APPENDIX A

RADIOLOGICAL CONTROL PLAN

CONTROLLED DOCUMENT #____

Radiological Control Plan

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Westinghouse Specialty Metals Plant Site
Blairsville, Pennsylvania

Revision 0
June 2000

Prepared by:
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RADIOLOGICAL CONTROL PLAN
Westinghouse Specialty Metals Plant Site
Blairsville, Pennsylvania

PROJECT NAME AND SITE LOCATION

Westinghouse Specialty Metals Plant Site

APPROVED

Westinghouse Electric Company

PROGRAM MANAGER

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1.0 DISCLAIMER NOTICE

The radiological control and safety requirements/guidelines contained within this Radiological Control Plan were developed specifically for the Westinghouse Specialty Metals Plant Site (WSMPS) characterization and remediation projects (i.e., Former Zircaloy Burn Area and surroundings) and should not be used on any project or site without prior approval of the site Radiological Safety Officer.

WSMPS Radiological Control Plan requirements and guidelines are effective only if each worker follows the requirements and guidelines. Intentional disregard by WSMPS management or workers of the established requirements/guidelines may result in unnecessary exposure or release of radiation or radioactive materials.

1.1 General Description of the Westinghouse Specialty Metals Plant Site

During the period from approximately 1955 to 1961, fuel manufacturing operations were conducted at the WSMPS facility using enriched uranium in both metal and oxide forms. This involved both highly enriched uranium for the Navy fuel program (under subcontract with the Bettis Atomic Power Laboratory) and low enriched uranium for atomic power plants (under License SNM-37 from the U.S. Atomic Energy Commission). AEC license SUC-509 authorized Westinghouse to perform research and development for fuel elements using depleted uranium at the Blairsville facility. This license was terminated on December 31, 1964. As part of a Nuclear Regulatory Commission (NRC) program to ensure that AEC and NRC licenses that have been terminated meet the NRC's current criteria for release for unrestricted use, the Blairsville site was determined to require additional review.

Beginning in 1993, Westinghouse personnel performed preliminary screening measurements in areas of the facility where licensed material had been handled. Several interior and exterior areas have since been characterized and remediated.

Records indicate that the radioactive wastes were processed and packaged in the area known as the Former Zircaloy Burn or Cow Palace area of the Blairsville site in addition to other potential areas. The investigation into the Former Zircaloy Burn Area was initiated in 1995. Several reports included data from the initial investigations. The results of the initial investigations did not indicate the presence of significant radioactive contamination.

During remediation activity to remove an underground pipe and sumps in the Former Zircaloy Burn Area conducted in June 1998, evidence of more significant radioactive contamination of the area was identified and partially remediated. Subsequent investigation and characterization has identified a variety of uranium contamination, including low enriched, high enriched, depleted uranium, and processed unenriched uranium.

The purpose of the current project is to:

(1) Conduct a detailed assessment of the radiological conditions in the area.
(2) Conduct appropriate remedial actions.
(3) Conduct a final radiological survey of the area.
(4) Prepare the documentation necessary to complete the project.

2.0 POLICY STATEMENTS

2.1 Health and Safety Policy

It is the policy of WSMPS to provide their employees and require all WSMPS contractors and subcontractors to provide their employees with a safe and healthful workplace in accordance with all Federal, State, and Local regulations, as well as WSMPS internal procedures. Safety of all employees is a primary consideration in the performance of WSMPS activities. Consistent with prudent professional practice, WSMPS will identify, evaluate and correct identified hazards, thereby ensuring that the health, safety, and well-being of all employees are protected.

2.2 ALARA Policy

WSMPS is committed to keeping radiation exposure to employees and the general public as low as reasonably achievable (ALARA), commensurate with sound economic and social considerations. WSMPS management will demonstrate their commitment by assigning high priority to work plans and procedures that will reasonably reduce personnel and environmental radiation exposures. Therefore, in addition to implementation of the ALARA policy, WSMPS will incorporate the ALARA philosophy into applicable operating procedures. Furthermore, WSMPS will place primary emphasis on design and engineering features to maintain exposures ALARA. When practical, design features will be selected in lieu of administrative controls to maintain exposures ALARA.

The "As Low As Reasonably Achievable" (ALARA) philosophy is a fundamental objective of all effective radiation protection programs. Reducing individual and collective exposures is desirable. Control of radiation exposure is based on the assumption that any exposure to ionizing radiation involves some risk. However, occupational exposure within regulatory limits represents a very small risk compared to the voluntarily accepted hazards of normal life. This radiation exposure control philosophy has been presumed repeatedly in the guidance provided by such organizations as the National Council of Radiological Protection and Measurements (NCRP), the International Commission of Radiological Protection (ICRP), and the National Academy of Sciences Committee on the Biological Effects of Ionizing Radiation (NAS-BEIR).

Thus, maintaining individual and collective radiation exposures ALARA is a critical element of this Radiological Control Plan which improves other parts of WSMPS radiological protection program through better planning of work, training of workers, and tracking of exposures. Ultimately, these efforts benefit the safety and reliability of the activities by improving the quality and the efficiency of work performed as required by 10 CFR 20.1101.

2.3 Radiation Protection Program Review Policy

In order to ensure that the Radiation Protection Program is effective in controlling radioactive materials and radiation exposures to personnel and the general public, a review (at least annually) of the program content and implementation will be performed as required by 10 CFR 20.1101.

2.4 Voluntary Personnel Dosimetry

Based on the nature of the uranium contamination at the WSMPS site (*Cummings/Riter Report, June 15, 1999*) and the short duration of the project, it is highly unlikely that personnel will receive doses above 10 percent of the limits specified in 10 CFR 20. Per 10 CFR 20.1502, a mandatory personnel monitoring program is not required if potential doses are less than 10 percent of the allowable limits. Although a mandatory personnel monitoring program will not be required for the WSMPS project, it will be WSMPS policy to provide appropriate personnel monitoring (TLD and bioassay) on a voluntary basis.

3.0 PURPOSE, SCOPE, RESPONSIBILITY

3.1 Purpose

This Radiological Control Plan establishes the basic radiation control and protection practices to be implemented by WSMPS consistent with Nuclear Regulatory Commission (NRC) standards, the National Council of Radiological Protection and Measurement (NCRP), and International Commission of Radiological Protection (ICRP) recommendations. In addition, this Plan promulgates the requirements contained in WSMPS project administrative and field procedures for maintaining radiation exposure as low as reasonably achievable (ALARA) and within Federally mandated exposure limits.

3.2 Scope

This Radiological Control Plan has been developed in accordance with the current 10 CFR 19 and 10 CFR 20 requirements and has been developed commensurate with the scope and extent of licensed activities and sufficient to ensure compliance with the provisions of 10 CFR 20. Specifically, this Plan provides the radiation protection standards and controls that will be in effect at the WSMPS site. Adherence to these controls is the responsibility of each individual as well as members of WSMPS line management. Any deviation from this plan requires the written approval of the WSMPS Project Radiation Safety Officer.

The major scope of this Plan is to establish the radiological protection practices to be implemented at the WSMPS site for ensuring control of radioactive materials and radiation exposures to personnel. It is the philosophy of the WSMPS to maintain radiation exposures to personnel and release of radioactive materials to the environs as low as reasonably achievable (ALARA), and to keep radioactive material contained in the smallest practical volume at all times.

3.3 Responsibilities of Workers

This Plan is available for review to all WSMPS contractor and subcontractor personnel working at the site. All individuals working or frequenting the radiologically controlled areas of the facilities are responsible for complying with the requirements of this Plan.

All personnel who could potentially come in contact with radioactive materials should understand that a knowledge of standard radiation protection rules and practices is an integral part of their job duties and responsibilities. Each person should be aware that it is their responsibility to minimize their own exposure to radiation and be cognizant of their obligations to WSMPS and co-workers for the safe handling of radioactive materials. Each individual working at the site is responsible to perform their job in accordance with WSMPS procedures, job training and in accordance with the principle of maintaining his or her exposure ALARA. Each person who could reasonably be expected to handle radioactive materials will receive periodic instruction in the general and specific radiological aspects which they may encounter and will be made aware of their responsibility to the company, the public, and co-workers for safe handling of radioactive materials.

3.4 Responsibilities of Management

It is the responsibility of WSMPS to provide its employees and require all subcontractors to provide their employees with a safe and healthful workplace in accordance with all Federal, State and Local regulations, as well as, WSMPS procedures.

In addition, WSMPS project management personnel are responsible for:

(1) Being knowledgeable of the contents of this Plan.

(2) Ensuring that employees have been fully informed of, and possess a thorough understanding of the sections contained in this Plan which apply to their job assignment.

(3) Ensuring that all necessary training is scheduled and completed and for maintaining auditable training records which will include any follow-up training and all annual refresher training.

(4) Reviewing the Radiation Control and Protection Program content contained in this Plan and reviewing the efficiency of its implementation on an annual basis.

(5) Maintaining records (provisions of the program, audit and review, surveys) related to the Radiation Control and Protection Program.

4.0 PROJECT ORGANIZATION

4.1 Roles, Responsibility and Authority

4.1.1 General

The organizational structure plays a key role in the effectiveness of any Radiological Control and Protection Program. Responsibility, authority and accountability for radiological control and protection must be established within this structure to effectively carry out the objectives of the program. Lines of authority must be organized in such a way that radiological protection and safety has a channel to the top. In addition, top management must be supportive of radiological control and protection efforts.

The WSMPS organizational structure depicted in Figure 4-1 has been developed to carry out the objectives of the policy statements presented in Section 2.0. This figure identifies employee titles and the lines of authority to be used throughout activities. The WSMPS organizational structure may be reviewed and updated, if necessary, to reflect the current status of site operations.

Key positions are filled by those individuals that are responsible for assuring the safe and expedient characterization and/or remediation of the WSMPS site. The key positions for the WSMPS project are described below.

4.1.2 Westinghouse Organization

4.1.2.1 Program Manager

The WSMPS Program Manager (PGM) has overall responsibility and authority for the planning and management of characterization and remediation activities. The PGM is responsible for ensuring that the WSMPS project activities meet the established environmental health and safety and quality assurance requirements, technical performance, and budgeting and scheduling criteria.

4.1.2.2 Remediation Project Review Committee

The WSMPS Remediation Project Review Committee (PRC) has overall responsibility and authority to exercise management controls necessary to assure safe implementation of the site characterization and/or remediation activities, including matters related to health and safety, licensing, quality assurance and regulation. The committee will consist of a minimum of three people. The membership includes persons with experience in areas such as management, radiological protection, industrial hygiene, safety or quality assurance. The membership of the PRC is appointed by the PGM. The PRC reports directly to the PGM. All members of the committee have the authority and responsibility to issue stop work orders for any matters involving health and safety.

The PRC holds meetings on at least a monthly basis to review project operations. The responsibility of the committee includes:

- Review and approval of Radiation Control Plan and Procedures.
- Review and approval of work plans and procedures.
- Review and approval of QA Plan.
- Assuring implementation of the Radiation Control Plan, Remediation Plan and QA Plan.
- Conducting reviews of project activities.

The PRC will work together with the WPM, Contractor Project Manager (CPM) and the Project Radiation Safety Officer (PRSO) to ensure that all health and safety protection measures and controls, including radiological protection, are carried out.

4.1.2.3 Project Manager

The WSMPS Project Manager (WPM) has overall responsibility and authority to exercise management controls necessary to assure safe implementation of the site characterization and/or remediation activities, including matters related to health and safety, licensing, quality assurance and regulation. This responsibility and authority includes implementation of the Radiological Control Plan, Remediation Plan and QA Plan. The PM reports directly to the PGM. The PM will work together with the Contractor Project Manager (CPM) and the Project Radiation Safety Officer (PRSO) to ensure that all radiological protection and control measures are carried out.

Additionally, the WPM will review and approve all radiation control plans and procedures, work plans and procedures, and QA plans that are developed for the project activities.

4.1.3 Contractor Organization

4.1.3.1 Project Manager

The Contractor Project Manager (CPM) is responsible for managing contractor personnel and other resources necessary to carry out the specific characterization/remediation project or activity. The CPM will work closely with the PRSO to ensure work being conducted by contractor personnel is in accordance with the requirements specified in the Health and Safety Plan, Radiological Control Plan and related procedures and QA Plan. The CPM reports directly to the WPM.

4.1.3.2 Project Radiation Safety Officer

The Contractor Project Radiation Safety Officer (PRSO) is responsible for developing and implementing policies and procedures in accordance with NRC Regulations (Title 10 CFR Parts 19 and 20) and any other applicable requirements/regulations. The PRSO reports directly to the CPM. The PRSO has direct recourse to the PGM to prevent unsafe practices or to halt an operation which is deemed radiologically unsafe. The PRSO is also responsible to oversee and control the day-to-day radiation protection activities in accordance with the requirements contained in the Radiological Control Plan.

Specific duties of the PRSO may include, but are not limited to, the following:

(1) Provide training to project personnel.

(2) Verify that site personnel receive (or have received) appropriate radiological training.

(3) Verify implementation of the Radiological Control Program, including ALARA.

(4) Provide technical expertise to on-site radiation safety personnel.

(5) Conduct periodic radiation safety audits at the site.

(6) Interface between site radiation safety personnel and site management.

(7) Review surveys conducted during and after the site activities.

(8) Implement additional health and safety requirements as directed by the PM.

(9) Develop and implement radiation control procedures specific to the project.

Qualifications of the Project Radiation Safety Officer are:

(1) A Bachelors of Science degree in Engineering or Science.

(2) A minimum of 5 years of applied radiation protection experience.

(3) Previous training consistent with Regulatory Guide 10.4, Item 7, Topics.

The PRSO will also serve as the Environmental Safety and Health Coordinator (ES&HC). The ES&HC is responsible for the industrial and environmental safety functions during characterization and/or remediation activities. The ES&HC is responsible for ensuring implementation measures provide safe and healthy work conditions, for maintaining radiation exposures as low as reasonably achievable, and for minimizing release of radioactivity and chemicals to the environment. This is accomplished through the review of work plans, instructions, procedures, monitoring and surveillance, training, and investigation and evaluation of routine monitoring data and unusual events.

4.1.3.3 Environmental Safety and Health Coordinator (ES&HC)

The Environmental Safety and Health Coordinator (ES&HC) is responsible for the industrial and environmental safety function during characterization and remediation activities. The ES&HC is responsible for ensuring implementation measures that provide safe and healthy work conditions, for maintaining radiation exposures as low as reasonably achievable, and for minimizing release of radioactivity and chemicals to the environment. This is accomplished through the review of work plans, instructions, procedures, monitoring and surveillance, training, and investigation and evaluation of routine monitoring data and unusual events. The ES&HC reports to the Project Manager. The PRSO will also serve as the ES&HC.

4.1.3.4 Quality Assurance Coordinator (Optional)

The Contractor Quality Assurance Coordinator (QAC) reports to the Program Manager for administrative activities and for quality assurance guidance. The QAC communicates and coordinates directly with the CPM on project-related matters. The QAC has the delegated responsibility and authority to direct and control QA functions to assure that the QA objectives are met as specified in the site specific Quality Assurance Project Plan (QAPP).

The QAC is responsible for the coordination, integration, and overview of project QA activities and for ensuring that the appropriate quality management, policy, training, and verification controls are present. The QAC is responsible for QA audits and surveillances, for prompt correction of conditions which could adversely affect quality, and for providing documented evidence that the required quality levels have been maintained in all remediation work activities.

4.1.3.5 Laboratory Manager (Optional)

The Contractor Laboratory Manager (LM) reports to the CPM. The LM is responsible for managing the laboratory activities for in-house and onsite laboratories and for the subcontractor laboratory services. The LM is responsible for ensuring that the chemical and radiological sampling and analyses for the characterization and/or remediation activities are performed in accordance with approved procedures and Quality Assurance programs. The LM is also responsible for ensuring that the laboratory data is compiled, validated, and appropriate evaluation and comparisons to establish limits performed.

4.1.3.6 Field Operations Supervisor

The Contractor Field Operations Supervisor (FOS) reports directly to the CPM. The FOS is responsible for ensuring that characterization and/or remediation activities are being performed in accordance with plans, procedures, and design requirements established for the remediation project.

4.1.3.7 Radiological Controls Technician

The Contractor Radiological Controls Technician (RCT) is responsible for adhering to radiological control procedures under the direction of the PRSO.

Specific duties and authority include, but are not limited to the following:

(1) Surveying of areas, materials, equipment and personnel as needed.

(2) Recording of all survey findings on appropriate forms.

(3) Report unexpected findings to the PRSO or CPM.

(4) Advise the PRSO or CPM of any unsafe working conditions at the site.

(5) Remove employee(s) who have approached the established administrative radiation exposure limits or who have not demonstrated their continuing understanding of, or need for compliance with radiological safety procedures.

4.1.3.8 Remediation Contractor Personnel

All Contractor Remediation Project Personnel engaged by WSMPS will comply with the requirements of this Radiological Control Plan.

4.1.3.9 Site Personnel

All WSMPS project personnel will comply with the requirements of this Radiological Control Plan.

4.2 Stop-Work Authority and Grounds for Dismissal

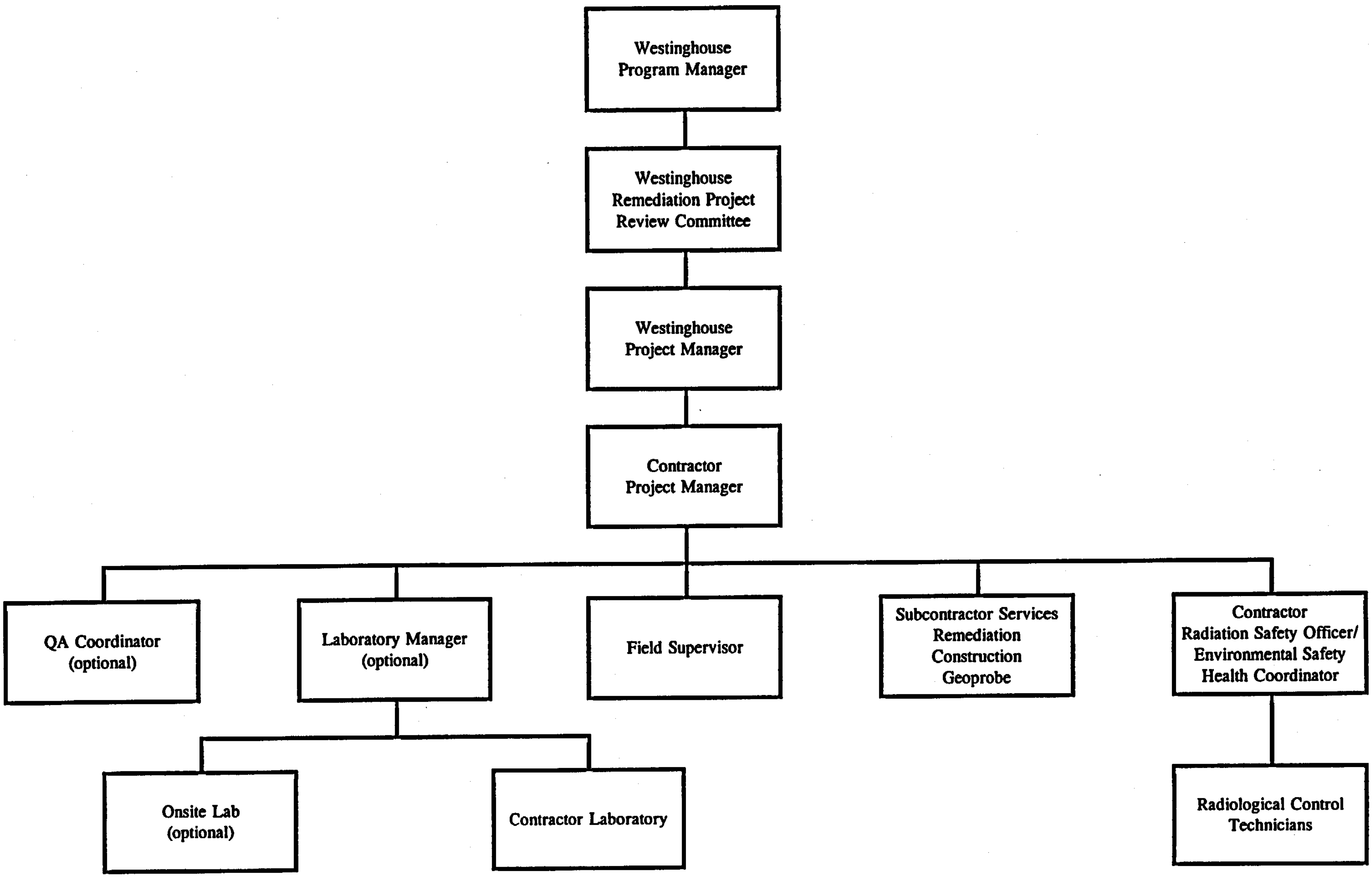
The WSMPS PGM, PM, CPM, PRSO and RCT have the authority to stop work when a situation is considered to pose an immediate threat to life, health, property or the environment. When an immediate threat does not exist, only the PM or his designee will have stop-work authority pursuant to the Radiological Control Plan. When it becomes necessary to stop a job due to a safety hazard, conditions will be stabilized immediately so that stopping the job does not in itself present an additional hazard pursuant to the Radiological Control Plan.

