equipment.

13.9 Training

Respirator users shall be trained at least annually (every 11-13 months) in the proper use and maintenance of respiratory protection equipment. Training of personnel in the use of respiratory protective equipment shall be performed by a knowledgeable instructor. The instructor shall have a thorough knowledge of the application and use of respiratory protective equipment and the hazards associated with radioactive airborne contaminants. Training shall include, but is not limited to, the following:

1. Presentation of SEG Respiratory Protection Policy Statement.

2. Discussion of the airborne contaminants against which the wearer is to be protected.

3. Discussion of the construction, operating principles and limitations of the various respirators.

4. Explanation of why more positive control measures are not always feasible. This shall include recognition that every reasonable effort is being made to reduce or eliminate the need for respirators

5. Instructions for assuring that respirators are in proper working condition.

6. Instructions in donning and removing the respirator properly.

7. Instructions in the proper method for checking to ensure an adequate face to facepiece seal.

8. Instruction in the proper use and maintenance of the respirator, including assurance to the user that he or she will be issued a sanitized and properly operating respirator.

9. Discussion of the types of cartridges and filters commonly used and the application for each type.

10. Instruction in emergency action to be taken in the event of a malfunction, including the appraisal of possible hazard in the event the respirator were to be removed in the hazardous area.

Personnel responsible for the cleaning and maintenance of respiratory protection equipment shall receive training necessary for fulfilling their responsibilities. This training shall include, but not be limited to the following:

1. Maintenance, inspection, and issuance of respiratory protection equipment.

2. Maintenance and repair of respiratory protection equipment in accordance with manufacturer's instructions.

3. Respiratory protection theory.

4. Properly cleaning and disinfecting respiratory protective equipment.

5. Proper storage of respirators.

13.10 Respirator Fit Testing

Respirators with a tight-fitting facepiece shall be fit tested to each individual to verify that an adequate seal can be obtained. The fit-testing shall be performed prior to first use for all users and shall be repeated at a frequency not to exceed 6 months for asbestos and lead workers and at a frequency not to exceed 12 months for all other users. Fit-testing shall be performed only on individuals who have a current medical approval, have received respiratory protection training within the past year and are clean shaven.

13.11 Respirator Maintenance

Respirators shall be cleaned and disinfected after each use. Respirators shall be inspected after each cleaning and necessary maintenance shall be performed. Maintenance shall be documented by the individual performing the maintenance. Respirators shall be stored in clean sanitary conditions. Storage locations shall be located free from chemical or physical agents which could be harmful to the respirator construction materials.

Respirators ready for issue shall be have no detectable beta-gamma or alpha loose surface contamination. Fixed contamination shall be < 100 cpm beta-gamma above background on sealing and interior surfaces, and < 500 cpm beta-gamma above background on the exterior surfaces as measured with a pancake type G-M detector. A satisfactory rating also indicates that the respirator meets all other inspection criteria.

13.12 Corrective Lenses

Personnel requiring corrective lenses when wearing a full-face respirator should wear prescription eye glasses approved for use inside a full-face respirator. Contact lenses shall not be used when wearing a full-face respirator without prior approval of the RPM or SSHO.

13.13 Supplied Breathing Air

All sources of breathing air shall meet the requirements for Grade D breathing air as specified in ANSI/CGAG-7.1 - 1989, "Commodity Specification for Air." Fittings to supplied air systems manifolds and cylinders shall be unique such that the introduction of gases other than pure breathing air is prohibited. Sources of breathing air shall be approved by the RPM or SSHO. If sources other than air cylinders are utilized, the source shall be sampled for Grade D breathing air prior to use and once every 6 months and after any maintenance on a breathing air system.

HP technicians or the SSHO shall perform smear surveys of breathing air manifolds, including airline connections, at least weekly while in use. Supplied air systems shall be assembled in the certified configuration, using only hose types, hose lengths and fittings approved for the device.

13.14 Program Quality Assurance

The radiological bioassay program is part of the Personnel Monitoring Program, but certain aspects of the bioassay program are pertinent to the Respiratory Protection Program. Personnel bioassay results shall be used to verify the respiratory protection program's effectiveness for selection of adequate respiratory protection devices and provision of properly functioning respiratory protection devices.