Any WSMPS or Contractor person found to be wilfully disregarding any provisions of this Radiological Control Plan will be subject to immediate removal from further remediation work by the WSMPS PM or his designee.

4.3 Administrative and Field Procedures and Review Requirements

The WSMPS Radiological Control Plan establishes the policies and requirements to be followed during the conductance of site characterization or remediation activities, detailed administrative and field operational procedures which incorporate radiological, industrial and other general safety considerations are required to ensure that the identified policies and requirements are met. Preparation of such procedures minimizes the potential problems encountered during the conduct of activities by requiring explicit planning prior to initiation of the required work. Thus, written procedure(s) is a step-by-step guide for the personnel performing the work or activity. Prior to being issued for use, the procedure will be reviewed and approved by the WPM and the PRSO. The approved procedure will be issued, as a controlled document, to ensure that the proper procedure is being used at the work location.

FIGURE 4-1
ORGANIZATION CHART FOR WSMP PROJECT ACTIVITIES



5.0 TRAINING REQUIREMENTS

5.1 Introduction

The purpose of radiation training for the WSMPS characterization and remediation activities is to provide qualified personnel to work with the radiation hazard at the site. The training program will be reviewed by WSMPS management and kept up to date to reflect changes in the facility and procedures, as applicable.

Training will be required of, but not limited to: all workers involved in day to day operations of the project, project and management personnel who will visit the site regularly and WSMPS and contractor personnel identified by the PM.

5.2 Site Orientation and Training

Prior to entry into radiologically controlled areas of the facility, all personnel will be given a radiological orientation. The objectives of this orientation are to familiarize personnel to:

(1) Recognize labeled hazardous chemicals and radioactive materials and understand the meaning of radiological and hazardous chemical warning signs;

(2) Understand that, as long as radiological control procedures and limits are followed, harmful effects to personnel or to the environment from radioactivity will be minimized; and

(3) Recognize and understand the meaning of, and proper response to, emergency signals and use of emergency equipment, such as fire extinguishers.

This orientation is required for all personnel visiting or working at the WSMPS Remediation Project site (i., Former Zircaloy Burn Area), including the project team, contractor and subcontractor personnel.

All visitors will be escorted by personnel who are trained as radiation workers and have passed the radiation worker written exam. Visitors will be issued temporary TLDs or self-reading dosimeters by the Radiological Safety Officer or his designee and will be required to wear them whenever they are inside the radiologically controlled work zones, if deemed necessary. Personnel training requirements are presented on Table 5-1.

5.3 Radiation Safety Training

5.3.1 General

A Radiation Safety Training Course provided by WSMPS will consist of classroom and practical training and will be in accordance with 10 CFR Part 19.12 and USNRC Regulatory Guide 10.4 Item 8. WSMPS will provide qualified instructors (through contractor/subcontractor arrangements), as defined by 10 CFR Part 40.32(b) and USNRC Regulatory Guide 10.4 Item 7, to conduct radiation safety training.

Consistent with 10 CFR 19.12, the radiation safety training is commensurate with the potential health protection hazards associated with the restricted areas of the site and will cover the following areas:

(1) Identification and location of licensed radioactive materials and radiological hazards present in the restricted area to be entered by the individual.

(2) Health protection problems associated with exposure to such radioactive materials or radiation.

(3) Precautions and procedures to minimize exposures and the spread of contamination (e.g., use of Radiation Work Permits, dosimetry, and frisking for personal contamination when leaving a contaminated zone).

(4) Purposes and functions of protective devices required (if any).

(5) Applicable provisions of NRC regulations to be observed by individuals working in or frequenting restricted areas.

(6) Standard operating and emergency procedures, including response to warnings to be followed by individuals working in or frequenting restricted areas.

(7) Responsibility of individuals to report promptly to WSMPS management unsafe acts or conditions observed in restricted areas that may lead to or cause a violation of NRC regulations or unnecessary exposure to radiation or to radioactive material.

(8) Rights of employees to receive radiation exposure reports upon request (10 CFR 19.13).

(9) For persons who actually work with radioactive material, instructions for the safe use of radioactive material.

5.3.2 Basic Radiation Safety Training

Personnel who will require routine unescorted site access (radiation workers) will receive basic Radiation Safety Training.

The basic Radiation Safety Training will include the following specific topics:

(1) Basic Fundamentals of Radiation.

(2) Biological Effects of Radiation.

(3) Risk of Low-Level Occupational Exposures to Radiation.

(4) Basic Radiation Protection, Exposure and Contamination Control Concepts.

(5) WSMPS Radiation Protection Policies and Procedures.

(6) Employee and Management Responsibilities for Radiation Safety.

(7) ALARA.

(8) Signs and Postings.

(9) Personnel Monitoring and Dosimetry (including Bioassay).

(10) Proper Use of Protective Clothing, Donning and Doffing Respirators and Frisking Techniques.

(11) Decontamination.

(12) Use of Radiation Work Permits (RWPs).

(13) Prenatal Exposure (Regulatory Guide 8.13).

(14) Contents of 10 CFR 19: Notices, Instructions and Reports to Workers.

(15) Emergency Procedures.

A written test will be administered to document adequate understanding of the subjects covered. Satisfactory completion is indicated by a score of 80% or greater. Prior to being allowed unescorted worker access to the site and issuance of a TLD, all personnel will be required to pass (80%) a written exam demonstrating a basic knowledge of radiation worker training and provide evidence of a recent medical examination as described in Section 14.0.

5.4 Other Training

Other training requirements such as the 40 Hour Hazardous Waste Site Training (OSHA Standard 29 CFR 1910.120(e)) may be required as determined appropriate by WSMPS or site specific training, as determined at the specific facility.

5.5 Refresher Training

Personnel who will require routine unescorted site access will receive refresher training annually of the following:

(1) Review of initial Radiation Worker Training subjects;

(2) Site specific training requirements;

(3) Any critique of incidents that have occurred in the past year that can serve as training examples of related work; and

(4) Any other relevant topics.

5.6 Training Verification and Documentation

All persons working on-site will have evidence of initial training and pertinent refresher training as required by Sections 5.3 and 5.5 (e.g., training certificates, letter of certification, etc.) prior to being permitted to perform work involving a potential for exposure to radiation or health hazards. In addition, all site personnel will be required to sign a statement documenting that they have received site-specific training and that they understand the potential site hazards along with the necessary control measures to reduce and/or eliminate those hazards.

All training documentation, including the content of Site-Specific Training, test results, attendance sheets, any other subsequent training (e.g., periodic safety meetings, specific task safety training, etc.), and personnel training files will be maintained on site as part of the project files and available for inspection.

5.7 Employee Access to Information

All pertinent information concerning the health and safety of on-site workers will be conveyed initially via site-specific training. Subsequently, documents such as this Radiological Control Plan, Material Safety Data Sheets (MSDS), and regulatory standards, will either be provided to employees or be made available to them upon request. In addition, any new information concerning safety or health conditions associated with this project will be conveyed to project personnel.

Furthermore, in accordance with 10 CFR 19, current copies of the following documents will be made available for examination by all employees:

- 10 CFR 19 and 20 standards and regulations
- License, license conditions, and documents incorporated into the license by reference and amendments thereto.
- Administrative and field procedures applicable to project activities.
- Any notice of violation involving radiological working conditions, proposed imposition of civil penalty, and any response from WSMPS.

A notice which describes the documents and states where the documents are available for review will be posted in conspicuous locations throughout the work area.

TABLE 5-1

Personnel Training Requirements

Group Identification	Training Requirements	Approximate Duration (hours)	Initial Requirements	Annual Re-training Requirements
Visitors	Radiation Control Plan	0.5 - 1	Site Orientation (Escorted Access by Radiation Worker)	Same as initial requirement
Contractor Site Workers Excavation, Sampling, etc.	Radiation Control Plan Radiation Worker Handbook	3-4	Radiation Worker Exam Medical Exam	Radiation Worker Handbook Refresher Medical Exam
Site Contractor Radiation Control Personnel	Radiation Control Plan Radiation Control Procedures Radiation Worker Handbook	8	Radiation Worker Exam Medical Exam	Radiation Worker Exam Medical Exam

6.0 ENVIRONMENTAL MONITORING

6.1 Introduction

Operations will be controlled such that no member of the general public will exceed the USNRC 10 CFR 20 non-occupational limit of 100 mRem/year. Operations will be conducted such that minimal releases to the environment of airborne and liquid radioactivity will occur. The concentration limits for specific radionuclides are taken from 10 CFR 20, Appendix B, Table 2, Columns 1 and 2.

In any event, exposure to the public, due to direct, inhalation and ingestion exposures of radioactive materials from the WSMPS site will be limited to 100 mRem in any year. Sampling for airborne and liquid radioactive materials will be performed in accordance with Sections 6.2.2 and 6.2.3 of the Radiation Control Plan and/or the direction of the PRSO.

6.2 Monitoring

To ensure that the non-occupational dose to the public is met, monitoring of the environment around the perimeter of the work site will be performed during contaminated soil excavation activities. Monitoring will consist of the three potential pathways of exposure to the public. The pathways consist of direct exposure to radiation, inhalation and ingestion of radioactive material from the WSMPS site.

6.2.1 Direct Exposure

Direct exposures will be monitored with environmental Thermoluminescent Dosimeters (TLDs). The TLDs will be placed at strategic locations along the perimeter of the site. The TLD's will be changed quarterly and analyzed and evaluated by a dosimeter processor that holds current dosimetry accreditation from National Voluntary Laboratory Accreditation Program (NAVLAP) of the National Institute of Standards and Technology. Additionally, during WSMPS project activities, a TLD(s) will be established at a background location(s) that is not influenced by the radioactively contaminated site. All TLD results will be maintained on an NRC Form 5 or equivalent.

In addition to the placement of TLD's along the site perimeters, exposure rate measurements will be taken periodically as part of the general site radiation survey program. These measurements will be performed with calibrated instruments, qualified personnel and in accordance with approved procedures.

6.2.2 Airborne Radioactive Materials

Airborne materials are included in the environmental monitoring program to determine possible inhalation exposures to radioactive materials by the public. During remediation operations involving potentially or known radioactive materials, air samples will be collected around the perimeter of the project site using low volume or variable rate air samplers. The collection and analysis of the air samplers will be performed with qualified personnel, in accordance with approved procedures and with calibrated equipment as described in Section 13.0. The minimum detectable activity the air sample and counter combination must be able to detect is less than the radionuclide specific administrative control limit.

Air sampler(s) will be positioned downwind at the site perimeter to collect air that may contain radioactive material during WSMPS project activities (i.e., downwind of soil excavation, hauling and placement operations).

In addition, air sampler(s) will be located upwind from the site to collect air that will be used to determine background levels.

If any sample result is greater than the WSMPS administrative limit, then the PRSO and PM will be notified. If the sample results are greater than the NRC 10 CFR 20, Appendix B, Table 2 limits, an evaluation will be performed to determine proper corrective action.

6.2.3 Liquid Radioactive Materials

Liquid radioactive materials generated as a result of characterization or remediation activities will be sampled and analyzed to determine that the material is within the limits established by WSMPS and the NRC 10 CFR 20, Appendix B, Table 2 limits. The sample collection and analysis will be performed with qualified personnel in accordance with approved procedures and calibrated equipment/instrumentation.

If the initial sample result is greater than the WSMPS administrative limit, then the PM and PRSO will be advised. If sample results are greater than the NRC 10 CFR 20, Appendix B, Table 2 limits, an evaluation will be performed to determine proper corrective action and disposition of the liquid.

6.3 Actions

If any environmental pathway exposure exceeds WSMPS administrative limits, then remediation operations will be reviewed to determine the cause of increased pathway exposure and the effect of the exposure on the public and the environment.

Additional measures will be initiated to reduce the exposure pathway and operations can continue with the concurrence of the PM and PRSO.

7.0 IDENTIFICATION AND MONITORING OF CONTROLLED AREAS

7.1 Introduction

To aid in the control of radiation exposure and limit the spread of radioactive material, a system of identifying radiologically controlled areas will be implemented by WSMPS.

The WSMPS site will be divided into two distinct areas for radiation exposure control. These areas are unrestricted, and restricted areas.

Restricted Area means any area access to which is controlled by WSMPS for purposes of protection of individuals against undue risks from exposure to radiation and radioactive materials. "Restricted area" will not include any areas used as residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area. Within the restricted areas, different zones will be designated to aid in radiation exposure control and control of the radioactive materials present.

Unrestricted Area means any area access to which is neither limited nor controlled by WSMPS for purposes of protection of individuals from exposure to radiation and radioactive materials.

In all cases, the radiologically restricted areas will be delineated with distinctive barrier tape or rope and signs. The signs will have the radiation symbol, standard colors, and appropriate wording to warn workers of the potential hazard. A description of the radiation symbol and sign can be found in USNRC Regulatory Guide 8.1 and ANSI Standard N2.1-1969. The radiation symbol will not be used for any purpose other than radiological control.

All radiological posting will be done by or at the direction of radiological control personnel. Movement or removal of posted radiation warning signs, tags, or boundary markers by personnel other than radiological personnel or without their approval may be cause for disciplinary action.

Restricted areas and specific zones within the restricted area will be posted with the appropriate signs such that posting is readily identifiable from ordinary avenues of approach.

7.2 Radioactive Materials Area

A *Radioactive Materials Area* is an area that contains radioactive materials in amounts exceeding 10 times the 10 CFR 20, Appendix C values. Each Radioactive Materials Area (RMA) must be posted with signs meeting applicable standards, including the radiation symbol, and the words "CAUTION - RADIOACTIVE MATERIALS AREA" or "DANGER - RADIOACTIVE MATERIALS."

7.3 Radiation Area

Radiation Area means any area, accessible to personnel, in which radiation levels could result in an individual receiving a dose equivalent in excess of 5 mRem in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

Entrance to Radiation Areas will be conspicuously posted with "CAUTION - RADIATION AREA" signs.

7.4 Contaminated Area

A contamination area is an area which contains radioactive material which can spread. The amount of contamination is measured in disintegrations per minute per 100 cm^2. Contamination above the lowest radionuclide specific limits in Table 7-1 will constitute a contamination area. The area will be isolated and posted. The posting will read "CAUTION - CONTAMINATED AREA".

7.5 Airborne Radioactivity

Areas accessible to personnel, such as a room, enclosure, or area will be posted as *Airborne Radioactivity Areas* if airborne radioactivity composed wholly or partly of licensed material exists in concentrations:

(1) In excess of the derived air concentrations (DACs) specified in Appendix B of 10 CFR 20.

(2) To such a degree that an individual present in an area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC hours.

Each Airborne Radioactivity Area must be posted with signs meeting applicable standards,including the radiation symbol, and the words "CAUTION - AIRBORNE RADIOACTIVITY AREA".

Additional instructions or requirements such as "RWP required"," TLD required," "Contact Health Physics Prior to Entry," as appropriate, may be attached as inserts to each of the above specified postings.

TABLE 7-1
RADIOLOGICAL CONTAMINATION LIMITS AND SELECTION OF PERSONNEL PROTECTIVE EQUIPMENT

PPE	DIRECT RADIATION LEVELS	RADIOACTIVITY	
		LOOSE SURFACE CONTAMINATION	AIRBORNE
None	<0.01 mR/hr	<1,000 dpm/100 cm² β-γ <20 dpm/100 cm² α soil contamination of ≤ radionuclide specific concentration limit	10% of 10 CFR 20, Appendix B, Table 1 Limit
TLD	>0.01 mR/hr above background	<1,000 dpm/100 cm² β-γ <20 dpm/100 cm² α soil contamination of ≤ radionuclide specific concentration limit	--
TLD, shoecovers, gloves, coveralls and head covering	>0.01 mR/hr above background	≥1,000 dpm/100 cm² β-γ ≥20 dpm/100 cm² α to 10,000 dpm/100 cm² β-γ 200 dpm/100 cm² α or soil contamination of > radionuclide specific concentration limit	10% of 10 CFR 20, Appendix B, Table 1 Limit
TLD, double shoe, double gloves, coveralls, head covering, hood, half face respirator	--	>10,000 dpm/100 cm² β-γ >200 dpm/100 cm² α soil contamination of > radionuclide specific concentration limit	10 CFR 20, Appendix B, Table 1 Limit
TLD, double shoecovers, double gloves, double coveralls, head cover, hood, full face respirator	--	>100,000 dpm/100 cm² β-γ >2,000 dpm/100 cm² α or soil contamination of > radionuclide specific concentration limit	10 times 10 CFR 20, Appendix B, Table 1 Limit
TLD, double shoecovers, double gloves, double coveralls, head cover, hood, airline respirator or SCBA	--	soil contamination of > radionuclide specific concentration limit	50 times 10 CFR 20, Appendix B, Table 1 Limit

8.0 RADIATION WORK PERMITS

8.1 Introduction

The Radiation Work Permit (RWP) is a administrative tool used to control work occurring inside the radiologically restricted area and to make all of the personnel involved with the work aware of specific hazards and precautions in the specific work area. Additionally, the RWP will instruct the workers as to what protective equipment may be needed and what monitoring will be required.

An RWP will be required for any of the following conditions:

- Entering a radiation area.
- Entering a contaminated area.
- Entering an airborne radioactivity area.
- Unknown radiological conditions in an area to be entered or equipment to be opened.

8.2 Work Control

All work will be administratively controlled via RWPs. RWPs will be issued daily or weekly, depending on the length of the work task, and reviewed daily by the PRSO or his designee. The RWP will list the following information:

(1) Task(s) to be performed.

(2) Location of Task(s).

(3) Radiological Hazards Involved with Task(s).

(4) Most Recent Radiation Survey Results.

(5) Required Personnel Protective Equipment.

(6) Special Units or Restraints.

(7) Signature of the RSO or his designee.

(8) Signature(s) of the individual(s) performing the required work

A daily safety meeting will be conducted with all workers to review safety and radiological conditions and/or changes to the RWP as appropriate.

An RWP will be issued at the start of remediation operations and daily or weekly thereafter. The RWP will be terminated at the end of 24-hour or 7 days or when conditions change.

9.0 EXTERNAL RADIATION EXPOSURE LIMITS AND CONTROL

9.1 Introduction

Control of exposure to ionizing radiation is based on the assumption that any dose received as a result of exposure involves some incremental risk; however, exposure within acceptable limits represents a very small increase in risk compared to the normal hazards of life. Therefore, it is the objective of the WSMPS Radiological Protection and Control Plan not only to maintain exposures within the limits established by Federal and State law, but also to minimize exposures to individuals, the total work force and the general population in accordance with the as low as reasonably achievable (ALARA) principle.

Site operations will be controlled such that no member of the public and no worker will exceed any 10 CFR 20 non-occupational and occupational limit (NRC, May 1991), respectively and the total of all workers' exposures will be limited to the lowest reasonably achievable. To ensure worker exposures will be limited to the lowest reasonably achievable, at any time during the project activities the radiation level exceeds 1 mR/hour, site work will be immediately stopped. An evaluation of the safety and health effects due to the abnormal radiation level will be performed and documented. Further remediation activities may proceed with the approval of the Project Radiological Safety Officer, after the evaluation is completed.

In addition, remediation activities will be controlled such that there will be no release to the environment of airborne radioactivity greater than the concentration limit of 10 CFR 20, Appendix B, Table 2, Column 1 or no release to surrounding water of radioactive liquids greater than 10 CFR 20, Appendix B, Table 2, Column 2 limits.

9.1.1 Control of Personnel Exposure

9.1.1.1 Exposure to Radiation Workers

9.1.1.1.1 Occupational Radiation Exposure Limits

Radiation exposure limits are used for controlling personnel exposure to radiation (excluding medical and dental exposures) to levels which are believed to cause no ill effects even if the employee was exposed to these levels throughout his/her entire working life. These limits are based on those promulgated by Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation." Personnel should endeavor to maintain their own exposures as low as reasonably achievable and below these limits.

The occupational exposure limits (10 CFR 20.1201(a)) and the WSMPS administrative exposure limits for radiation workers to external radiation are given in Table 9-1. It will be the goal of WSMPS to maintain individual radiation exposure to less than 1 Rem per year.

As stated previously, Table 9-1 lists WSMPS administrative limits for occupational radiation exposure. These limits are less than or equal to those specified in 10 CFR 20. These administrative limits will be the operating limitations for exposure to all personnel. No employee will exceed these limits without receipt of a formal written extension of allowable exposure by the Project Radiation Safety Officer (PRSO) or his designee.

9.1.1.1.2 Occupational Radiation Exposure Controls

To maintain personnel radiation exposures as low as reasonably achievable (ALARA), WSMPS may choose to have more restrictive radiation exposure limits.

The three most important methods to minimize exposure in fulfillment of ALARA objectives are the proper use of time, distance, and shielding. Each of these items is discussed below.

- Time. The less time an individual spends in a radiation area, the less exposure to radiation he/she will receive. To fully utilize the time that is spent in radiation areas, all jobs should be preplanned. Such preplanning should include:

  (1) Making sure all the tools and equipment required for the job are obtained prior to entering the area.

  (2) Being familiar with the equipment and work plans prior to entering the area.

  (3) Knowing the radiation levels as well as component location prior to entering the area.

- Distance. Exposure to radiation can be significantly reduced by keeping as much distance between the individual worker and source as possible.

- Shielding. The third method of controlling/minimizing radiation exposure is by means of shielding. WSMPS will utilize shielding as necessary to limit exposure to personnel.

9.1.1.1.3 Personnel Monitoring for External Radiation

The purpose of personnel monitoring for external radiation is to provide an indication of the level of external radiation to which an individual has been exposed.

Upon the initial site visit by each radiation worker, a USNRC Form 4 (or equivalent) will be completed and signed. Exposures to the worker during the course of the project activities will be documented on a USNRC Form 5 (or equivalent).

9.1.1.2 Exposure to Minors

The annual occupational dose limits for minors specified in 10 CFR 20.1207 is 10 percent of the annual dose limits specified for adult workers.

However, to minimize exposures to minors, individuals under the age of 18 are not permitted to enter any restricted area or any radiation area at the WSMPS site without the authorization of the PRSO.

9.1.1.3 Exposure to Unborn Child

Because of the high radiosensitivity of newly formed and fast growing cells, female employees who work in controlled areas and their supervisors will be advised of the National Council on Radiation Protection and Measurement recommendations to keep radiation exposure to an embryo or fetus to the very lowest practical level during the entire gestation period and to limit the dose to the unborn child to a maximum 500 mrem or less during the entire period of pregnancy as specified in 10 CFR 20.1208 (a).

The dose to an embryo will be taken as the sum of the deep dose equivalent to the declared pregnant woman and the dose to the embryo/fetus from radionuclides in the declared pregnant woman.

The WSMPS policies regarding exposure to an embryo or fetus are derived from those of Regulatory Guide 8.13 and 8.36 and are very strict in limiting the exposure of fertile females.

These policies are in place to protect the unborn child.

- As stated in 10 CFR 20.1003, a "declared pregnant woman" is a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

- Upon declaration of pregnancy, it is the responsibility of WSMPS management to ensure that all proper precautions are taken to minimize exposure to the unborn child of the female employee.

As part of the radiation safety training (and reverification training) and prior to issuance of TLDs, all personnel authorized to receive radiation exposure will be given specific instruction about prenatal exposure risks to a developing embryo and fetus. This instruction will include both orally and in writing, the applicable information contained in the Appendix to U.S. Nuclear Commission Guide 8.13 (see Figure 9-1).

The signed statements will be kept with the training records and will be retained by WSMPS as part of the project files.

9.1.1.4 Exposure to Visitors

WSMPS will control the exposure of visitors to levels as low as reasonably achievable (ALARA). For exposure control purposes a "visitor" is defined as any person not qualified as a "radiation worker" and who requires access to restricted areas.

Entry by a visitor to a control area will require the following:

(1) Assignment of a temporary TLD badge or self-reading dosimeter.

(2) Escort by a qualified radiation worker at all times while in the restricted area.

(3) Documentation of the following information:

(a) Name
(b) Social Security Number
(c) Date of Visit

Visitors are not allowed access to any area where there is a significant risk of internal deposition of radioactive material.

If repeated entries to restricted areas are required by a visitor, over periods exceeding two weeks, a temporary TLD can be issued if the visitor meets the appropriate requirements for a radiation worker.

9.2 Personnel External Exposure Monitoring

9.2.1 Equipment

As stated previously, the purpose of personnel monitoring for external radiation is to provide an indication of the level of external radiation to which an individual has been exposed. Monitoring for external radiation exposure will be accomplished with the use of primary dosimetry and radiation survey dose rate meters. The primary dosimeter for this project will be the thermoluminescent dosimetry badge (TLD) capable of measuring the worker's whole-body (deep and shallow dose equivalent) exposure.

Other devices that will be available for exposure control are self reading dosimeters and dose rate survey meters. The self reading dosimeters will be used by visitors to the site and as directed by the PRSO.

The radiation survey dose rate meter for this project will have a minimum detection rate of 2 μR/hr, an accuracy of $\pm$ 10%, and a response time of 15 seconds. Radiation and/or contamination instrumentation and specifications are presented in Section 13.0.

9.2.2 Calibration

Portable dose rate survey instrumentation used to evaluate personnel exposure will be calibrated semi-annually by a qualified vendor in accordance with ANSI N42.17A-1989 guidance for each type of radiation of concern at the site. Portable instrumentation will be source checked each day the instrument is in use. All calibrations will be performed using standards traceable to the National Institute of Standards and Technology (NIST).

Self reading dosimeters will be tested semi-annually by a qualified vendor in accordance with ANSI N13.5-1972 (R 1989) guidance. TLD badges do not require field calibration, but must meet the performance criteria found in ANSI N13.15-1985.

9.2.3 Survey and Dosimetry Requirements

9.2.3.1 Surveys

Surveys for radiation levels and/or contamination levels will be performed using appropriate portable radiation survey dose rate meters prior to working on known or materials suspected of being contaminated to assess the level of hazards and aid in the establishment of appropriate radiological controls.

These surveys will be performed by qualified individuals using calibrated instruments and in accordance with approved procedures.

9.2.3.2 Dosimetry

Consistent with 10 CFR 20.1502, all personnel who are likely to receive, in one year from sources external to the body, a dose in excess of 10 percent of the limits specified in 10 CFR 20.1201(a) will be monitored by dosimeters. While it is unlikely that any worker will receive a dose in excess of 10 percent of the specified limits, under the voluntary dosimetry policy (Section 2.4) the following personnel may be monitored with dosimeters:

(1) Personnel entering an area posted as a radiation area.

(2) Personnel who routinely remain in spaces immediately adjacent to radiation areas. Even though the general area radiation levels in the space are less than one mRem per hour, personnel will be monitored.

(3) Personnel who directly handle or touch radioactive material, or personnel in a controlled surface contamination area, even though they do not enter a radiation area. However, it is permissible for personnel to handle radiation survey instruments containing check sources without being monitored with dosimeters.

9.2.3.2.1 Thermoluminescent Dosimeter (TLD)

WSMPS will use TLD badges to measure personnel radiation exposure for permanent record purposes. This TLD measures ionizing radiation by emitting a measurable amount of visible light which is directly proportional to the amount of incident radiation. This TLD measures both beta and gamma exposure. Extremity TLDs will be made available by WSMPS if the need arises. Extremity TLDs will be TLD finger rings or TLDs oriented toward the source of radiation as much as practical without causing damage to the devices during use.

The results of the TLD badge measurements are the basis of the legal record of an employee's exposure. Therefore, any deliberate action by an employee which invalidates the TLD measurements is cause for disciplinary action.

An individual's permanent TLD badge will be worn on the front of the body between the waist and neck, facing away from the body. TLD badges are to be placed in the special onsite storage rack when not being used. TLD badges are not to be taken offsite (i.e., home, car).

All personnel required to regularly enter and work in the radiologically restricted area will be provided with a primary dosimeter (TLD). This dosimeter will be worn daily throughout the duration of the project. Dosimetry will be analyzed quarterly or at the time of employee termination (whichever is earlier) to determine radiation exposure of the individual. Visitors will be assigned a temporary dosimeter (TLD) or a self-reading dosimeter (SRD).

9.2.3.2.1.1 Issuance

Workers will not be issued a TLD until the worker has:

- Provided evidence of the physical fit for duty and fit for respirator use (when required)
- Successfully passed the Radiation Workers Training course (score of 80% or higher)
- Completed NRC Form 4
- Provided a urine sample for baseline bioassay

All employees upon permanent departure from the project will turn in dosimetry, if utilized, and provide a urine sample for closeout bioassay.

9.2.3.2.1.2 Loss or Damage of TLDs

Each instance of a lost or damaged personnel TLD will be reported promptly to radiological control personnel.

Individuals who lose or damage their TLD while in a restricted area will immediately exit the area and report the condition to the RCT. The individual will be restricted from entering restricted areas until an exposure estimate has been completed and a new TLD issued.

9.2.3.2.1.3 Estimate of Dose

All exposures indicated by the TLD will be considered to have been received by the individual unless it can be clearly demonstrated to be erroneous.

If an exposure measurement result from a TLD is lost or proven erroneous, an estimate of the dose received by the individual during the period in question will be established by the PRSO and documented as part of the employee's exposure record. An example of a Dose Evaluation Report is provided as Figure 9-2.

Estimates of dose received will consider at least the following:

(1) Dose rates in the individual's work area.

(2) Actions taken by the individual during the time for which dose information is desired. This review should include consideration of work position, time in restricted areas, etc.

(3) Doses received by other personnel doing similar work in the area.

9.2.3.2.1.4 Wearing TLDs

The wearing of TLDs will be strictly enforced. TLDs will be worn on the front of the body between the waist and neck, facing away from the body. Any deliberate action by an employee which invalidates the TLD measurements is cause for disciplinary action.

9.2.3.2.1.5 Tracking Radiation Exposure

Prior to personnel performing work at the WSMPS site, NRC Form 4, "Occupational External Radiation Exposure History," will be completed to determine personnel lifetime exposure. NRC Form 5, "Current Occupational External Radiation Exposure," will be completed to determine personnel exposure for the current year.

9.2.3.2.2 Self-Reading Pocket Dosimeters

Self-reading pocket dosimeters (SRPD) may be issued to individuals who enter controlled areas. These dosimeters, if used, will be utilized as required and will be returned to the Radiological Control Technician (RCT) for processing. If the SRPD is worn with a TLD, the SRPD will be worn next to the permanent TLD.

Pocket dosimeters, whether low or high range types, will be read by the wearer prior to entering radiation or high radiation areas and periodically thereafter to control his own radiation exposure while in these areas. To prevent offscale reading, low range dosimeters will be recharged whenever the reading exceeds 150 mRem.

9.2.4 Analysis

Dosimetry will be provided, processed and evaluated by an offsite dosimetry processor that:

(1) Holds current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NAVLAP) of the National Institute of Standards and Technology (NIST); and

(2) Approved for the type of radiation (gamma and high energy beta from depleted uranium) that most closely approximates the type of radiation for which the individual wearing the dosimeter is monitored.

Dosimeters will be processed on a quarterly basis or at the time of employee termination, whichever is earlier.

9.2.5 Recordkeeping

9.2.5.1 Dosimetry

When self reading dosimeters are used, the daily exposure will be recorded and tracked on a separate form for visitors and as a portion of the Radiation Work Permit (RWP) for radiation workers. Copies of TLD results (NRC Form 5) as they relate to a named employee will be maintained on site and available for inspection. Personnel monitoring reports will be maintained with guidance from NRC Regulatory Guide 8.7, Rev. 1, 1992.

Copies of NRC Form 4 (see Section 9.1.1.1) and Form 5 for individual workers will be maintained as part of the WSMPS project files in accordance with the WSMPS records retention requirements.

9.2.5.2 Radiation and Contamination Surveys

Records of radiation and contamination surveys will include:

(1) Date and time of survey.

(2) Type(s) of instrument(s) used, including the model numbers and calibration information.

(3) Sketch and description of survey area.

(4) Contact and general exposure rates and/or contamination levels.

(5) Location of any boundaries and step-off pads.

(6) Name of survey performing individual and reviewing supervision.

A form that includes the information presented above will be developed for the WSMPS project.

Records of all surveys will be maintained by WSMPS in accordance with WSMPS records retention requirements.

TABLE 9-1
RADIATION EXPOSURE LIMITS

WHOLE BODY	OCCUPATIONAL EXPOSURE LIMIT	WSMP ADMINISTRATIVE LIMITS
Total Effective Dose Equivalent	5 rem/yr	1 rem/yr
Sum of deep dose equivalent plus committed dose equivalent to any individual organ or tissue	50 rem/yr	5 rem/yr
Lens of eye, skin and extremities	15 rem/yr	1.5 rem/yr
Shallow dose	50 rem/yr	5 rem/yr
Minor	10% of occupational dose limits	10% of Administrative Dose Limits However, no minors are permitted to enter a restricted area*
Embryo/fetus	0.5 rem/gestation period	0.5 rem/gestation period
General public	0.1 rem/yr	0.1 rem/yr

*No minors are permitted to enter a restricted area without the authorization of the PRSO

FIGURE 9-1

PRENATAL EXPOSURE INSTRUCTIONS FORM

I, ____, acknowledge and understand the recommendation of the National Council on Radiation Protection and Measurements to limit radiation exposure to the unborn child to the very lowest practical level, not to exceed 0.5 Rem during the entire period of pregnancy, as contained in "Instructions Concerning Prenatal Radiation Exposure" Regulatory Guide 8.13.

____
Signed

____
Printed

____
Social Security Number

____
Witness

FIGURE 9-2
DOSE EVALUATION REPORT

DOSE EVALUATION REPORT	Sheet ______ of ______ Rev ______ Date ______

Name ____________________ Social Security No. ____________________

Date of Birth ____________________ Company or Craft ____________________

Lost TLD ☐ No. ____________________ Neutron Dose Evaluation ☐

Lost Film Badge ☐ No. ____________________ Lost Dosimeter ☐ No. ____________________

Damaged ☐ (Describe) ____________________

DESCRIPTION OF OCCURRENCE

(Use additional sheets, if necessary, and check here if used ☐)

Summary of Available Records of Exposure (Give Survey Numbers, RWP Numbers, Dosimeter Readings, etc.)

(Use additional sheets, if necessary, and check here if used ☐)

ESTIMATED EXPOSURE

Evaluate above data and estimate Occupational External Radiation Exposure. Describe evaluation below and attach additional sheets, if necessary. Check here ☐ if used.

____________ Rem	____________ Rem	____________ Rem
Whole Body	Skin	Extremities
____________	____________	____________
Employee	Supervisor	Investigator

ACTION

Personnel Monitoring Records Adjusted

File This Report with Applicable Dosimetry Records for Period

Date ____________________
By ____________________

10.0 INTERNAL RADIATION LIMITS AND EXPOSURE CONTROL

10.1 Introduction

It is the policy of WSMPS to maintain the internal exposure of radioactive materials to ALARA. The use of engineering controls to the maximum extent possible will be employed. If engineering controls are not adequate, as demonstrated by work area air sampling, then respiratory protection will be considered to control internal exposures to radioactive materials. The effectiveness of the internal exposure control program will be confirmed through the use of air sampling surveys and bioassay.

Operations will be controlled such that no member of the public and no worker will exceed any 10 CFR 20 (NRC, May 1991) non-occupational and occupational limit, respectively, and the total of all workers' internal exposures will be limited to the lowest reasonably achievable.

10.2 Engineering Controls

Engineering controls will be utilized to the maximum extent possible to control the production of dusts during the remediation project. Engineering controls may be, but are not limited to using tarps or coverings, water misting or dust control additives.

10.3 Monitoring of Airborne Radioactivity

To demonstrate compliance with the limits specified in 10 CFR 20, Appendix B, Table 1, air sampling of the work areas will be performed daily during contaminated soil excavation, transfer or hauling activities. The frequency and location of sampling equipment will be dictated by the remediation activities that occur each day. An adequate number of samples will be collected to be representative of the air in the work area.

Representative samples will be collected daily in the general work areas, at the breathing zone (within 18") of workers and downwind of the work area at the restricted area boundary. If work involves the use of heavy equipment air samples will be collected in the operator's cabs daily or as directed by the PRSO. Work area air sample volumes will be a minimum of 36 cubic feet and collected using high volume, low volume or lapel air samplers as directed by the PRSO.

If work involves activities outside the operator cab or when deemed appropriate by the PRSO, representative samples will be collected daily in the general work area as close to the workers as practical.

If air sampling determines the possibility of an airborne release, then the PRSO will evaluate the possibility of an uptake. Evaluation will include, but not be limited to nasal smears and bioassay methods to determine exposures due to an uptake of the specific radionuclides.

To demonstrate compliance with the limits specified in 10 CFR 20, Appendix B, Table 2 during excavation, transfer or hauling solidification and placement operations site perimeter air samples will be collected and analyzed daily. The sampler(s) will be positioned at appropriate locations downwind of the site to collect potential releases from the site.

One background sample will be collected daily from the upwind location to the remediation site. At a minimum, one sample will be collected downwind to the remediation site. The site perimeter air samplers will collect a minimum of 36 cubic feet using a low volume sampler. Downwind perimeter air samples will be collected during periods of site activities to verify that radionuclides above the established limits in 10 CFR 20, Appendix B, Table 2, Column 1 are not released from the site.

Air sample collection and analysis will be performed with qualified personnel using calibrated equipment/instrumentation and in accordance with approved procedures.

10.4 Equipment

Air sampling equipment will be calibrated in accordance with ANSI N13.1-1969 (R/1982) within six months of the start of the project and every six months thereafter. Flow rates for the air samplers will be variable from 0.5 to 20 CFM. The analysis of air samples will be performed with equipment capable of a minimum detectable activity of the radionuclide of concern. The analysis equipment will be calibrated in accordance with ANSI N42.17A-1989 guidance.

10.5 Analysis

Results of air samples will be compared with the limits given in Table 10-1. If the air sample results are above 10% of the 10 CFR 20, Appendix B limit for the most restrictive nuclide known to be present, then the PRSO or PM will be notified.

10.6 Respiratory Protective Equipment

10.6.1 Selection

To maintain the internal exposure of radioactive materials to ALARA, engineering controls will be used to the maximum extent possible. If engineering controls are not adequate, as demonstrated by work area air sampling, then respiratory protection will be considered to control internal exposures to radioactive materials.

All respiratory protective equipment (RPE) will be recommended by the Project Radiation Safety Officer (PRSO) or his designee prior to the initiation of each new task or operation.

RPE will always be selected on the basis of hazard or presumed hazard. Whenever the degree of hazard can not be determined prior to task initiation, a conservative approach for protecting personnel will be assumed.

Respiratory equipment may be used to limit the potential for intake of radioactive materials. Protection factors as specified in 10 CFR 20, Appendix A will not be applied and potential exposures will be based upon measured volumes of contamination in the air. If WSMPS determines a need to take credit for the use of respiratory protection equipment (apply protection factors), it will notify the NRC in writing 30 days prior to using respiratory protection equipment for that purpose.

10.6.2 RPE Use

Consistent with the applicable portion of 10 CFR 20.1703, the following requirements will apply to the use of RPE at this project:

(1) RPE will only be used by those persons who have been examined by a licensed physician and found medically qualified to wear the prescribed equipment.

(2) Project personnel will use the prescribed RPE in accordance with their training and the requirements of the work permit.

(3) Only equipment recommended by the PRSO will be permitted.