The Site Safety and Health Officer shall determine non-radiological bioassay requirements to verify the effectiveness of the Respiratory Protection Program for non-radiological exposures.

Stored respirators shall be inspected periodically to verify they have been properly cleaned, inspected, maintained and stored. Respiratory protection issuance records shall be reviewed periodically to verify only trained and qualified individuals are issued respirators. Respiratory protection training courses shall be reviewed periodically to assure adequacy of respirator training. In addition, maintenance and inspection records of respiratory protection equipment shall be reviewed to assure equipment is maintained in accordance with NIOSH certification.

ATTACHMENT 13.1
Respiratory Protection Policy Statement

It is the SEG policy to maintain personnel exposure to both internal and external hazards as low as is reasonably achievable (ALARA). Personnel exposure to airborne contaminants shall be limited by process and engineered controls whenever possible. However, under some conditions, process and engineered controls may not be feasible or provide adequate assurance that exposure to contaminants will be maintained ALARA. In such instances, respiratory protection devices may be required for individuals performing work in areas containing airborne contaminants. The selection and use of respiratory protection equipment shall be balanced against the potential for causing increased external exposure or other health and safety concerns. The use of respiratory protection equipment must be consistent with maintaining the total effective dose equivalent ALARA.

The routine use of respirators for radiological protection purposes will be prescribed by Health Physics usually on an RHWP. Concurrence by Health Physics shall be obtained prior to the non-routine use of respiratory protection equipment. Use of respiratory protection equipment during emergency conditions shall be in accordance with established procedures and should not hinder major medical or accident mitigation activities.

When respirators must be used, appropriate rest or relief periods shall be provided. An individual wearing a respirator may leave the work area at any time for relief in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of work area conditions, or any other condition that might require relief.

SEG is committed to establishing and maintaining a respiratory protection program consistent with the goal of protecting its employees. It is therefore the policy of this company that all employees, when using respirators in the work place, or administering the Respiratory Protection Program, shall adhere to the principles established in the written procedures.

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H. W. Arrowsmith Date
President
Scientific Ecology Group, Inc.

14.0 ENVIRONMENTAL MONITORING

14.1 Environmental Monitoring

If required, a site specific environmental monitoring program will be established to document compliance with Tennessee Regulation 1200-2-5 at each site prior to beginning operations at that site. The site specific environmental monitoring program shall be reviewed and approved by the Radiation Safety Committee and a copy submitted to the State of Tennessee.

Environmental conditions, as appropriate, will be monitored through measurements performed on air samples, surface water samples, sanitary sewerage discharge, soil samples, and ambient radiation, etc. Results from these measurements, if positive, can be utilized to calculate potential doses to individual members of the public. Measurements also serve to identify potential areas of concern and shall trigger appropriate radiological response or process changes in the event that unanticipated radiological conditions are identified.

Analysis of environmental samples and environmental media will be through the SEG laboratory at SEG's Bear Creek Facility or a qualified outside laboratory.

14.2 Environmental Action Levels

Air, water, and sanitary sewerage action levels shall be set at 10 percent of the applicable Table 2 values in Tennessee Schedule RHS 8-30. Soil and sediment action levels shall be set at 5 pCi/g for man-made radionuclides. Ambient gamma action levels shall be set at 25 millirem in any quarter, and 1 millirem in any one hour for individuals in unrestricted areas.

Immediate notification shall be made to the RSO or SSHO of any samples or doses exceeding action levels. The RSO or SSHO shall initiate or perform an investigation and response consisting of one or more of the following actions:

1. Verify of laboratory data and calculations;
2. Analyze and review probable causes;
3. Evaluate need for reanalysis or additional analyses on original sample;
4. Evaluate need for re-sampling;
5. Evaluate need for sampling of other pathways;

6. Evaluate need for notifications in accordance with Section 15;
7. Document all actions, analysis, and evaluations in logs or files; or
8. Perform dose assessment

14.3 Quality Control Requirements

Laboratory counting performed for purposes of environmental or effluent stream monitoring shall comply with the requirements of U.S. NRC Regulatory Guide 4.15.