(4) Only equipment that has been selected, maintained, and inspected prior to commencement of work will be permitted.

(5) Personnel will only be permitted to use equipment for which they have been adequately trained and fitted.

(6) Only equipment that has been properly fitted in accordance with the acceptable methods contained in NUREG-0041 will be permitted for use.

(7) Only equipment that has been adequately decontaminated will be permitted to be reused.

(8) Only approved RPE will be allowed for use during the remediation project.

(9) Only NIOSH and MSHA-approved respiratory equipment will be used.

(10) Communications (voice, visual, or signal line) will be maintained between all individuals present. Planning will be such that one individual, unaffected by any likely incident, will have the necessary resources to assist the others in case of any emergency.

(11) Respiratory protective equipment will not be worn when conditions exist that prevent a good face-to-face piece seal.

(12) Cartridges and filters used in conjunction with air-purifying respirators will be changed daily, or upon increased breathing resistance; whichever comes first.

(13) No contact lenses will be permitted when wearing respiratory protection.

Additional requirements may be identified as work progresses.

10.6.3 Maintenance and Repair

All RPE will be maintained and repaired in accordance with the manufacturer's recommendations, using only manufacturer-approved replacement parts, by personnel who are knowledgeable in the maintenance/repair procedure to be performed. Some procedures may be performed by the user while other procedures must be performed by the manufacturer, or an authorized service center. The following subsections describe the maintenance procedures anticipated for this project.

10.6.3.1 Maintenance/Repair by the User

All personnel who have been issued RPE will be responsible for:

(1) Daily cleaning or disposal of assigned equipment.

(2) Cartridge/filter replacement.

(3) Proper storage of assigned equipment.

(4) Possession of assigned equipment.

(5) Requesting maintenance/repair as needed.

(6) Proper use/handling.

(7) Breathing-air replenishment.

(8) Periodic frisking for radioactive contamination.

10.6.3.2 Survey of Cleaned RPE

All RPE coming into contact with the skin will be surveyed for radioactive contamination prior to use by a qualified Radiation Controls Technician.

10.6.3.3 Maintenance/Repair by the Manufacturer

All equipment that cannot be maintained, serviced, or repaired by the user will be sent to the manufacturer or authorized service center for service. Some of the procedures that are not anticipated to be handled in-house include:

(1) High-pressure regulator maintenance/repair.

(2) Cylinder maintenance/repair.

(3) High-pressure hose maintenance/repair.

Prior to returning RPE to a manufacturer for repair, the equipment will be surveyed for radioactive contamination, decontaminated if necessary, and resurveyed for unrestricted release.

10.6.3.4 Inspection

All RPE will be inspected prior to each use and during cleanings/reassembly. In the case of respiratory protection, the content of inspections will be as prescribed by the manufacturer. In addition, all respirators will be periodically monitored for radioactive contamination. If airborne radioactivity is indicated by the airborne sampling program (Section 10.3), then respirators will be monitored for radioactive contamination after each use. This will be accomplished by direct surveying and swipe testing for loose contamination. Contaminated respirators will be decontaminated immediately and retested, prior to being used again. Decontamination will be in accordance with contamination limits presented in Chapter 11.0 (Table 11-1).

10.7 Training and Instructions

As part of the radiation worker training, individuals will be instructed in the proper donning and doffing of respirators. They will also be fit tested and instructed on the proper field test to be used to ensure an adequate fit.

In addition, individuals will be instructed on the proper maintenance and cleaning of respirators.

The worker will also be advised that the worker may leave the work area any time for relief from respirator use in the event of respirator failure, physical/psychological distress or other emergency situations.

10.8 Bioassay

While it is not expected that internal exposures due to inhalation or ingestion (uptake) would exceed the limits specified in 10 CFR 20, Appendix B, Table 2, Columns 1, 2 and 3, bioassay methodology may be implemented to demonstrate compliance. This bioassay methodology will be consistent with the applicable portions of Regulatory Guide 8.9.

10.8.1 In-Vitro Bioassay

Urine samples may be collected from radiation workers prior to start of work to establish a baseline measurement of radioactive material (if any) within the individual body. Urine samples may also be taken more frequently (e.g., annually) from radiation workers and other contractor remediation workers as designated by the PRSO to monitor possible intake. A final urine sample may also be collected from each worker at the time of termination to demonstrate compliance with the specified limits and to ensure that any unknown intakes are quantified. A urine sample may also be collected any time there is a suspect ingestion or inhalation of contaminated material.

10.8.2 In-Vivo Bioassay

In-vivo (lung/whole body) counting may be performed by a qualified vendor or facility, if urinalysis is not possible or sufficient.

Results of each worker pre employment and past employment bioassays will be maintained as part of the project files and will be available for the worker to review.

10.8.3 Special Internal Dosimetry Evaluation

Personnel who are involved in radiological work will have internal dosimetry evaluations when internal contamination is confirmed or suspected, in accordance with the following criteria:

A urinalysis or lung count will be required in the following circumstances:

(1) Whenever personnel are exposed to airborne radioactivity above the limits in 10 CFR 20, Appendix B.

(2) Whenever personnel are exposed to high airborne concentrations exceeding protection provided by respiratory equipment being worn.

(3) Whenever nasal swabs or personnel frisking indicates detectable counts of alpha or beta-gamma activity.

(4) Whenever the Project Radiation Safety Officer or his designee feels that internal monitoring is needed.

When in-vivo examinations are required as a result of internal contamination, the involved personnel will be transported directly to the whole body counter facility as soon as practicable after the incident. Additionally, in-vitro fecal sampling may be required if the urinalysis or in-vivo examination indicates internal contamination.

10.8.4 Dose Commitment

When an internal deposition is detected, the employee's committed effective dose equivalent (CEDE) will be estimated by methods using metabolic modeling consistent with reports 26, 30 and 54 of the International Commission on Radiological Protection (ICRP) and Regulatory Guide 8.9. The calculated CEDE will be reported to the employee and will become a part of his/her exposure history file (NRC Form 5).

10.9 Work Restriction

An employee may have his radiation work activities altered or limited as a result of:

(1) Approaching the control levels specified in Section 9.1.1 and 10.1.

(2) Unknown exposure status.

(3) Increased potential for internal deposition, such as an open skin break.

(4) Repeated violations of radiological or general safety requirements.

The PRSO is responsible for implementing work restrictions, when necessary. The employee's supervisor will be notified in writing that a work restriction has been imposed within hours of determining the need for a restriction. Copies of work restrictions will be maintained in the employee's dosimetry record.

No person will exceed the administrative control levels of Section 9.1 without prior written approval of the PRSO.

An employee whose exposure status is unknown (e.g., lost dosimeter) will not enter a controlled area until his/her current exposure status is determined by the PRSO.

When an employee has an internal deposition of a radioisotope induced for medical diagnostic purposes, he/she will be restricted from wearing a TLD until the medical isotope is eliminated from the body. This is done to avoid including exposure from the medical isotope to that exposure received from this contact with radioactive material.

Employees who work with radioactive materials will report any skin breaks which they may have to their immediate supervisor and radiological controls personnel. Skin breaks include unhealed wounds, open cracks from chapping, injuries such as lacerations, abrasions, punctures, and blisters or burns. A clearly open wound will be sufficient reason to prohibit entry to a controlled area, irrespective of protective clothing or medical dressings.

Safeguards will be maintained by supervision to minimize the likelihood of accidental introduction of radioactive materials beneath the skin. If the skin is broken while working with radioactive materials, the employee will immediately report to his immediate supervisor who will have the skin break surveyed by an RCT. The PRSO will determine if additional follow-up action is required.

Contaminated personnel will be decontaminated in accordance with the approved procedures listed in Chapter 11.0 (Table 11-2).

TABLE 10-1
AIR MONITORING/SAMPLING ACTION LEVELS

TYPE OF MEASUREMENT	READING	ACTION
TLD - Personnel	>50 mrem/qtr	• Investigate exposure source(s), evaluate tasks/operations involving potential for exposure, establish ALARA controls to reduce exposures as appropriate. • Notify PM and RSO.
TLD - Project Site Perimeter	2 times background	• Determine source and evaluate impact on public. • Notify PM and RSO.
Work Area Air Samples for Particulate Radioactivity	Administrative Limit (50% of 10 CFR 20 limit)	• Investigate additional engineering. methods to reduce exposure to airborne materials. • Notify PM and RSO. • Increase frequency of work site air sampling.
Work Area Air Samples for Particulate Radioactivity	0.10 to 0.25 of 10 CFR 20 Limit	• Investigate the need for respiratory protection. • Notify PM and RSO.
Perimeter sampling for Particulate Radioactivity	>0.5 of 10 CFR 20 Limit	• Notify PM and RSO. • Evaluate controls of off-site emissions and modify as appropriate.

* *The most restrictive nuclide of concern on each site will be used to determine action levels based on 10 CFR 20 values.*

11.0 CONTAMINATION CONTROL

11.1 Introduction

Control of radioactive materials is needed to minimize the spread of contamination. When radioactive contamination is spread, the potential for an individuals exposure to radiation will increase. In the event that radioactive contamination is spread, then decontamination efforts will be implemented.

Decontamination may be required whenever personnel and equipment exit potentially or known contaminated areas of the project site. Proper decontamination will be necessary to minimize the potential for transfer of contaminants to previously unaffected areas, and for personal protection. The subsections below present the personal and equipment decontamination requirements applicable to this project.

11.2 Contamination Control

To the maximum extent possible, all radioactive contamination will be kept to a minimum. Spills of radioactive materials will be isolated and cleaned up as quickly as possible. All equipment and personnel exiting the radiologically restricted area will be monitored for contamination. Limits for contamination and associated personnel protective equipment are given in Table 11-1.

11.3 Equipment Decontamination

11.3.1 General

All equipment used on site will be thoroughly decontaminated prior to being cleared for release from the project site. This requirement will apply to all equipment, including (but not limited to) the following:

(1) Vehicles and heavy equipment.

(2) Contaminated materials transport equipment (conveyors, hoppers, piping, containers, etc.).

(3) Air monitoring instruments.

(4) Sampling apparatuses.

(5) Hand tools.

The degree of decontamination necessary will vary on the type of equipment involved, and on its uses relative to the amount of contamination that may have occurred.

11.3.2 Requirements

Small items of equipment (i.e., hand-held items such as hand tools and air monitoring instruments) will be taken to the personnel decontamination area and decontaminated by the user(s) upon entry into the Personal Decontamination Pad. Larger items such as vehicles will be taken to the Equipment Decontamination Pad.

Small items will be protected from contacting contamination to the extent possible through practices such as bagging instruments or taping (if applicable/possible), and avoidance of setting items on potentially-contaminated surfaces. Decontamination of small items will typically involve a soap and water wash and a clean water rinse, followed by instrument frisking/screening.

Exceptions to these requirements may include:

(1) Items made of absorbent materials (i.e., wooden handles on tools, etc.) may be discarded and not subjected to decontamination efforts after reasonable effort is made to decontaminate. Absorbent materials in the contamination area should be kept to a minimum.

(2) Items that require special decontamination procedures, such as samples and/or sampling apparatus.

Large items of equipment (i.e., site vehicles, bulldozers, backhoes, etc.) will undergo decontamination at the Equipment Decontamination Pad. The procedures utilized at this location will include high-pressure steam cleaning of all exterior surfaces. Pre- and post-instrument screening/frisking will be performed to identify potential "hot" spots from a radiological standpoint. These measurements will be taken on both exterior and accessible interior surfaces.

11.3.3 Contaminated Release Limits

Guidance for specific radionuclide contamination limits for materials and equipment are specified in "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source, or Special Nuclear Materials" *(NRC, August 1987)*. (See Table 11-1 for guidance on contamination limits.)

11.4 Personnel Decontamination

11.4.1 General

It is not expected that personnel exiting the radiological control zones will be contaminated after removal of the outer layer of protective clothing. However, if personnel are determined to be contaminated then personnel decontamination procedures will be performed (see Table 11-2).

The only exception to this requirement would be in the event of an extreme emergency when the urgency of the situation outweighs the need for decontamination. An example of this is a medical emergency where medical attention requires priority treatment.

11.4.2 Procedures

Personnel decontamination protocol will be comprised of removing items of personal protective equipment and clothing (tyvek and outer boots), followed by surveying for radioactive contamination. Radiological survey instrumentation and specifications are presented in Section 13.0. Personnel contaminated above the limits specified in Table 11-1 will be decontaminated using the procedures specified in Table 11-2.

All personnel will receive training in proper decontamination procedures and sequences as part of the site-specific training for this project.

11.4.3 Facilities

Personal decontamination facilities will consist of as a minimum, a bermed area lined with plastic. The decontamination facility will have provisions for containers containing soapy water, rinse water and receptacles for waste, water and trash. All materials will be tested for radioactive contamination prior to release from the decontamination facility.

11.5 Reuse of Personal Protective Equipment (PPE)

Reuse of items of personal protective equipment (PPE) will be permitted, provided that such items are successfully decontaminated, and that they satisfactorily pass the instrument screening/frisking process. Examples of PPE items that may be reused include:

(1) Hardhats.

(2) Respirators (exception: air-purifying respirator cartridges).

(3) Work boots.

(4) Boot covers.

(5) Eye and face protection.

(6) Ear protection (exception: disposable ear plugs).

(7) Cloth coveralls and/or Tyvek.

(8) Work gloves.

Items that cannot be properly decontaminated will be handled as waste products, containerized, and will be disposed of in accordance with WSMPS requirements for disposal of radioactive waste.

11.6 Confiscation of Contaminated Articles

All site personnel will be made aware, as part of site-specific training that any item brought on site may be confiscated if it becomes radioactively contaminated and cannot be successfully decontaminated. In this regard, site personnel will be informed that personal articles should not be brought on site.

11.7 PPE Requirements for Decontamination Areas

Personnel working in decontamination areas during decontamination operations will need to utilize items of PPE to protect themselves from the contaminants that may be present on the surfaces that are being decontaminated.

PPE requirements for personnel working in the personnel decontamination areas will generally be consistent with the items of PPE worn by the workers being decontaminated. For those workers assigned to the equipment decontamination pad, an increased potential for contact with liquids exists due to the use of a high-pressure steam generator. Therefore, minimum PPE requirements for workers in this area will typically involve:

(1) Hooded coveralls, made of moisture-repellant material or rain suits.

(2) Full-face shield.

(3) Boot covers.

(4) Moisture-resistant gloves.

These PPE requirements may be modified based on project site conditions including the use of full-face air-purifying respirators as conditions warrant.

11.8 Personal Hygiene

Due to the nature of operations and contaminants involved at this site, practicing sound personal hygiene will be emphasized to all site workers both initially during site training, and on an on-going basis.

Eating, drinking, chewing gum or tobacco, and smoking will be prohibited in the contaminated or potentially contaminated areas or where the possibility for the transfer of contamination exists.

11.9 Personal Contamination (Frisking and Decontamination)

As part of Radiation Worker Training, all personnel will be instructed in the proper method of removing outer clothing/tyveks and boot covers and monitoring for personal contamination as part of the formal radiation safety training program. Friskers (personal contamination monitors) will be available at each exit from a controlled area. Instructions will be provided at each personal frisking station. Instrumentation/specification of instruments used to monitor for personal contamination are presented in Section 13.0.

In the event that personnel contamination is suspected or found, the RCT will be notified and appropriate action as directed by the PRSO be taken. Table 11-1 gives contamination levels for personnel contamination. Table 11-2 provides guidance for skin decontamination methods.

11.10 Waste Minimization

As a result of carrying out the WSMPS project activities, radioactive waste in the form of protective clothing, rags, gloves, wipes, tools and equipment will be generated.

It is WSMPS policy to minimize the amount of radioactive waste to the extent practical. To achieve this objective, the following guidance is offered:

- Radwaste receptacles are for contaminated trash only. Do not throw clean trash into these containers.

- Take only the amount of material (bags, wipes, rags, etc.) that you need to perform the immediate job. Avoid taking bulk volumes of material into the contaminated area.

- Bag or tape tools or equipment to minimize the potential for the article to become contaminated.

- Reuse to the extent possible tools and equipment that is already contaminated. Reuse of contaminated tools and equipment will reduce the amount of radioactive material contaminated.

- All tools and equipment removed from contaminated areas must be surveyed by Radiological Control personnel prior to removal to determine if they are contaminated. Contaminated tools and equipment should be stored for future use and contaminated trash should be disposed of as radwaste. Tools, equipment, and trash that are frisked "clean" may be stored or discarded as everyday non-radioactive material.

- If cleaning solutions are to be used for decontamination purposes, make sure that the solution is not a hazardous chemical that will generate a "mixed waste" if it becomes contaminated with radioactivity and has been declared waste. A water based decontamination solution is the preferred option.

TABLE 11-1
RADIOACTIVE CONTAMINATION LIMITS

NUCLIDES[a]	AVERAGE[b, c, f]	MAXIMUM[b, d, f]	REMOVABLE[b, e, f]
Equipment: U-nat, U-235, U-238 and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1,000 dpm $\beta\gamma$/100 cm^2
Personnel	200 dpm $\beta\gamma$ 20 dpm α		

[a] *Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.*

[b] *As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.*

[c] *Measurements of average contaminant should not be averaged over more than one square meter. For objects of less surface area, the average should be derived for each such object.*

[d] *The maximum contamination level applies to an area of not more than 100 cm^2.*

[e] *The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.*

[f] *The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.*

TABLE 11-2
TABLE OF SKIN DECONTAMINATION METHODS

METHOD	ADMINISTRATING PERSON	EFFECTIVE FOR	INSTRUCTIONS
Masking Tape	RC Technician	Visible Particulate	Apply tape to skin by light patting. Remove carefully.
Waterless Hand Cleaner	RC Technician	All Skin Contamination	Apply to affected area and allow it to melt onto skin. Remove with cotton or soft disposable towel.
Soap and Tepid Water	RC Technician	All Skin Contamination	Wash area with low alkaline, non-abrasive soap and tepid water. Repeat until further attempts do not reduce the level. A surgical hand brush may be used with moderate pressure.
Cornmeal Detergent Paste	RC Technician	All Skin Contamination	Mix cornmeal and powder detergent in equal parts with enough water to form a paste. Put onto affected area for five (5) minutes. Remove with cotton or disposable towel. Rinse skin.
Shampoo	RC Technician	Hair Contamination	Wash hair and rinse. Repeat as necessary. Remove any hair that cannot be decontaminated. DO NOT SHAVE HAIR. Cut hair as close to the skin as possible with scissors.
Nose Blowing	Individual	Nasal Contamination	Blow nose into a rag, tissue, kim wipe, etc. Monitor tissue after attempt. Stop when no increase in activity is noted.

TABLE 11-2 (continued)
TABLE OF SKIN DECONTAMINATION METHODS

METHOD	ADMINISTRATING PERSON	EFFECTIVE FOR	INSTRUCTIONS
Titanium Dioxide Paste	Medical Personnel	Fission Product Contamination	Form a paste of Titanium Dioxide powder and water. Apply small amounts of water to paste to keep it moist whole massaging it onto area. Continue massage for five (5) minutes. Remove paste with cotton. Rinse thoroughly with lukewarm water followed by a wash with soap and water.
EDTA Cream*	Medical Personnel	Fission Product Contamination	Mix a cream consisting of 1% EDTA, 3% powdered detergent, 8% Carboxy-Methyl-Cellulose, and 8% distilled water. Scrub area with cream. Remove with cotton.
Potassium	Medical	Alpha	Mix an equal volume of a saturated solution of Potassium Permanganate (6.4 grams) $KMnO_4$/100 ml water) with 1% Sulfuric Acid solution (0.2N). Pour this solution over WET contaminated areas. Rub lightly for several minutes with surgical hand brush. Rinse with tepid water to remove the resulting brown stain. Pour a freshly prepared 5% Sodium Bisulfite solution (10 g $NaHSO_3$/200 ml water). Rinse with tepid water and scrub lightly for several minutes. This procedure may be repeated several times without harm. Limit washing to 2 minutes each.

* *Note: Do not use EDTA on halogens such as* I^{131} *contamination*

12.0 RADIATION SURVEYS

12.1 Introduction

In order to adequately determine the extent of the radiation hazard for the WSMPS project and to ensure that personnel do not exceed the 10 CFR 20.1201(a) limits or unnecessary exposure to radiation, routine and non-routine radiation surveys will be performed. These surveys will consist of direct radiation surveys, total and loose contamination surveys and airborne radiation surveys.