Steps should be taken to ensure that samples collected are representative of the material sampled. Replicate samples should be taken periodically to determine the reproducibility of sampling.

Sample integrity should be maintained from the time of collection to time of analysis. Procedures shall contain requirements to ensure sample integrity.

Quality control sample analysis provides a means to determine the precision and accuracy of the monitoring process. SEG shall utilize both intralaboratory and interlaboratory measurements to verify the quality of its analysis methods.

Intralaboratory analyses shall consist of replicate sample analy s of environmental media, reference test materials, or both. The size and other physical and chemical characteristics of the replicate samples should be similar to those of samples that are routinely analyzed by the lab. If possible, replicate samples should be analyzed as blind samples. Simulated samples can be prepared when true replication or splitting of samples is not possible (e.g. air samples).

Analysis of intralaboratory blank and spiked samples should be performed on a regular basis to provide a basis for estimating the accuracy of analytical results.

Interlaboratory analyses provides a means to detect errors in measurement that might not be detected by intralaboratory measurements. SEG shall participate in the EPA Environmental Radioactivity Laboratory Intercomparison Studies (Cross-Check) Program, or other suitable program. Participation shall be for all of the determinations offered by EPA that are included in SEG's environmental monitoring program.

14.4 Operating Procedures and Instructions

SEG shall have written procedures for sample collection; packaging, shipment, and receipt of samples for off-site analysis; preparation and analysis of samples; maintenance, storage, and use of reference standards; calibration and checks of radiation and radioactivity measurement systems; and reduction, evaluation, and reporting of data.

14.5 Records

Records necessary to document the activities performed in support of the environmental program shall be maintained. Provision for tracking and control of laboratory samples through the sequence of monitoring processes shall be available. Documentation of sample collection shall include description, location, date, and time of sample; receipt and laboratory identification of the sample; preparation and processing of the sample; and analysis of the sample. In addition, background samples, analytical blank samples and data reduction and verification for those samples shall be documented.

Quality control records for laboratory counting systems shall include the results of measurements of radioactive check sources, calibration sources, backgrounds, and blanks.

Records shall be kept indefinitely after license termination until they are determined to be of no further use by management. The minimum time period for record retention shall be ten years after termination of the licenses.

14.6 Reference Standards

All standards used for calibration of laboratory equipment shall be NIST traceable when such standards are available. Preparation of working standards and standard geometries from certified standard solutions should be documented. The working standard should be prepared in the same manner as the unknown samples, to the extent practical.

Efficiency calibrations should be checked at least quarterly using reference standards. Calibrations should also be checked whenever a significant change or repair is made to the measurement system, or when changes are detected as a result of check source measurements.

14.7 Performance Checks of Radiation Measurement Systems

Scheduled checks should be performed on laboratory equipment to determine background counting rate and response to check sources. Results of these checks should be documented in laboratory logs and plotted on control charts. Investigations shall be performed and corrective actions taken whenever measurement values fall outside of predetermined control values.

Background counting should normally be performed daily or before each use. Check source measurements are usually measured daily or with each batch of samples counted on automated equipment.

Energy calibration checks on gamma spectrometry systems should normally be performed on a daily to weekly frequency. Results of measurements should be recorded and compared to predetermined limits to determine if adjustments to the counting are necessary.

Energy resolution measurements should normally be performed on a weekly to monthly frequency and check source counting rate on a daily frequency for gamma spectroscopy systems. These measurements should also be made after any significant changes to the system.

Results of all quality control measurements should be documented in laboratory logs or files.

14.8 Calculations and Computations

Calculations and computations used in determining concentrations of radioactive materials shall be independently checked prior to implementation. The calculations shall be proceduralized and implemented in accordance with quality assurance requirements for procedure development.

14.9 Data Review and Analysis

Review and analysis of data at SEG shall be performed on a timely basis in order to identify concentrations of radioactive materials in environmental media that are of concern or problems with laboratory equipment.

15.0 NOTICES, REPORTS, AND RECORDS

15.1 Section Overview

This section provides summary information regarding the radiation protection notices, reports, and records required by regulations and for purposes of insurance liability protection. This section also provides information about additional radiation protection records maintained for the radiation protection program at SEG.

The SSHO at SEG field projects is delegated full authority to perform or fulfill the responsibilities of the RSO. Notifications required for SEG field projects may be performed by the SSHO or by the RSO through coordination and communication with the SSHO.

15.2 Record Quality Assurance

All records required for license and regulatory compliance must be legible throughout their required lifetime, which is generally 10 years or more after the license is terminated. Records can be originals, microfilms, or copies provided that microfilms and copies are authenticated by authorized personnel and are capable of producing legible, accurate, and complete records during the required retention period. Records shall include all pertinent information, such as stamps, initials, and signatures. Safeguards against tampering and loss of records will be taken to ensure record security. Quality Assurance of records will be maintained in accordance with the SEG QA procedures manual.

15.3 Units of Measurement for Notices, Reports, and Records

The regulations require use of certain units for all quantities in radiation program records. SEG will use the units curie, rad, rem, and multiples thereof and will clearly indicate the units of all quantities on all required records. In addition, it is required that clear distinction be made among the quantities entered on records. For example, dose equivalent quantities shall be clearly defined as total effective dose equivalent, shallow dose equivalent, eye dose equivalent, deep dose equivalent, committed dose equivalent, and committed effective dose equivalent.

15.4 Notices and Reports to Employees

Regulations require that the following items be posted conspicuously so that workers can observe them as they go to or return from radiation work:

1. State Regulations for Protection Against Radiation, Radioactive Materials License and documents incorporated into the license by references or amendment,

2. Operating and Emergency Procedures,

3. Notice to Employees (RHS 8-3), and

4. Notices of Violation and responses concerning the regulatory violations.

In lieu of posting of the regulations, licenses, and procedures, a notice describing the document and the location where it can be examined is allowed. Notices of violation of the regulations and responses to such notices shall be posted within two working days after receipt or dispatch of the documents. These documents shall remain posted for a minimum of five working days or until the violation has been completely corrected, whichever is later.

It is the SEG policy that a written annual report of internal and external exposure be provided to workers. Regulations also require SEG to copy the effected individual(s) on any reports that are required to be submitted to the State. Information regarding administrative overexposures (those exceeding SEG administrative limits) is reported to employees as a regular part of SEG dose control practices. At the request of former employees, a summary report of exposures by year, must also be provided within 30 days from the request or within 30 days after the exposure has been determined. In addition, workers terminating employment may request a report or estimate of the dose received during the current quarter or calendar year.

15.5 Notification of Respiratory Protection Use

At least 30 days before SEG first uses respiratory protection equipment, the state shall be notified in writing of that intent. SEG interprets such equipment to include any kind of personal respiratory or breathing mask but not temporary or permanent engineering controls such as ventilation or other engineering techniques used to provide respiratory protection.

15.6 Notification of Packages Exceeding DOT Limits

The RSO shall immediately notify the final delivery carrier and the Tennessee Division of Radiological Health by telephone, telegram, mailgram, or facsimile when:

1. Removable radioactive surface contamination on external surface of packages exceeds 2,200 dpm/100 cm^2 β-γ activity or 220 dpm/100 cm^2 α activity when averaged over 300 cm^2 of package surface.

2. For non-exclusive use shipment:

   a. External radiation levels exceed 200 millirem per hour at any point on the external surface of the package, or;

   b. Radiation levels at three feet from the external surface of the package exceed 10 millirem.

3. For a package transported as exclusive use by rail, highway, or water radiation levels external to the package may exceed the limits in 2.a and 2.b above, but must not exceed any of the following:

   a. 200 millirem/hour on the external surface of the package unless the following conditions are met, in which case the limit is 1,000 millirem/hour.