Specific procedures will be developed to perform each of the surveys needed to provide adequate information to determine the true extent of the radiation hazard at the WSMPS project site and to minimize personnel exposure to as low as reasonably achievable (ALARA). The routine and non-routine radiation surveys will be performed by qualified individuals using calibrated equipment/instruments and in accordance with approved procedures.

The radiation survey program is designed to provide the following;

(1) Provide a means for analyzing trends of the site radiological conditions.

(2) Informs the workers of existing radiological hazards at the site and in their work area.

(3) Verifies that the radioactive material is being adequately controlled and not spreading to uncontrolled areas.

(4) Verifies the effectiveness of contamination controls.

(5) Verifies the effectiveness of engineering controls and/or respiratory protection.

12.2 General Requirements and Standards

(1) Surveys will only be conducted by individuals specifically trained in the use of radiation monitoring equipment.

(2) Surveys are classified as routine and non-routine surveys. Routine surveys are surveys performed on a regular basis while non-routine surveys are performed as necessary to support remediation activities. A schedule of routine surveys will be developed by the PRSO.

(3) Surveys will be performed with instruments calibrated for the type and energy of the radiation being monitored.

(4) A sufficient number of survey points will be taken in order to adequately assess the radiological status of the area being surveyed.

(5) Radiological postings and other control measures should be reviewed for adequacy following surveying. The posting will be updated as needed or at the direction of the PRSO.

(6) All radiological surveys will be recorded on standard forms. The forms will contain spaces for the following information:

(7) Date and time.

(8) Name of survey and surveyor.

(9) Space for sketches or drawings of material or areas to be surveyed.

(10) Space for survey results.

(11) Space for the instrument(s) being used, serial numbers, calibration date(s), background(s) and efficiencies.

Continuation sheets can be used to complete survey information, however continuation sheets will contain enough information to tie it to the cover sheet.

12.3 Radiation Surveys

Radiation surveys will be performed at predetermined points in active work areas and adjacent areas whenever operations are performed that have the potential for changing radiation or contamination levels.

12.3.1 Survey Frequencies

Radiation surveys are performed as necessary to ensure personnel do not exceed radiation exposure limits and to meet requirements for posting radiation areas. These surveys are performed to determine whether abnormal radiation levels exist and to determine the extent and magnitude of radiation levels. The following surveys will be the minimum performed.

12.3.1.1 Facilities Containing Radioactive Material

Radiation surveys will be performed to control radiation exposure whenever operations are performed that might be expected to change existing radiation levels. Examples of such operations include accumulation of waste and relocation of highly radioactive materials.

Temporary boundaries (e.g., rope boundaries) of radiation areas will be surveyed weekly to ensure controlled areas do not extend beyond posted boundaries.

Gamma surveys and contamination control surveys will be performed at least weekly in occupied posted radiation areas, in all occupied areas of radiological facilities, and in radioactive material short-term storage areas. Long-term storage areas will be surveyed at least monthly.

Other surveys will be performed as necessary to control personnel exposure to gamma, beta and alpha radiation.

12.3.1.2 During Casualties

Radiation surveys will be performed as necessary to access the extent and magnitude of a radiation condition in the event of an accident which might cause abnormal radiation levels.

12.3.1.3 Records

Records of radiation surveys will be retained until the end of the job. The survey information will be recorded on a standard form, if specified, or on locally prepared forms which contain at least the following information:

- Date and time of survey.
- Reason for survey and type of radiation measured (e.g., weekly gamma).
- Type and identifying number of instruments used.
- Instrument calibration due dates.
- Location (will be shown on a survey map or listed in a table).
- Radiation level measured.
- Remarks.
- Signature of surveyor.
- Signature of persons reviewing results (e.g., Radiological Control Supervisor).

12.3.2 Safety Precautions

The following safety precautions will be observed by personnel using portable radiation monitoring equipment.

(1) Only personnel trained in the use of portable radiation monitoring equipment will be allowed to use this equipment. As a minimum, training will consist of a lecture on the use of the instrument, the meaning of its measurements, a demonstration of its proper handling, and a period of supervised use.

(2) Damage to or loss of radioactive source can result in spreading, inhaling, or ingesting contamination. Therefore, radioactive sources require careful handling and accountability control. If a source is lost, immediate steps will be taken to recover the source and minimize radiation exposure to or contamination of personnel as a result of the lost source. A log entry will be made each time a source is used or removed from its repository.

(3) Except for sources which are permanently attached to monitoring instruments, check sources which are not in use will be kept in a locked cabinet. The number of keys will be kept at a minimum. Combination

locks are permitted and, when used, the number of personnel having the combination will be kept to a minimum. A log entry will be made each time a source is used or removed from its repository.

12.3.3 Calibration and Maintenance of Survey Instruments

Radiological control supervisory personnel will ensure that the appropriate survey instruments are available, functional, and calibrated using accepted standards for performing radiation surveys.

The types and uses of specific radiation monitoring devices recommended for use are listed in Section 13.2.

12.4 Airborne Radioactivity Surveys

Airborne radioactivity surveys (monitoring/sampling) provide assurance that airborne radioactivity is adequately controlled. The airborne survey consists of drawing a known volume of air through a 0.5 micron, 47 mm diameter (or equivalent) air filter and analyzing the air filter for appropriate radionuclides. Additionally, the airborne survey can act as a guide in the selection of the appropriate respiratory protection equipment.

13.0 INSTRUMENTATION

13.1 Introduction

Direct radiation and contamination monitoring using portable or laboratory measurements will be performed using instrumentation and techniques necessary to detect 200 dpm/probe area (15 cm^2) total and 100 dpm/100 cm^2 removable beta/gamma contamination. Instruments will be calibrated with radiation sources traceable to the National Institute of Standards and Technology (NIST) and having consistent energy spectrum with the radionuclides being measured. If alpha contamination is suspected, appropriate surveys and/or laboratory measurements capable of detecting 20 dpm/100 cm^2 removable alpha activity will be performed.

13.2 Equipment Specifications

<u>Portable Contamination Monitor (Beta/Gamma)</u>

Range	-	0 TO 500,000 counts per minute
Accuracy	-	±20% of reading between 10% and 100% of full scale on any range
Response Time	-	20 seconds (slow response)
Instrument	-	Ludlum model 3 with Ludlum model 44-9 probe (or equivalent)

<u>Direct Radiation Exposure Meter (Beta/Gamma)</u>

Range	-	0 TO 5 R/hr auto scaling
Accuracy	-	±20% of reading between 10% and 100% of full scale on any range
Response Time	-	2 to 8 seconds (slow response)
Energy Spectrum	-	beta above 100 KeV and gamma above 15 KeV
Instrument	-	Victoreen 450 (or equivalent)

<u>Portable Alpha Survey Monitor</u>

Range	-	0 TO 200,000 counts per minute
Accuracy	-	±20% of reading between 10% and 100% of full scale on any range
Response Time	-	5 seconds (slow response)
Efficiency for Pu239	-	16%
Instrument	-	Ludlum Model 2221 with Ludlum 43-5 zinc sulfide probe (or equivalent)

Direct Radiation Micro R Meter (Gamma)

Range	-	0 TO 5,000 micro R/hr scales
Accuracy	-	±20% of reading between 10% and 100% of full scale on any range
Response Time	-	15 seconds (slow response)
Energy Response	-	1 to 1 energy response above 80 KeV
Instrument	-	Victoreen 450 P (or equivalent)

Scaler (Alpha and Beta/Gamma)

Range	-	0 TO 500,000 counts
Accuracy	-	±20% of reading between 10% and 100% of full scale on any range
Response Time	-	2 to 8 seconds (slow response)
Energy Response	-	1 to 1 energy response above 80 KeV
Instrument	-	Ludlum 2200 single channel analyzer (or equivalent)

Air Samplers

Flow Rate	-	0.5 to 20 cubic feet per minute
Instrument	-	Radeco 809V variable flow rate air sampler (or equivalent)

Dosimetry

Personnel Dosimetry, Record	-	Landauer TLD Equipment (or equivalent)
Personnel Dosimetry, Self-Reading	-	Atomic Products #019-100, 200 (or equivalent)

The above identified radiation survey instruments (or equivalents), will be calibrated every 6 months.

Instrument calibration records and daily source check records will be maintained by the PRSO and available at the site field office for inspection.

14.0 MEDICAL SURVEILLANCE

14.1 Introduction

This section describes the medical surveillance program applicable to personnel who will work within the Radiologically Controlled Areas at the WSMPS site. The purpose of the medical surveillance program is to determine site personnel fitness for duty. The data obtained from the medical surveillance program, in conjunction with information generated via employee exposure monitoring, will be utilized to evaluate the health status of site personnel.

The WSMPS Medical Surveillance Program consists of the following elements:

(1) Administration of the program by WSMPS.

(2) Initial, annual and termination medical examinations for all personnel engaged in field work.

(3) A standard protocol for medical examinations, modified as necessary to reflect site-specific concerns not addressed by the standard protocol.

(4) Maintenance and retention of medical records.

14.2 Medical Examinations

The WSMPS Project Medical Surveillance Program requires that all personnel engaged in field work involving potential exposure to health, safety, and/or radiological hazards participate in the program. An initial examination is performed on the employee prior to assignment to field work. At least annually, thereafter, the employee is provided with an additional examination. All WSMPS employees assigned to this project will be active participants in the medical surveillance program. All project personnel will have had a medical examination meeting the requirements of the program within the past 12 months.

WSMPS contractors and subcontractors must demonstrate that their employees are participants in a medical surveillance program that is at least as comprehensive as the WSMPS program by providing WSMPS with a written description of their program and the name and telephone number of their examining physician or medical consultant. The WSMPS Project Manager (PM) may contact the subcontractor's physician or medical consultant to discuss the specifics of this project and the content of the subcontractors program.

14.3 Physician's Written Opinion

Physicians performing examinations of WSMPS employees are provided with the following information:

(1) A description of the employee's duties as they relate to the employee's exposures.

(2) The employee's exposure levels or anticipated exposure levels.

(3) A description of any personal protective equipment to be used, including the potential use of air-supplied or negative pressure, air-purifying respirators.

(4) Any information from previous medical examinations in the possession of WSMPS or the Contractor which is not readily available to the examining physician.

This information, and the results of the examination, are used as the basis of the physician's written opinion regarding the medical status of the employee.

Upon completion of an initial or annual medical examination of a WSMPS contractor employee, the examining physician is required to provide medical clearance prior to the employee engaging in on-site work activities.

14.4 Recordkeeping

The clinics or physicians utilized by WSMPS to perform medical examinations will maintain records of all examinations. WSMPS will maintain a medical surveillance file on all current employees as well as terminated employees.

15.0 RECORDS AND REPORTS

15.1 General

All records and reports related to the Radiation Control and Protection Program will be maintained by WSMPS until the project is complete and the NRC terminates the license, if appropriate. Employee exposure records will be retained in accordance with WSMPS records retention requirements.

15.2 Exposure Records and Reports

The PRSO will assure that records are maintained to permit a ready accounting of an employee's accumulated radiation exposure. This occupational exposure record will include:

(1) Any known prior employment occupational exposure history (NRC Form 4 or equivalent) (see Figure 15-1).

(2) External and internal exposure received occupationally, including that received at other installations (NRC Form 5 or equivalent) (see Figure 15-2).

(3) Special dose evaluations and work restrictions (see Figure 15-3).

(4) Reports of unusual exposure, such as overexposure or incidents with potential for internal deposition.

Each employee will be informed of the results of all recorded dosimetry evaluations. Each employee will be provided a copy of his/her occupational exposure upon written request.

15.3 Forms and Records

Specific forms or records will be developed and used for the following items:

(1) Direct and contamination surveys.

(2) Personnel contamination survey.

(3) Airborne survey (monitoring/sampling) calculation data sheets.

(4) Daily instrument operational check and calibration sheets.

(5) Daily report of work and surveys completed.

(6) Radiation Work Permits.

(7) NRC Form 4 or equivalent and Form 5 (or equivalent will be used to track individual worker exposure).

(8) Self Reading dosimeter usage.

(9) Incidents and accidents.

15.4 Record Maintenance

WSMPS will maintain records consistent with 10 CFR 19 and 20 requirements as applicable and will make such records available to individual workers for inspection. The following is a general listing of the records that will be maintained by WSMPS for the project.

(1) The provisions of the Radiation Protection and Control Program.

(2) Audits and other reviews of the Radiation Protection and Control Program content and implementations.

(3) Results of surveys and calibrations required by 10 CFR 20.1501 and 10 CFR 20.1906(b).

(4) Records of the results of surveys to determine the dose from external sources and used, in the absence of or in combination with individual monitoring data, in the assessment of individual dose equivalents.

(5) Records of the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose.

(6) Records showing the results of air sampling, surveys, and bioassays.

(7) Records of the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment.

(8) Records of doses received by all individuals for whom monitoring was required pursuant to 10 CFR 20.1502. These records must include, when applicable:

   (a) The deep-dose equivalent to the whole body, eye dose equivalent, shallow-dose equivalent to the skin, and shallow-dose equivalent to the extremities;

   (b) The estimated intake or body burden of radionuclides;

   (c) The committed effective dose equivalent assigned to the intake or body burden or radionuclides;

   (d) The specific information used to calculate the committed effective dose equivalent pursuant to 10 CFR 20.1204(c);

   (e) The total effective dose equivalent when required by 10 CFR 20.1202; and

   (f) The total of the deep-dose equivalent and the committed dose to the organ receiving the highest total dose.

(9) WSMPS will maintain the records specified on NRC Form 5, in accordance with the instructions for NRC Form 5, or in clear and legible records containing all the information required by NRC Form 5.

(10) Records sufficient to demonstrate compliance with the dose limit for individual members of the public.

(11) Records of the disposal of licensed materials made under 10 CFR 20.2002 and 10 CFR 20.2003.

(12) WSMPS will maintain the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman.

(13) Records sufficient to demonstrate compliance with the dose limit for individual members of the public.

(14) Records of the disposal of licensed materials made under 10 CFR 20.2002.

(15) Incident reports, as required by 10 CFR 20, Subpart M.

FIGURE 15-1

PAGE ____ OF ____

NRC FORM 4 (6-92) 10 CFR PART 20	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0005 EXPIRES: 6/30/96
LIFETIME OCCUPATIONAL EXPOSURE HISTORY		ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 8 MINUTES. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0005), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. IDENTIFICATION NUMBER	3. ID TYPE	4. SEX: MALE ☐ FEMALE ☐	5. DATE OF BIRTH

6. MONITORING PERIOD		7. LICENSEE NAME		8. LICENSE NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE NAME		8. LICENSE NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE NAME		8. LICENSE NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE NAME		8. LICENSE NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE NAME		8. LICENSE NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE NAME		8. LICENSE NUMBER		9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE	16. CDE	17. TEDE	18. TODE

19. SIGNATURE OF MONITORED INDIVIDUAL	20. DATE SIGNED	21. CERTIFYING ORGANIZATION	22. SIGNATURE OF DESIGNEE	23. DATE SIGNED

NRC FORM 4 (6-92) PRINTED ON RECYCLED PAPER

FIGURE 15-2

PAGE ____ OF ____

NRC FORM 5
(6-92)
10 CFR PART 20

U.S. NUCLEAR REGULATORY COMMISSION

OCCUPATIONAL EXPOSURE RECORD FOR A MONITORING PERIOD

APPROVED BY OMB NO. 3150-0006
EXPIRES: 6/30/96

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 15 MINUTES. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0006), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. IDENTIFICATION NUMBER	3. ID TYPE	4. SEX ☐ MALE ☐ FEMALE	5. DATE OF BIRTH

6. MONITORING PERIOD	7. LICENSEE NAME	8. LICENSE NUMBER(S)	9A. ☐ RECORD ☐ ESTIMATE	9B. ☐ ROUTINE ☐ PSE

INTAKES

10A. RADIONUCLIDE	10B. CLASS	10C. MODE	10D. INTAKE IN µCi

DOSES (in rem)

DEEP DOSE EQUIVALENT	(DDE)	11.
EYE DOSE EQUIVALENT TO THE LENS OF THE EYE	(LDE)	12.
SHALLOW DOSE EQUIVALENT, WHOLE BODY	(SDE,WB)	13.
SHALLOW DOSE EQUIVALENT, MAX EXTREMITY	(SDE,ME)	14.
COMMITTED EFFECTIVE DOSE EQUIVALENT	(CEDE)	15.
COMMITTED DOSE EQUIVALENT, MAXIMALLY EXPOSED ORGAN	(CDE)	16.
TOTAL EFFECTIVE DOSE EQUIVALENT *BLOCKS 11+15*	*(TEDE)*	17.
TOTAL ORGAN DOSE EQUIVALENT, MAX ORGAN *BLOCKS 11+16*	*(TODE)*	18.

19. COMMENTS

20. SIGNATURE -- LICENSEE	21. DATE PREPARED

NRC FORM 5 (6-92)

PRINTED ON RECYCLED PAPER

FIGURE 15-3
DOSE EVALUATION REPORT

DOSE EVALUATION REPORT	Sheet ______ of ______ Rev ______ Date ______

Name ____________________ Social Security No. ____________________

Date of Birth ____________________ Company or Craft ____________________

Lost TLD ☐ No. ____________________ Neutron Dose Evaluation ☐

Lost Film Badge ☐ No. ____________________ Lost Dosimeter ☐ No. ____________________

Damaged ☐ (Describe) ____________________

DESCRIPTION OF OCCURRENCE

(Use additional sheets, if necessary, and check here if used ☐)

Summary of Available Records of Exposure (Give Survey Numbers, RWP Numbers, Dosimeter Readings, etc.)

(Use additional sheets, if necessary, and check here if used ☐)

ESTIMATED EXPOSURE

Evaluate above data and estimate Occupational External Radiation Exposure. Describe evaluation below and attach additional sheets, if necessary. Check here ☐ if used.

______ Rem	______ Rem	______ Rem
Whole Body	Skin	Extremities
______	______	______
Employee	Supervisor	Investigator

ACTION

Personnel Monitoring Records Adjusted

File This Report with Applicable Dosimetry Records for Period

Date ____________________
By ____________________

16.0 EMERGENCY ACTIONS

Accidents, industrial events, and medical emergencies that occur at the WSMPS site will be handled in accordance with the site specific Health and Safety Procedures and Emergency Action Procedures.

Onsite first aid emergency response will be supported by the local emergency response (fire and medical) organizations. Radiation awareness training will be provided to transport and treatment personnel.

The emergency response protocol for various accidents and emergencies are summarized in the subsequent sections. WSMPS will notify the NRC of any accident or emergency consistent with the applicable requirements in 10 CFR 20.2202.

16.1 Accidental Spillage of Radioactive Materials

Should radioactive or contaminated materials be accidentally released from their container, the following actions should be taken. WSMPS or its subcontractor personnel are to follow the instructions below which have been developed using the SWIMS acronym:

S = Stop the spill
W = Warn other personnel
I = Isolate the spill area
M = Minimize personnel exposure
S = Secure the appropriate equipment

Stop the spill. If the spill has occurred from a source which may or is continuing to add material to the spill, take such measures as necessary to stop the spill, such as closing a valve or blocking the path of the fluid with absorbent material. A balance of risk to the individual must be weighed for potential personnel risk in these actions versus the potential safety and economic cost if limited actions are taken. If mechanical action is needed, such as closing a valve or disabling a pump, knowledge of the effect on the total system or machinery involved is required prior to such actions.

Warn other personnel. Others in the immediate area and those entering the area must be told of the event to enable all personnel to take the appropriate response actions. Health physics personnel must be notified as soon as possible.

Isolate the spill area. Non-vital personnel will be kept out of the immediate vicinity, if necessary, by having someone posted at the entrance to the area. Personnel who have been contaminated will remain in the immediate vicinity to prevent the spread of contaminants until health physics personnel release them. An exception to this is when the ambient radiation levels are high or of a traumatic injury requiring leaving the area has occurred.

Minimize personnel exposure. The event may include both a radiological and a chemical hazard. Personnel will remain in the immediate vicinity until health physics personnel arrive both to assist in spill control and to be available for surveying of exposed individuals. The nature of the spill, both chemical and radiological, and the need to monitor the spill will dictate how close personnel should remain.