      1. The shipment is made in a closed vehicle;

      2. Provisions are made to secure the package so that its position within the vehicle remains fixed during transportation; and

3. There are no loading or unloading operations between the beginning and end of the transportation;

b. 200 millirem/hour at any point on the outer surface of the vehicle, including the upper and lower surfaces, or, in the case of an open vehicle, at any point on the vertical planes projected form the outer edges of the vehicle, on the upper surface of the load, and on the lower external surface of the vehicle;

c. 10 millirem/hour at any point two meters from the vertical planes represented by the outer lateral surfaces of the vehicle, or, in the case of an open vehicle, at any point two meters from the vertical planes projected from the outer edges of the conveyance; and

d. Two millirem/hour in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when persons occupying these positions are provided with special health supervision, personnel radiation exposure monitoring devices, and radiation worker training.

15.7 Notification of Theft or Loss of Radioactive Material

If radioactive material exceeding 1,000 times the quantities in Schedule RHS 8-31 or any quantity of an unlisted material is lost or stolen, the regulations require immediate telephone notification to the Division of Radiological Health (8:30 am - 4:30 pm, Monday -Friday) or the Tennessee Emergency Management Agency (after working hours). Lost or stolen quantities exceeding 10 times those listed in Schedule RHS-31 require a report by telephone within 30 days. In addition to the verbal notification, a written report will be made within 30 days after the telephone report. The report will include:

1. Description of the radioactive material
2. Circumstances of the loss
3. Disposition of the material
4. Exposure assessment
5. Actions taken to recover the material
6. Measures taken to prevent recurrence of the theft or loss

Exposures to individuals from loss or theft of radioactive materials shall be provided in a separate and detachable part of the report.

15.8 Notification of Incidents

The regulations divide radiological incidents into two notification classes: immediate notification and 24-hour notification. Immediate notification by telephone is required if any incident involving an SEG radiation source may have caused or threatens to cause:

1. A TEDE of 25,000 mrem or greater;
2. An eye dose equivalent of 75,000 mrem or greater;
3. A shallow dose equivalent to skin or extremities of 250,000 mrad or greater; or
4. Release of radioactive material such that an individual could have received an intake of 5 ALI in 24 hours.

Notification to the Division within 24 hours is required if any incident involving an SEG radiation source may have caused or threatens to cause:

5. A TEDE exceeding 5,000 mrem;
6. An eye dose equivalent exceeding 15,000 mrem;
7. A shallow dose equivalent to the skin or extremities exceeding 50,000 mrem; or
8. Release of radioactive material such that an individual could have received an intake exceeding 1 ALI.

The above notifications are not applicable to doses received from planned special exposures that are within the limits for planned special exposures. Reports made to the Division shall be made in a manner such that names of individuals are stated in a separate and detachable portion.

15.9 Reports of Overexposures, Excessive Radiation Levels, and Concentrations Exceeding Limits

SEG shall issue a written report to the state within 30 days for:

1. Any incident requiring notification in Section 15.9;

2. Exceeding dose limits for any occupationally exposed adult;
3. Exceeding dose limits for any occupationally exposed minor;
4. Exceeding dose limits for an embryo/fetus of a declared pregnant woman;
5. Exceeding dose limits for an individual member of the public;
6. Radiation levels or concentrations in the restricted area exceeding the state regulatory or license limits; or
7. Radiation levels or concentrations in the unrestricted area exceeding 10 times any state regulatory or license limit.

Each report shall describe the extent of exposure of individuals to radiation or radioactive material and include:

1. Estimates of each individual's dose;
2. Levels of radiation and concentrations of radioactive material involved;
3. Cause of the elevated exposures dose rates, or concentration; and
4. Corrective actions taken to ensure against recurrence, including a schedule for achieving conformance with requirements.

Reports shall provide descriptions of each involved individual by name, social security number and date of birth such that the information on individuals is stated in a separate and detachable portion.

15.10 Notice of License Termination

If SEG should ever decide to terminate the radioactive materials license, the regulations require written notification of that intent no less than 30 days prior to the license termination.

15.11 Recordkeeping Requirements and Policy

The regulations require SEG to document compliance with the radiation protection program in almost all aspects that could be related to health and safety of radiation workers or individual members of the public. At SEG, records shall be maintained indefinitely. The recordkeeping requirements are important due to the regulations requiring them as well as the potentially high liability issues that can arise. Demonstration of regulatory compliance and ALARA practices is also valuable from a public relations viewpoint. All records shall be prepared and maintained in accordance with Section 15.2 of this guide.