Secure the appropriate equipment. Ventilation or other operating equipment may be selected for shutdown due to the nature of the spill and to prevent further occurrence. Knowledge of the system and equipment involved is necessary prior to taking such action.

16.2 Fire in a Restricted Area

Areas will be evacuated by all non-emergency personnel when a fire, heavy smoke, or similar fumes occur in a controlled area. Health physics, operational and/or fire response personnel will be immediately notified. This is true for all fire events, including those where personnel in the immediate vicinity have extinguished a minor event, such as a wastebasket fire.

- When possible, the fire will be extinguished by personnel in the immediate vicinity rather than allowing it to grow into larger proportions while designated personnel are on their way.
- If a fire cannot be rapidly extinguished, the local fire department will be summoned for fire detail:
  - fire fighting personnel will be informed that radioactive material may be present
  - fire detail will wear self-contained respiratory equipment, protective clothing, and any other items deemed necessary by the lead health physics individual
  - the primary function of the fire detail will be to evacuate personnel from the fire area
  - the secondary function of the fire detail will be to save equipment and property without endangering their own or other lives
  - the tertiary function of the fire detail is to minimize the spread of contamination outside the controlled area
- Fire extinguishing agents, such as CO_2, foam, or dry chemicals, are preferred as this minimizes the volume of potentially contaminated liquids.
- All fire fighting personnel will be surveyed prior to exiting the event area except for those in need of immediate medical assistance outside the controlled area. Minimization of the spread of contamination will be kept in mind at all times.

16.3 Contaminated Injury

Medical emergencies or accidents can be divided into two categories. The first category is non-life-threatening and the second being considered as life-threatening.

16.3.1 Non-Life-Threatening Incidents

Non-threatening medical emergency victims will be given first aid on the WSMPS site. Prior to the victims leaving the site the victim will be monitored for radioactive contamination. If the individual is contaminated decontamination procedures will be followed unless it is determined that the emergency is life-threatening.

Specific emergency actions include:

- Wash minor wounds immediately under running water, spreading the edges of the gash. If at all practical, collect and retain cotton sponges, fluids, etc., for analyses.
- Report all radiation accidents involving personnel wounds, ingestion or inhalation to the PRSO as soon as possible.
- Call, at once, a physician qualified to treat radiation injuries and to collect additional bioassay samples.
- Permit no person involved in a radiation injury to return to work without the approval of the attending physician and the PRSO.
- Prepare a complete history of the accident and subsequent activity related thereto for the PRSO.

16.3.2 Life-Threatening Incidents

In the event that a life-threatening accident or injury occurs, the victims life takes prominence over any radiation or contamination controls at the WSMPS site. The victim will be treated and transported to the local medical center as soon as possible. Attempts will be made to minimize the spread of contamination and the medical center will be notified of the potentially radioactively contaminated victim being transported to the facility.

In emergency situations where an individual is seriously injured in a contaminated area, the first priority is to treat the injury.

Other actions include:

- Contact the FOS and PRSO.
- Call or have someone call an ambulance.
- Notify the nearest hospital qualified to treat contaminated injuries that a potentially contaminated injured person would soon arrive.

A Health Physics Technician equipped with appropriate survey instruments will accompany the contaminated, injured individual to the hospital.

Once at the hospital, the Technician will survey the emergency transport vehicle and paramedic crew. The Technician will support the medical staff treating the patient regarding survey results, accident history, etc.

No contaminated injured individual may return to work without written approval of the attending physician and the PRSO.

16.3.3 Medical Facility and Transportation

Arrangements will be made with the local medical center and emergency response and transportation services to transport, receive and treat potentially contaminated injury victims. If requested, orientation/training will be provided to the medical center and ambulance transportation organization personnel for the handling of radioactively contaminated victims.

A listing of emergency contacts and phone numbers will be posted at the site.

16.4 High Airborne Radioactivity

Particulate radioactivity above the 10 CFR 20 Appendix B limits for the most restrictive nuclide present at the site in occupied radiological areas:

NOTE: High airborne contamination is not expected in ground moving tasks. However, cutting, grinding or burning of other material may be performed in containment, thus warranting these precautions.

Immediate Action: Notify FOS and PRSO

(1) Evacuate personnel from affected areas. Don respiratory equipment in accordance with the Airborne Radioactivity Procedure for personnel who must return to the affected area.

(2) Verify that the high airborne results (i.e., from air sampling or elevated instrument readings) are correct.

(3) Stop operations which might be causing high airborne radioactivity until adequate control of airborne radioactivity is established.

(4) Secure air moving equipment (e.g., fans, window air conditioners, and unit heaters) in the affected spaces.

(5) Determine the extent of the airborne radioactivity by sampling the affected area and adjacent areas which might be affected using portable air samplers.

16.4.1 Special Emergency Signals

Each project site may pose additional hazards to the worker performing radiological work. Individuals will be instructed on the alarms and evacuation system implemented by the project site as part of their radiation worker training.

16.4.2 Supplementary Action

(1) Attempt to identify the radionuclide causing the airborne radioactivity. For example, by promptly measuring the sample for alpha radioactivity and determining the half life.

(2) Measure and control surface contamination in areas affected by high airborne radioactivity.

(3) Perform alpha and beta/gamma surveys of ventilation filters and ducts and measure surface contamination in the vicinity of the ventilation exhaust discharge point.

(4) When resuming operations, take a portable air sample to verify that the cause of high airborne radioactivity is corrected.

(5) Check personnel exposed to high particulate radioactivity for internal radioactivity.

16.4.3 Incident and Deficiency Reporting System

The WSMPS Incident and Deficiency Reporting System (IDRS) establishes a system for the identification, reporting, evaluation and resolution of incidents and/or deficiencies associated with non-compliance with the WSMPS Radiological Control Program. The IDRS provides for identification of root causes, disposition and implementation of corrective action measures that may be required to reduce or preclude future occurrences. Deficiencies and non-conformances may be reported by any individual or may be documented as a result of inspection, surveillance or audit activities.

Incidents and/or deficiencies will be identified and documented on an Radiological Deficiency Report (RDR) (Figure 16-1).

An RDR will be prepared under the following circumstances:

- Following a significant breakdown or violation of radiological controls (e.g., violation of RWP or area posting)
- Following an overexposure (external or internal) of personnel
- As required by other operational, field or administrative procedure
- At the discretion of the Radiation Safety Officer

The RDR will contain the following information:

- Complete and through documentation of circumstances and events leading up to the incident/deficiencies
- Complete and thorough documentation of the incident including detail such as personnel involved, dose rates, contamination levels, air concentration, location of radiation sources and exposed individuals
- Complete and thorough documentation of the evaluation of the dosimetric consequences of the incident (dosimetry data or calculations)

- Complete and thorough documentation of root cause and corrective action to be taken to prevent recurrence.

16.5 Loss of Radioactive Material

If radioactive material is lost, the following procedures will be followed:

- WSMPS or WSMPS contractor personnel will immediately conduct a search. The primary reason for this is to ascertain that no persons will receive inadvertent internal or external exposure from the material.

- If the material cannot be located before the end of the work day, WSMPS will prepare an incident report in accordance with Section 16.4.3 and 10 CFR 20.2201 and notify the NRC, as appropriate.

FIGURE 16-1

RADIOLOGICAL DEFICIENCY REPORT

Report Number ____________________

Job Site ____________________

Date ____________________

I. Reason for report initiation:

1. ☐ Radiological Emergency
2. ☐ Non-Radiological Emergency
3. ☐ QA/QC Audit
4. ☐ Radiological Controls
5. ☐ Procedure Violation/Problem
6. ☐ RWP Violation/Problem
7. ☐ Personnel Contamination Event
8. ☐ Personnel Exposure Event
9. ☐ Other: ____________

II. Detailed explanation of items identified: (attach additional sheets if needed)

____
____
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____
____
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____
____
____
____

III. Evaluation and Identification of Root Cause

____
____
____
____
____
____
____

APPENDIX B

WESTINGHOUSE SPECIALTY METALS PLANT

SAFETY ANALYSIS

for

REMEDIATION OF THE FORMER

ZIRCALOY BURN AREA AND SURROUNDINGS

SITE REMEDIATION PLAN
WESTINGHOUSE SPECIALTY METALS PLANT
FORMER ZIRCALOY BURN AREA AND SURROUNDINGS
BLAIRSVILLE, PENNSYLVANIA

TABLE OF CONTENTS

SITE REMEDIATION PLAN
WESTINGHOUSE SPECIALTY METALS PLANT
FORMER ZIRCALOY BURN AREA AND SURROUNDINGS
BLAIRSVILLE, PENNSYLVANIA

1.0 INTRODUCTION

The proposed remedial alternative for the Westinghouse Specialty Metals Plant Site (WSMPS) Former Zircaloy Burn Area (FZB) property in Blairsville, Pennsylvania is characterization and excavation of soils containing concentrations of uranium (U-238, U-235, U-234) above the NRC limit (30 pCi/g) and subsequent shipment to a licensed low level waste disposal facility. One objective of this action is to ensure that radiation doses incurred by workers and members of the general public during the characterization and remedial activities do not exceed the regulatory limits specified in Section 2.1.

2.0 POTENTIAL EXPOSURE SCENARIOS

2.1 Potential Exposures under Normal Operating Conditions

During remediation of contaminated soils and construction debris material within the FZB Area remediation, workers may be exposed to low levels of ambient gamma radiation and internal radioactivity. The potential doses to remediation workers under routine circumstances have been determined and compared to the regulatory limits promulgated by the USNRC in 10 CFR 20.1201 *(NRC 1991)* of 5,000 millirem per year. Based on site characterization data (*Cummings Riter, June 1999)*, exposure of the general public to levels of radiation which exceed background is highly unlikely. However, members of the public may receive potential doses which exceed background as a result of abnormal conditions. The magnitude of these doses was also evaluated and compared to the regulatory limit of 100 millirem per year pursuant to 10 CFR 20.1301 *(NRC 1991)*. The following subsections contain the results of these analyses.

2.1.1 Potential Exposure to Remediation Workers Onsite

2.1.1.1 Potential Inhalation Exposure

Doses from intake of radioactivity into the body are determined by first estimating the magnitude of intake of soils by:

$$I_s = E \times V_m \times C_s$$

where I_s = the number of grams of soil inhaled during remedial activities, E = the Exposure Duration, V_m = the minute volume of air breathed, and C_s = the airborne concentration of soil. For this safety analysis, the following parameters are assumed:

- A continuous airborne concentration (C_s) of 200 micrograms of soil per cubic meter of air is representative of the conditions in the workplace (C_s). This value is the maximum dust loading noted for dusty occupations *(NCRP 1987)*.

- The workers' respiratory rate (V_m) will equal that of an adult male performing light work for a minute volume of 20 liters per minute, or 1.2 m^3 per hour *(ICRP 1973)*.

- For the exposure duration (E), it is assumed that remediation work will proceed at a rate of 8 hours per day, continuously, for 80 hours. No credit is taken for breaks during the work day.

From the estimated intake of soils, the reasonable maximum intake of radioactive materials is estimated by the following:

$$I_R = I_s \times C_R$$

where I_R = the intake of radioactive material, I_S = the number of grams of soil taken in during remedial activities, and C_R = the concentration of radioactive material in the soils. For this analysis, C_R is equal to 52 pCi/g U-238, 20 pCi/g U-235 and 331 pCi/g U-234 for the WSMPS (maximum sample concentration of uranium discovered during Cummings Riter characterization (*Cummings Riter, June 1999*).

The Environmental Protection Agency, in Federal Guidance Report No. 11 *(FGR 1988)*, provides a series of factors to convert annual intake of radioactive materials into committed effective radiation dose equivalent (CEDE). These factors are based upon contemporary metabolic modeling and dosimetric methods. Using the USEPA methodology, the maximum committed radiation dose equivalent which may be incurred by workers during remedial activities as a result of inhalation of suspended soils is estimated by:

$$CEDE = \sum I_i \times DCF_i$$

where CEDE = the committed effective dose equivalent incurred by the workers, I_i = the activity inhaled from the i_{th} radionuclide, and DCF_i = the dose conversion factor for inhalation of the i_{th} radionuclide. For this analysis, DCF = 0.12 millirem per pCi of U-238 inhaled 0.12 millirem per pCi of U-235 inhaled and 0.13 millirem per pCi U-234 inhaled. The following are the results of the three-step dose assessment for remediation workers at the WSMPS:

$$I_s = 80 \text{ hr} \times 1.2 \frac{m^3}{hr} \times 200 \frac{\mu g}{m^3} \times \frac{1g}{10^6 \mu g} = 1.9 \times 10^{-2} g$$

$$I_R = 1.9 \times 10^{-2} g \times [52 \text{ pCi/g (U-238)} + 20 \text{ pCi/g (U-235)} + 331 \text{ pCi/g (U-234)}]$$

$$CEDE = (1 \text{ pCi} \times 0.12 \text{ mrem/pCi}) + (0.4 \text{ pCi} \times 0.12 \text{ mrem/pCi})$$

$$+ (6 \text{ pCi} \times 0.13 \text{ mrem/pCi})$$

$$0.1 \text{ mrem} + 0.05 \text{ mrem} + 0.8 \text{ mrem}$$

$$= 1 \text{ mrem}$$

2.1.1.2 Potential Direct Exposure

In addition to possible intakes of contaminated soils, remediation workers may also incur direct radiation exposures. The ambient exposure rate levels are comparable to background (7 to 10 μR/hr). Therefore, if the average worker is exposed to the maximum rate (a conservative assumption) for the duration (80 hrs) of the remedial activities, an external radiation dose of 0.8 millirem may be incurred. Table 1 contains a summary of the results of the dose assessment for remediation workers and under normal conditions.

2.2 Potential Exposures under Abnormal Conditions

Trucks and equipment (backhoe, front-end loader, etc.) will be operated with emphasis on safety during remediation activities. Worst case accident scenarios are that a truck tips over, spilling contaminated soils, or a fire originates at the site of a tipped truck causing contaminated soils to be dispersed in the air. The following are the dose assessments from these two "worst case" accident scenarios.

2.2.1 Trucking Accident

The following are the assumptions used to assess the dose from a truck tripping accident:

- A fully laden truck (15.3 m^3) tips over and spills soil contaminated with uranium (U-238, U-235 and U-234) (in equilibrium with daughters) at a maximum concentration (conservative assumption) of 403 pCi/g total uranium *(Cummings Riter, June 1999)*.

- Assumed soil density of 1.63 g/cm^3.

- The soil is spread over a 27.5 m^2 area.

- The total activity (based on an activity ratio of 13% - U-238, 5% - U-235 and 82% - U-238) (*Cummings Riter, June 1999*) available for release is 1.3 x 10^9 pCi U-238, 5.0 x 10^8 pCi U-235 and 8.3 x 10^9 pCi U-234.

- Assuming a resuspension factor of 4 x 10^{-5}/hr *(Mishima 1993)* for the duration of a 10 second release period, the total release would be 1.44 x 10^{-10} Ci U-238, 5.6 x 10^{-11} Ci U-235 and 9.22 x 10^{-10} Ci U-234.

- The annual average dose from the CAP88PC model (EPA, 1992)is applicable to accident conditions (puff release).

Table 1 contains a summary of the results of the dose assessment for the truck accident scenario.

2.2.2 Truck Fire

In the truck fire scenario, the diesel fuel in the tanks of a truck spills on the soil, catches fire and burns. The heat from the fire would cause some of the soil to be carried away by conversion currents. The following are the assumptions used to assess the dose from a truck fire:

- A fully laden truck (15.3 m^3) tips over and spills soil contaminated with uranium (in equilibrium with daughters) at a maximum concentration of 403 pCi/g total uranium *(Cummings Riter, June 1999)*.
- The soil is spread over a 27.5 m^2 area.
- The total activity available for release is 1.3×10^9 pCi U-238, 5.0×10^8 pCi U-235 and 8.3×10^9 pCi U-234.
- Assuming a resuspension factor of 4×10^{-5}/hr *(Mishima 1993)* for the duration of a half-hour release period, the total release is 2.6×10^{-8} Ci U-238, 1×10^{-8} Ci U-235 and 1.66×10^{-7} Ci U-234.
- The nearest receptor who is assumed to be a WSMPS plant worker (i.e., not a remediation worker) is 10 meters from the location of the accident.

Table 1 contains a summary of the results of the dose assessment for the truck fire accident scenario.

3.0 CONCLUSIONS

In consideration of the information, data, and conservative calculations contained in this Appendix, it is clear that implementation of the remedial activities described in the Remediation Plan will result in "no significant impact" on the radiological safety of onsite workers and members of the general public under normal operating conditions or under abnormal (accident) conditions.

4.0 REFERENCES

CRC 1990 — Chemical Rubber Company, "Handbook of Chemistry and Physics," 1990.

Cummings Riter 1999 — Cummings/Riter Consultants, Inc. June 1999. Data Summary Report. Radiological Testing, Former Zircaloy Burn Area. Westinghouse Electric Corporation, Specialty Metals Division, Blairsville, Pennsylvania.

EPA 1992 — U.S. Environmental Protection Agency, "User's Guide for CAP88PC Version 1.0," by Barry S. Parks, Report No. 402-B-92-001, Office of Radiation Programs, March, 1992.

EPA 1988 — U.S. Environmental Protection Agency, Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake And Air Concentration and Dose Conversion Factors For Inhalation, Submersion, And Ingestion", September, 1988.

ICRP 1973 — International Commissioning on Radiological Protection, Publication 23, "Reference Man," Pergamon Press, Oxford, England, 1973.

Mishima 1993 — Mishima, J., "Recommended Values and Technical Bases for Airborne Release Fractions (ARFs), Airborne Release Rates (ARRs), and Respirable Fractions (RFs) for Materials from Accidents in DOE Fuel Cycle Ex-Reactor Facilities," Revision 2, Draft, April 21, 1993.

NCRP 1987 — National Council on Radiation Protection and Measurements, NCRP Report No. 77, "Exposures from the Uranium Series with Emphasis on Radon and its Daughters," Bethesda, Maryland, January, 1987.

NCRP 1987b — National Council on Radiation Protection and Measurements, NCRP Report No. 91, "Recommendations on Limits for Exposure to Ionizing Radiation," Bethesda, Maryland, June 1, 1987.

NRC 1980 — U.S. Nuclear Regulatory Commission, Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation," May 21, 1991.

NRC 1989 — U.S. Nuclear Regulatory Commission, Supplement to the FEIS Related to the Decommissioning of the Rare Earths Facility, West Chicago, IL, NUREG-0904, Supplement No. 1, April, 1989.

TABLE 1
SUMMARY OF DOSE ASSESSMENTS

Condition	Target Population/Pathway	Dose (millirem)
Normal Operations	Workers/Inhalation	1
Normal Operations	Workers/Direct Radiation	0.8
Truck Tipping Accident	Nearest Public Receptor/All Pathways	2.6 E-03
Truck Fire	Nearest Public Receptor/All Pathways	0.5

APPENDIX C

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

WESTINGHOUSE SPECIALTY METALS PLANT SITE

FORMER ZIRCALOY BURN AREA AND SURROUNDINGS

BLAIRSVILLE, PENNSYLVANIA

Revision 0, June 2000

PREPARED BY:

B. KOH & ASSOCIATES, INC.
11 WEST MAIN STREET
SPRINGVILLE, NEW YORK 14141-1012
(716) 592-3431

HEALTH AND SAFETY PLAN
WESTINGHOUSE SPECIALTY METALS PLANT SITE
FORMER ZIRCALOY BURN AREA AND SURROUNDINGS
BLAIRSVILLE, PENNSYLVANIA

I. General Information

Site Name:	Westinghouse Specialty Metals Plant Site, formerly Zircaloy Burn Area and Surroundings Blairsville, Pennsylvania
Contact:	Claude Wiblin, CHP
Phone No.:	716-592-3431
Fax No.:	716-592-3439
Date Plan Prepared:	June 2000
Revision No.:	0
Date:	June 2000
Site Activity:	Remedial activities consisting of sampling/survey and excavation of radioactively (uranium) contaminated waste.
Date of Work:	July 1, 2000

Proposed Site Investigation Team:

WSMPS Personnel	Assigned Task
Claude Wiblin	Project Manager/Radiation Safety Officer
To Be Determined	Health and Safety Officer
To Be Determined	Site Safety Coordinator

Plan Preparation

Prepared by: Claude Wiblin Date: Aug. 14, 2000

Reviewed and Approved by: A Joseph Nardi Date: 8/15/00

Approval:

Program Manager: [signature] Date: 8/15/2000
WSMPS Program Manager

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1.0 PURPOSE

The purpose of this project-specific Health and Safety Plan (HSP) is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and to provide for contingencies that may arise during site characterization and remedial operations to be conducted within the former Zircaloy Burn Area located at the Westinghouse Specialty Metals Plant Site, Blairsville, Pennsylvania.

Westinghouse Specials Metals Plant Site (Westinghouse) is committed to providing a safe work environment, to the extent possible, for its own personnel and contractor personnel during the performance of the characterization/remediation activities at the Former Zircaloy Burn (FZB) Area and Surroundings located at the Specialty Metals Plant Site.

To ensure onsite personnel safety and fire safety, as well as public and environmental safety, all closure work will be carried out in accordance with this project-specific Health and Safety Plan (HSP) and the project -specific Radiation Control Plan (RCP).

The HSP provides the requirements for general safe work practices, specific hazards associated with the closure efforts and emergency planning/response actions to be taken in the event of a personnel medical or fire emergency. The RCP and related procedures provide the necessary controls to minimize radioactive contamination and exposure, and to ensure all exposures are maintained As Low As Reasonably Achievable (ALARA).

2.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite Westinghouse personnel and contractor/subcontractor personnel who are engaged in hazardous material management activities, including, but not limited to: initial site reconnaissance, preliminary field investigations, mobilization, characterization, project remedial operations, final survey and sampling, and demobilization. This plan has been developed under US Environmental Protection Agency (USEPA) guidelines and complies with all regulations, including the Occupational Safety and Health Administration (OSHA) Standards (29 CFR 1910 and 1926). This plan includes a site-specific Radiation Control Plan (RCP).

Westinghouse will insist on the following health and safety requirements from its subcontractors:

- Subcontractor employees must have appropriate training (i.e., either a 40-hour or 24-hour OSHA-required [29 CFR 1910.120] health and safety course for hazardous waste work, or certified equivalent training), including worker training regarding radiation, if deemed appropriate, for the Zircaloy Burn Area.

- Personnel working at hazardous waste sites must have had an annual physical (or physician's waiver for biennial physical) and be certified "fit for duty" and "fit for respirator use," if necessary, by a qualified physician.

- Westinghouse will insist on obtaining proof of both training and a physical before site work may begin. Documentation of training should be maintained by Westinghouse as part of Westinghouse's records at the site.

- Personnel must have appropriate personal protective equipment (PPE) for the specific job. At a minimum, personnel should have the following equipment, which will be inspected by Westinghouse:

  - Hard Hat
  - Safety Shoes
  - Gloves
  - Goggles/Safety Glasses
  - Hearing Protection (if appropriate)
  - Respiratory Protection with Fit Test (if appropriate)
  - Other equipment as specified by the HSP

- Drilling equipment and field operations must meet applicable safety standards and satisfy Westinghouse's field inspection. Unsafe equipment or operations will necessitate shutdown of the job at a cost to the subcontractor.

Before field activities begin, the subcontractor may wish to develop a site-specific HSP that includes radiation controls specific to planned operations covering the subcontractor's employees. This HSP must comply and be consistent with project-specific HSP in scope and functional organization and include additional information, as required, to cover worker protection for enriched and depleted uranium metals. Westinghouse will provide the subcontractor with a copy of its HSP as a guide to the minimum site-specific health and safety requirements so that it can be used by the subcontractor while developing their own HSP. If the subcontractor chooses not to not develop a site-specific HSP, they have the option of accepting and working under the project-specific HSP.

The subcontractor must agree to comply with at least the minimum requirements of its own site-specific HSP or project-specific Health and Safety Plan should they elect to work under it, be responsible for the health and safety of its own employees, and sign the Subcontractor Statement of Compliance for all onsite employees before site work begins. The subcontractor also must agree that it will take any additional measures it deems necessary to meet at least minimum applicable health and safety standards if unforeseen circumstances arise.

The subcontractor will provide at least minimum safety equipment as required by the site-specific HSP. When respirators are necessary, the subcontractor will provide a respirator fit test certificate and a physician's "fit for respirator use" declaration.

SUBCONTRACTOR
STATEMENT OF COMPLIANCE

This is to confirm that the employees listed below are qualified by virtue of training and experience to engage in field activities at ____________________ ____________________ in connection with the Contract/Subcontract Agreement between WSMPS and __________, dated __________, 19___. Further, all said employees have been determined to be properly trained and medically fit to perform those activities prescribed by said contract and to use the respiratory protective equipment necessary to perform the job safely in accordance with 29 CFR 1910 and 1926 and any other Federal, State, or local requirements.

Employee Names

1. ______________________	6. ______________________
2. ______________________	7. ______________________
3. ______________________	8. ______________________
4. ______________________	9. ______________________
5. ______________________	10. ______________________

____
Authorized Subcontractor Representative

____
Printed Name

3.0 SITE CHARACTERIZATION AND ANALYSIS

3.1 General Information

Site: Westinghouse Specialty Metals Plant Site (WSMPS)
Former Zircaloy Burn Area
Blairsville, Pennsylvania

Objectives: Characterization/remediation of onsite uranium contamination.

Overall Site Hazard is:	High	____	Moderate	X		
	Low	____	Unknown	____		
Chemical/Waste Type(s):	Liquid	____	Solid	X		
	Solid	____	Gas/Vapor	____		
Characteristics(s):	Corrosive	____	Ignitable	X	Radioactive	X
	Volatile	____	Toxic	____	Reactive	____
	Unknown	____				

3.2 Site Description

Figure 3-1 shows the general location of the WSMPS Site.

3.2.1 Former Zircaloy Burn Area

During the period from approximately 1955 to 1961, fuel manufacturing operations were conducted at the WSMPS facility using enriched uranium in both metal and oxide forms. This involved both highly enriched uranium for the Navy fuel program (under works for the Bettis Atomic Power Laboratory) and low enriched uranium for atomic power plants (under License SNM-37 from the U.S. Atomic Energy Commission). AEC license SUC-509 authorized Westinghouse to perform research and development for fuel elements using depleted uranium at the Blairsville facility. This license was terminated on December 31, 1964. As part of a Nuclear Regulatory Commission (NRC) program to ensure that AEC and NRC licenses that have been terminated meet the NRC's current criteria for release for unrestricted use, the Blairsville site was determined to require additional review.

Beginning in 1993, Westinghouse personnel performed preliminary screening measurements in areas of the facility where licensed material had been handled. Several interior and exterior areas have since been characterized and remediated.

Records indicate that the radioactive wastes were processed and packaged in the area known as the Former Zircaloy Burn or Cow Palace area of the Blairsville site in addition to other potential areas. The investigation into the Former Zircaloy Burn Area was initiated in 1995. Several reports included data from the initial investigations. The results of the initial investigations did not indicate the presence of significant radioactive contamination.

During remediation activity to remove an underground pipe and sumps in the Former Zircaloy Burn Area conducted in June 1998, evidence of more significant radioactive contamination of the area was identified and partially remediated. Subsequent investigation and characterization has identified a variety of uranium contamination, including low enriched, high enriched, depleted uranium, and processed unenriched uranium.

The purpose of the current project is to:

(1) Conduct a detailed assessment of the radiological conditions in the area.
(2) Conduct appropriate remedial actions.
(3) Conduct a final radiological survey of the area.
(4) Prepare the documentation necessary to complete the project.

3.3 Hazard Analysis

A health and safety hazards analysis for each project task has been prepared in accordance with 29 CFR Part 1910.120. The analysis includes the physical, chemical and mechanical hazards associated with each task. The results of the hazards analysis are provided in the subsequent sections.

A general description of tasks to be performed under the characterization/remediation activities of the Zircaloy Burn Area include the following:

- Soil samples will be collected using a truck or ATV mounted Geoprobe sampling system.

- Radiological surveys will be performed and will include walkover scan surveys and exposure rate measurements.

- Excavation and removal of contaminated soils using standard earthmoving equipment (i.e., dumptrucks, excavators, backhoes, etc.).

- Radiological final release surveys consisting of walkover scans, exposure rates, and surface soil sampling of areas in which soil remediation was performed.

3.3.1 Mechanical Hazards

The primary physical hazards for the remediation project are associated with the use of large earth moving equipment (vehicles), material handling, and drilling hazards.

3.3.1.1 Vehicle Safety

Workers can be struck by vehicles used during remediation activities. While driving in reverse, the operator usually has a more limited view than while driving forward and must observe extra caution. Such vehicles must be equipped with a backup alarm to warn workers that the vehicles are moving in reverse.

Caution must be exercised when working around or with mobile-powered equipment. Excavators, earthmoving equipment, vehicles, winches, and other equipment may be present at the site. Personnel will be aware of the locations of such equipment relative to the work area. Operators must move equipment and vehicles with care to avoid accidents with personnel working in the area. Personnel at the ground level must be aware that the operator may not be able to see people while driving the equipment. Operators and ground personnel should consider that personnel wearing hearing protection may not be able to hear warning alarms or horns. Operators must be aware of overhead electrical wires to avoid putting the rig up into the wires. Contact with these wires can cause electrocution and death.

Site personnel will examine the areas where foot and vehicular traffic occur to determine if the areas are safe. Personnel or vehicles will not be permitted in areas where the danger of rollover, sliding, or where preventable hazards to pedestrians or drivers exist.

3.3.1.2 Material Handling

Powered industrial trucks can have different kinds of power sources and means of engaging a load. They can have battery-powered motors or engines using gasoline, diesel fuel, or liquid propane gas. The load engagers can be the usual forks or can be scoops, arms or manipulators for grasping boxes or drums from the sides. The trucks are controlled either by a riding operator or a walking operator. General requirements for powered industrial trucks are:

- They must be examined daily before being placed into service to detect safety violations.
- High-lift rider trucks must be fitted with an overhead guard to protect the operator from falling objects.
- If the load being carried obstructs forward view, the unit must travel with the load trailing.
- When a unit is left unattended (the operator is 25 feet or more away or the unit is not in view), the load must be fully lowered, the control level positioned in neutral, the power shut off, and the brakes set. The wheels must be blocked if parked on an incline.
- Trucks or trailers being unloaded or loaded with lift trucks must be secured by setting their brakes and placing wheel chocks under their rear wheels. Portable docks boards must be secured in position with devices which will prevent their slipping during loading and loading.

Accidents in manual handling of materials are primarily the result of unsafe working habits — improper lifting, carrying too heavy a load, incorrect gripping, or failing to wear personal protective equipment. These may be avoided by testing the weight of an object before attempting to lift and carry it. If it is too heavy, get help, and if possible, use mechanical lifting aids. The most common type of accident that occurs in material handling operations is the "caught between" situation when a load is being handled and a finger or toe gets caught between two objects. The proper method for lifting is:

- Get a good footing.
- Place feet about shoulder width apart.
- Bend knees to pick up load. Never bend from waist.
- Keep back straight.
- Get a firm hold. Grasp opposite corners of the load, if possible.
- Keep the back as upright as possible.
- Lift gradually by straightening the legs — don't jerk the load.
- Keep the weight as close to the body as possible.
- When changing directions, turn the entire body, including the feet.
- Don't twist the body.

3.3.1.3 Drilling

Drilling activities will be performed using a truck or ATV mounted Geoprobe sampling system. A hollow-stemmed auger drill rig may be utilized if site conditions warrant.

The location of the Geoprobe or auger rig on stable ground with proper blocking and leveling is crucial. Rig accidents can occur as a result of improperly placing the rig on uneven or unstable terrain, or failing to adequately secure the rig prior to the start of operations. Proximity to overhead power lines, buried power, gas, water, sewer, and telephone lines also present potential hazards.

Cat lines are used on auger drill rigs to hoist material. Accidents that occur during cat line operations may injure the employee doing the rigging as well as injure the operator.

The rig floor is the working surface for most tasks performed in well drilling operations. The surface is frequently wet from circulating fluid and/or water used to wash it down. Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, and slips and falls.

The derrick man on a well drilling operation performs his tasks from various elevated work platforms in the mast. He is exposed to falls when not utilizing fall protection equipment while climbing the derrick ladder, while working with the pipe stands, and while moving from the ladder to his platform station.

3.3.2 Toxic Materials Hazards

Airborne exposure to chemical contaminants during remediation and soil sampling operations is possible. The potential for dermal exposure during operations is significant.

Table 3-1 presents the known or potential contaminants present within the FZB Area and surroundings. Exposure limits and recognition qualities are listed in Table 3-1. Acute effects and target organs of these contaminants are presented in Table 3-2.

Radioactive Material

Depleted and enriched uranium has been used at this facility. Uranium is a radioactive material and consists of three isotopes of uranium: U-238, U-235 and U-234, all of which emit alpha radiation during the radioactive decay process. In the decay process of U-238, two radioactive progeny occur — Th-234 and Pa-234 — both of which give off beta radiation during the decay process along with some gamma radiation. U-234 is the progeny of the decay of Pa-234. Alpha radiation is only of concern when taken into the body by inhalation or ingestion. Beta and gamma radiations can be of concern as both an external radiation hazard and an internal hazard.

Monitoring and safety procedures regarding potential exposure to uranium are detailed in the project-specific Radiological Control Plan.

3.3.3 Physical Hazards

3.3.3.1 Heat Stress

Wearing PPE puts site personnel at considerable risk of heat stress. Heat stress effects range from transient heat fatigue to serious illness and death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is one of the most common and potentially serious illnesses during construction type activities, preventive measures and alertness to the symptoms are vital.

Heat stress monitoring should commence when personnel are wearing PPE, including Tyvek coveralls, and the ambient temperature exceeds 70 degrees Fahrenheit (°F). If impermeable garments are not worn, heat stress monitoring should commence when the ambient temperature exceeds 85°F. The symptoms of heat stress are discussed in Section 10.3.

3.3.3.2 Cold Stress

The characterization/remediation activities are scheduled for August-October, 2000, therefore, cold stress should not be a problem. However, should the tentative plans change, cold stress has been included in this HSP for completeness.

Cold and/or wet environmental conditions can place workers at risk of a cold-related illness. Hypothermia can occur whenever temperatures are below 45°F, and is most common during wet windy conditions, with temperatures between 40 to 30°F. The principal cause of hypothermia in these conditions is loss of insulating properties of clothing due to moisture, coupled with heat loss due to wind and evaporation of moisture on the skin.

Frostbite, the other illness associated with cold exposure, is the freezing of body tissue, which ranges from superficial freezing of surface skin layers to deep freezing of underlying tissue. Frostbite will only occur when ambient temperatures are below 32°F. The risk of frostbite increases as the temperature drops and wind speed increases.

The symptoms of cold stress are discussed in Section 10.3.

3.3.3.3 Noise

Noise exposure at or above the OSHA action level (85 decibels [dBA]) is likely during construction activities such as drilling operations or soil hauling. Exposure to noise levels in excess of 90 dBA, the OSHA permissible exposure limits (PEL) for noise, is likely during any drilling operations involving percussion-type rigs, or drilling in hard-packed soil or rock. A hearing conservation program is required for drilling projects. The hearing conservation standard for the Zircaloy Burn Area Remediation Project is 85 dBA max (L-SP-S-2005).

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication; thereby, increasing the risk of accidents on site.

3.4 Field Personnel

The characterization/remediation activities at the FZB and surroundings will be performed by a team composed of qualified and experienced personnel. The WSMPS Remediation Project Organization (Figure 3-2) is described in detail in Section 2 of the Site Remediation Plan (BKA, June 2000).

Field personnel will consist of the following persons:

Project Manager:	Claude Wiblin
Health and Safety Officer:	To Be Determined
Site Safety Coordinator:	To Be Determined
Field Personnel:	To Be Determined

Westinghouse's field activities (managed through B. Koh and Associates, Inc.) will consist of the oversight of remedial actions at the Former Zircaloy Burn Area site. Remedial activities will include characterization activities, the excavation, packaging and subsequent disposal at a licensed disposal facility of uranium contaminated soils. B. Koh & Associates, Inc. personnel will be monitoring radioactive contamination and radiation levels in excavated soils.

3.5 Emergency Information

3.5.1 Emergency Contacts

Contact	Person or Agency	Telephone No.
Security	To Be Determined	
Site Security Guard	To Be Determined	
Fire	To Be Determined	
Fire	To Be Determined	
Police	To Be Determined	
Police	To Be Determined	
Ambulance	To Be Determined	
Hospital	To Be Determined	
Client Contact	To Be Determined	
Project Manager	Claude Wiblin	Work Home
Health and Safety Officer	To Be Determined	
Site Safety Coordinator	To Be Determined	

3.5.2 Location of Site Resources

Water Supply:

Telephone:

3.5.3 Location of Hospital/Clinic

To be inserted.

3.6 Emergency Response Plan

This section describes contingencies and emergency planning procedures to be implemented at the site. This Emergency Response Plan is compatible with local, state, and Federal disaster and emergency management plans, as appropriate. The list of appropriate emergency contacts is given in Section 3.5 above.

3.6.1 Pre-Emergency Planning

An emergency evacuation route(s) will be chosen immediately upon arrival at the site. During the periodic site briefings, all workers will be trained in provisions of the Emergency Response Plan, communications systems, and evacuation routes. The plan will be reviewed and revised, if necessary, on a regular basis by the Site Safety Coordinator to ensure that the plan is adequate and consistent with prevailing site conditions.

3.6.2 Personnel Roles and Lines of Authority

The Site Safety Coordinator has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public, such as evacuation of personnel and adjacent residents from the site area. The Site Safety Coordinator must also ensure that corrective measures have been implemented, appropriate authorities have been notified, and follow up reports have been completed.

The individual contractor organizations are responsible for assisting the Project Manager's mission within the parameters of their scope of work.

3.6.3 Emergency Recognition

Tables 3-1 and 3-2 provide listings of actual or potential hazards onsite. Personnel should be familiar with techniques of hazard recognition from pre-assignment training and site-specific briefings. The Site Safety Coordinator should ensure that the proper prevention devices or equipment are available to personnel.

In an emergency, personnel should proceed to the closest exit with their buddies and mobilize to the safe distance area associated with the evacuation route. Personnel should remain at that area until further instructions are provided by an authorized individual.

3.6.4 Emergency Medical Treatment Procedures

Any person who becomes ill or injured in the Exclusion Zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, partial decontamination may be attempted (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket). However, the seriousness of the injury or illness and its related treatment will take precedence over need to decontaminate. The Site Emergency Brigade should be notified immediately. First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must be reported immediately to the Project Manager.

Personnel who are transported to a clinic or hospital for treatment should take with them information on the hazard(s) they have been exposed to at the site. This information is included in Table 3-1.

Any vehicle used to transport contaminated personnel will be treated and cleaned, as necessary.

3.6.5 Fire or Explosion

In the event of a fire or explosion, the Site Emergency Brigade should be notified immediately. The Site Safety Coordinator or a designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials onsite.

If it is safe to do so, site personnel may:

- Use fire fighting equipment available onsite to control or extinguish the fire.
- Remove or isolate flammable or other hazardous materials that may contribute to the fire.

Zirconium is a known pyrophoric metal. As a result of excavating the contaminated soil, zirconium chips could be uncovered which may begin to burn. The chips can be extinguished by the application of a thin layer of soil or the application of Metal X (NAX) Metal (Class D) fire extinguishers. Several Class D fire extinguishers will be available for use at the work site.

3.6.6 Reporting Accident

It is the responsibility of all Westinghouse personnel and Westinghouse contractor/subcontractor personnel to report accidents/incidents to the Site Safety Coordinator.

3.7 Chemical and Physical Properties of Hazardous Substances

The exposure limits, recognition qualities and the acute and chronic effects of exposure to uranium are presented in Table 3-1, "Exposure Limits and Recognition Qualities."

The exposure limits and recognition qualities to potential contaminants on the WSMPS site are presented in Table 3-1. Acute effects and target organs of these contaminants are presented in Table 3-2.

These tables were compiled from the following resources:

(1) OSHA 29 CFR Part 1910.1000 et seq., "Air Contaminants," U.S. Department of Labor, Washington, D.C., July 1, 1992.

(2) National Institute of Occupational Safety and Health and Human Services Guide to Chemical Hazards, Department of Health and Human Services (DHHS) Publication No. 90-117, June 1990.

(3) Threshold Limit Values and Biological Exposure Indices for 1992-93, American Conference of Governmental Industrial Hygienists (ACGIH).

(4) Amoore, J.E., and Hautala, E., 1983. " Odor as an Aid to Chemical Safety", Journal of Applied Toxicology, Vol. 3, No. 6.

TABLE 3-1
EXPOSURE LIMITS AND RECOGNITION QUALITIES

Compound	OSHA Exposure Standard	IDLH Level	Odor	Odor Warning Concentration (ppm)	LEL (percent)	UEL (percent)	Photoionization Meter Information	
							Ionization Potential (eV)	Lamp (eV)
Trichloroethylene	50 ppm* 200 ppm** (15 minute)	1,000 ppm	Solvent	21.4-400	12.5	90	9.45	10.2

Source: Occupational Health Services, HAZARDLINE, 1987 and 1988, and HNu Systems, Inc. Instruction Manual, 1986.

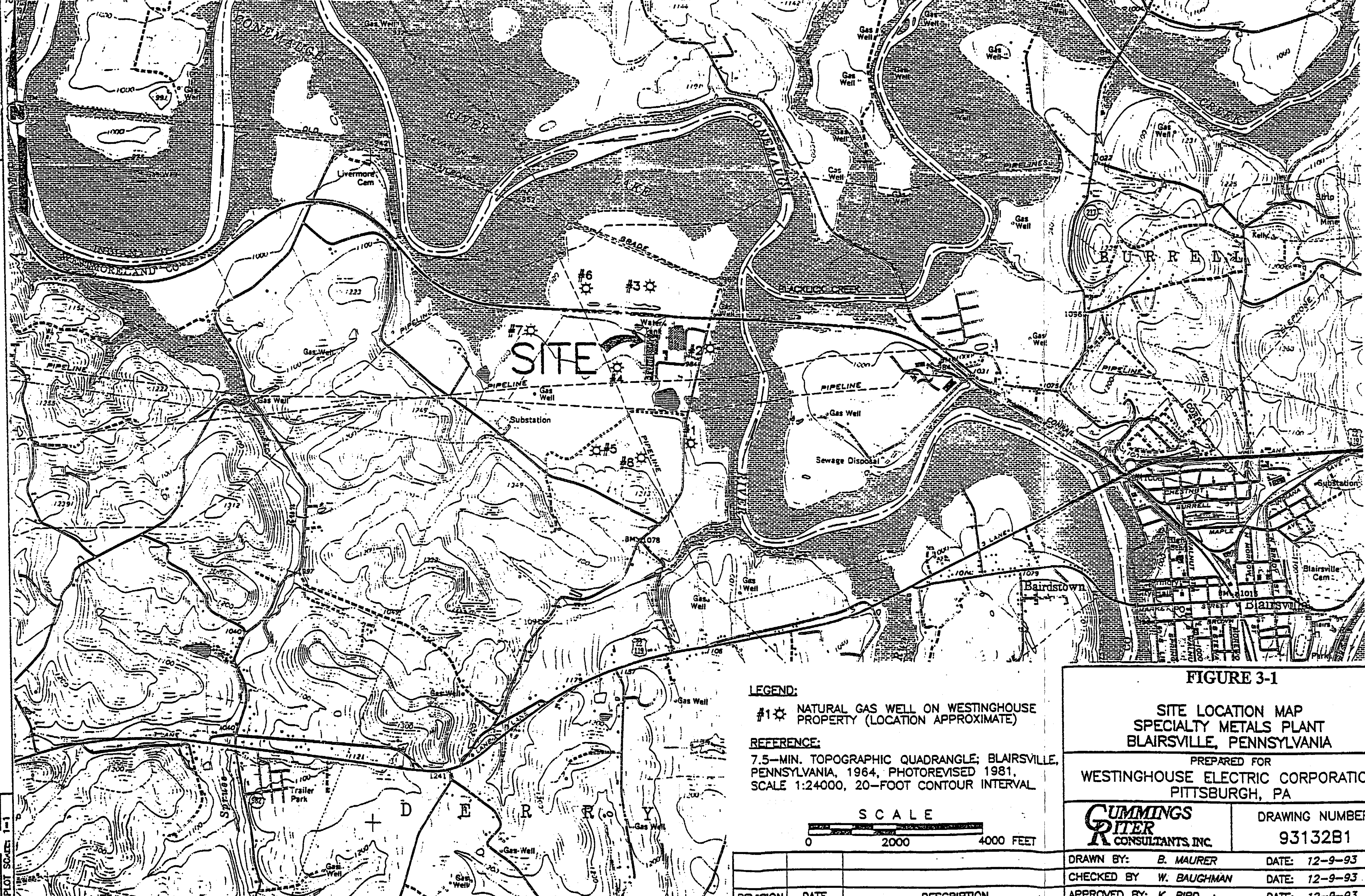
NOTES: * American Conference of Governmental Industrial Hygienists
** Ceiling value-concentration that should not be exceeded during any part of the working exposure.

Low and Highly Enriched Uranium, Natural Uranium and Depleted Uranium	Personnel Surface Contamination Rate	Direct Exposure mRem/hr	Detection Instrumentation Instrument*
Alpha	20 dpm	--	Ludlum Model 2221 with Model 43-5 Probe
Beta	200 dpm	--	Ludlum Model 2221 with Model 44-9 Probe
Gamma	--	<2	Bicron MicroRem Meter

*Equivalent instruments of different manufacturers may be used.

TABLE 3-2
ACUTE AND CHRONIC EFFECTS AND FIRST AID TREATMENT

Compound	Routes of Entry	Eye Irritant	Acute Effects	Chronic Effects	First Aid Treatment
Trichloroethylene	Inhalation Ingestion Skin and/or Eye Contact	Yes	Headache, vertigo, visual disturbances, tremors, nausea, vomiting, dermatitis.	Respiratory system, heart, liver, kidneys, CNS, skin, potential human carcinogen.	Wash skin with soap and water promptly when contaminated. Irrigate eyes with water immediately. If swallowed seek medical attention immediately.
Uranium	Ingestion Inhalation	Yes	Dermatitis, skin burns, chest rales, nausea, vomiting.	Skin, bone marrow, lymphostics, blood, liver, kidneys.	Wash skin with mild soap and water promptly. Irrigate eyes with water immediately. If ingested seek medical/monitoring immediately.



LEGEND:

#1☼ NATURAL GAS WELL ON WESTINGHOUSE PROPERTY (LOCATION APPROXIMATE)

REFERENCE:

7.5–MIN. TOPOGRAPHIC QUADRANGLE; BLAIRSVILLE, PENNSYLVANIA, 1964, PHOTOREVISED 1981, SCALE 1:24000, 20–FOOT CONTOUR INTERVAL.

SCALE

0 2000 4000 FEET

REVISION	DATE	DESCRIPTION

FIGURE 3-1

SITE LOCATION MAP
SPECIALTY METALS PLANT
BLAIRSVILLE, PENNSYLVANIA

PREPARED FOR
WESTINGHOUSE ELECTRIC CORPORATION
PITTSBURGH, PA

CUMMINGS RITER CONSULTANTS, INC.

DRAWING NUMBER 93132B1

DRAWN BY:	B. MAURER	DATE:	12-9-93
CHECKED BY	W. BAUGHMAN	DATE:	12-9-93
APPROVED BY:	K. BIRD	DATE:	12-9-93

DRAWING NUMBER 93132B1

PLOT SCALE 1=1

4.0 SITE CONTROL

4.1 General

The purpose of site control is to minimize potential chemical and radiological contamination of workers, protect the public from the site's hazards, and prevent vandalism. Site control is especially important in emergency situations. Several site control procedures will be implemented to reduce worker and public exposure to chemical, physical, biological, and safety hazards.

4.2 Site Work Zones

To prevent the accidental spread of hazardous substances from a contaminated area to clean areas, the following zones will be delineated on the site where various sampling or remediation operations will occur:

(1) The Exclusion Zone (Restricted Area) - The area where, because of activity, contaminated materials will potentially harm personnel. Entry into the Exclusion Zone requires the use of PPE.

(2) The Contamination Reduction Zone (Radiological Control Point) - The area where personnel and equipment are decontaminated. It is essentially a buffer zone between contaminated areas and clean areas. Activities to be conducted in this zone will require personal protection as defined in Section 6.0.

(3) The Support Zone (Controlled Area) - The area situated in clean areas where the chance to encounter hazardous materials or conditions is minimal; therefore, PPE is not required.

(4) No unauthorized individuals are permitted in the Exclusion Zone, and the FOS has the authority to deny any person access to the Exclusion Zone if, in their judgement, the person does not meet entry requirements.

4.3 Standard Safe Work Practices

4.3.1 General

The following general safe work practices apply:

(1) Eating, drinking, chewing gum or tobacco, and smoking are prohibited in contaminated or potentially contaminated areas. or where a possibility for the transfer of contamination exists.

(2) Contact with potentially contaminated substances should be avoided. Puddles, pools, mud, etc., should not be walked through. Kneeling, leaning, or sitting on equipment or the ground should be avoided, whenever possible. Monitoring equipment should not be placed on a potentially contaminated surface, such as the ground.

(3) Spillage should be prevented, to the extent possible. In the event that spillage occurs, the liquid should be contained, if possible.

(4) Splashing of contaminated materials should be prevented.

(5) Crew members should use all their senses to alert themselves to potentially dangerous situations (i.e. presence of strong, irritating, or nauseating odors).

(6) Crew members should be familiar with the physical characteristics of investigations, including:

- Accessibility to associates and equipment
- Communications
- Hot zones (areas of known or suspected contamination)
- Site access
- Nearest water sources
- Routes and procedures to be used during emergencies

(7) A minimum number of personnel and equipment should be in the contaminated area, but only to the extent consistent with workforce requirements of safe site operations.

(8) All wastes generated during remedial activities at the site must be disposed of as directed by the Project Manager.

4.3.2 Buddy System

Workers will conduct all site activities with a buddy who is able to:

- Provide his or her partner with assistance
- Observe his or her partner for signs of chemical or heat exposure
- Periodically check the integrity of his or her partner's protective clothing
- Notify the site supervisor if emergency help is needed.

5.0 MONITORING

5.1 General

Monitoring will be performed for the hazards presented in Table 3-1 to ensure proper selection of engineering controls, work practices, and PPE so that employees are not exposed to levels that exceed permissible exposure limits or published exposure levels for hazardous substances. Air monitoring will be performed to identify: exposure over permissible exposure limits or published exposure levels, or other dangerous conditions, such as the presence of flammable atmospheres, oxygen-deficient environments or radioactive substances (see Radiological Control Plan). Periodic monitoring will be conducted in the event of a flammable atmosphere or when there is an indication that exposure levels may have risen, such as:

- When work begins on a different portion of the site.
- When contaminants other than those previously identified are being handled.
- When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling).
- When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., spill or lagoon).

5.2 Monitoring Requirements

Equipment necessary for site monitoring consists of a PID, pancake GM detector, air samplers and thermoluminescent detectors (TLDs). The types of monitoring instruments specified by the hazard, as well as the action levels to upgrade personal protection are shown in Table 5-1. All ambient measurements taken to evaluate employee exposures must be taken in the individual's breathing zone and must be fairly constant for at least 30 seconds.

Equipment, instrumentation and related procedures necessary for site monitoring for radiological constituents are specified in Sections 6.0 through 12.0 of the WSMPS Radiological Control Plan.

5.2.1 Instrument Calibration

All applicable instruments will be calibrated daily and after use. Readings will be recorded on the Daily Instrument Calibration Checksheet provided in Section 13.0.

The calibration program required for radiation survey and monitoring instrumentation is described in Section 9.0 of the Radiological Control Plan.

5.2.1.1 HNU PI-101 (or equivalent) Calibration

- Battery Check — The function switch should be turned to BATT. The needle should be in the green region; if not, recharge the battery.
- Zero Set — The function switch should be turned to STANDBY. In this position, the lamp is OFF and no signal is generated. The zero point should be set with the ZERO set control.
- Gas Standard — The standard should be connected to the probe. The function switch should be turned to the range position of the standard and the meter reading should be noted. The SPAN control setting should be adjusted, as required, to read the parts per million (ppm) concentration of the standard. The zero setting should be rechecked.
- Lamp Cleaning — If the span setting from calibration is 0.0 or calibration cannot be achieved, then the lamp must be cleaned.
- Lamp Replacement — If the lamp output is too low or if the lamp has failed, it must be replaced.

5.2.2 Background Readings

Before any field activities commence, the background levels of the site must be read and noted. Daily background readings for chemicals and radiological constituents, as appropriate, must be conducted away from areas and upgradient of potential contamination to obtain accurate results.

Requirements for background readings and instrument checks for radiation surveys, exposure rate measurements, and monitoring instrumentation are specified in Sections 9.0 through 12.0 of the Radiological Control Plan.

5.2.3 Air Monitoring

All site readings must be noted on the Air Monitoring Record provided in Section 13.0, along with the date, time, background level, weather conditions, wind direction and speed, and the location where the background level was recorded.

Radiological air monitoring results (work area, breathing zone, perimeter) will be documented on forms specified in Section 15.0 of the Radiological Control Plan.

TABLE 5-1

AIR MONITORING/SAMPLING ACTION LEVELS

Hazard	Monitoring Method	Action Level	Schedule	Protection Measures
Toxic Dust	Particulate Monitor	Up to 5 mg/m3 above background in the breathing zone	Periodically monitor during invasive field activities	Level D
		5-50 mg/m3	Periodically monitor during invasive field activities	Level C
		> 50 mg/m3	Periodically monitor during invasive field activities	Level B or EVACUATE AREA
Organic Vapors	HNU with 10.2 probe or greater eV probe	<1 ppm above background in the site workers' breathing zone	Continuing working and monitoring	Level C
		≤1 ppm <10 ppm above background in the site workers' breathing zone and sustained for 1 minute	Use Draeger pump and detector tubes; if no benzene is detected, continue working and monitoring	Level C
		≥10 ppm above background in the site workers' breathing zone and sustained for 1 minute	Stop work and leave area; contact PM and OSC; a reassessment of site conditions (including PPE) will be conducted	EVACUATE AREA
	PID Breathing Zone	>Background but <10 units	Monitor as necessary	APR-OV Required Establish respiratory protection control zone
		≥10 units	Monitor as necessary	PD-SAR Required Establish respiratory protection control zone

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 General

PPE that will protect employees from the hazards and potential hazards likely to be encountered during site investigations will be selected and used. PPE selection will be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site. Additional guidance on PPE required for radiological constituents is described in Section 11.0 of the Radiological Control Plan. The level of protection provided will be increased when site conditions deem it necessary to reduce employee exposures to below permissible exposure limits and published exposure levels for hazardous substances.

6.2 Levels of Protection

All field activities will be initiated at Level D. If the action levels specified in Table 5-1 are reached, an upgrade will be made to Level C, as described in Table 6-1.

Additional guidance for radiological action levels and related levels of protection are provided in Section 7.0.

6.3 Respiratory Protection

If air purifying respirators are required, full facepiece respirators, with high efficiency dust and mist cartridges, will be used, as appropriate. Respirators belong to, and are only used and maintained by, the individual to whom they have been issued. Each WSMPS and subcontractor employee who anticipates working in a respiratory protection required area must be trained, fit tested, and declared medically fit to wear respiratory equipment prior to participating in field activities.

Respiratory protection requirements for radiological contaminants are specified in Section 10.0 of the Radiological Control Plan.

TABLE 6-1
PROTECTIVE EQUIPMENT FOR ONSITE ACTIVITIES

Activity	Level	Protective Equipment
Site characterization and final survey.	D	• Hearing protection (if required). • Work clothes or coveralls and Tyveks. • Safety boots and shoe covers (as required by PRSO). • Gloves. • Safety glasses or goggles. • Hard hat. • TLD.
Remediation	D	• Hearing protection (if required). • Work clothes or coveralls and Tyveks. • Safety boots and shoe covers (as required by PRSO). • Gloves. • Safety glasses or goggles. • Hard hat. • TLD.
Upgrade	C	• Full facepiece air purifying respirator. • Chemical resistant clothing. • Inner and outer chemical resistant gloves. • Safety boots. • Hard hat.

7.0 DECONTAMINATION

The following decontamination procedures are for organic and inorganic chemical hazards only. Decontamination procedures for radioactive hazards are discussed in Section 11.0 of the Radiological Control Plan.

7.1 Standard Procedures

(1) A decontamination area should be located between the Hot Line (upwind boundary of the Exclusion Zone) and the Support Zone boundary.

(2) A personnel decontamination station (PDS) should be established.

(3) All personnel should proceed through the appropriate contamination reduction sequence upon leaving the contamination area.

(4) All protective gear should be left onsite during any lunch break following decontamination procedures.

(5) Material Safety Data Sheets for chemicals used during decontamination procedures should be made available to those who are potentially exposed to these chemicals. See also Section 12.0 "Hazard Communication" (below).

7.2 Decontamination of Equipment

To the extent possible, measures should be taken to prevent contamination of sampling and monitoring equipment. Sampling devices may become contaminated; however, monitoring instruments, unless they are splashed, usually do not become contaminated. Once contaminated, it is difficult to clean instruments without damaging them. Any delicate instrument that cannot be decontaminated easily should have a bag taped and secured around it. Openings should be made in the bag for sample intake.

7.2.1 Sampling Devices

Sampling devices used for collecting soil samples will require special cleaning. Decontamination of all sampling equipment will be accomplished by washing in the following manner:

(1) Rinse with tap water.
(2) Wash with solution of laboratory detergent and deionized water.
(3) Rinse with deionized water.

7.2.2 Respirators

Certain parts of contaminated respirators, such as the harness assembly and cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush. Persons responsible for decontaminating respirators should be thoroughly trained in respirator maintenance.

7.2.3 Sanitization of Personal Protective Equipment

Respirators, reusable protective clothing, and other personal articles not only must be decontaminated before being reused, but also must be sanitized. The inside of masks and clothing becomes soiled because of exhalation, body oils, and perspiration. The manufacturer's instructions should be followed to sanitize the respirator mask. If practical, protective clothing should be machine washed after a thorough decontamination; otherwise, it must be cleaned by hand.

7.2.4 Persistent Contamination

In some instances, clothing and equipment will become contaminated with substances that cannot be removed by normal decontamination procedures. A strong detergent (industrial grade) may be used to remove such contamination from equipment if it does not destroy or degrade the protective material. If persistent contamination is expected, disposable garments should be used. Testing for persistent contamination of protective clothing and appropriate decontamination must be done by qualified laboratory personnel.

7.2.5 Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes, and all other equipment that is contaminated must be secured in drums or other containers and labeled. Clothing not completely decontaminated onsite should be secured in plastic bags before being left onsite. Contaminated wash and rinse solutions should be contained and left onsite.

Additional guidance for decontamination of radiologically contaminated personnel equipment or items is provided in Sections 11.0 and 16.0 of the Radiological Control Plan.

7.3 Minimal Decontamination

Less extensive procedures for decontamination can be subsequently established when the type and degree of contamination become known or the potential for transfer is judged to be minimal by the SSC in consultation with the Project Manager. These procedures generally involve one or two washdowns only.

7.4 Closure of the Personnel Decontamination Station

All disposable clothing and plastic sheeting used during the operation should be double bagged, labeled, and either contained onsite or removed to a client-approved disposal facility. All wash tubs, pails, containers, etc., should be thoroughly washed, rinsed, and dried prior to removal from the site.

7.5 Level D Decontamination

The decontamination layout for Level D is described below.

Maximum Measures for Level D Decontamination

Segregated Equipment Drop	1. Deposit equipment used onsite (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in plastic-lined containers. Segregation at the drop reduces the probability of cross contamination.
Boot Cover Wash	2. Scrub outer boot covers with decon solution or detergent and water.
Boot Cover Rinse	3. Rinse off decon solution by using as much water as necessary.
Boot Cover Removal	4. Remove boot covers and deposit them in the plastic-lined container or segregated area.
Tyvek and Glove Removal	5. Remove Tyvek (if worn) and gloves. Place in designated receptacle.
Perform Whole Body Frisk	6. Using frisker, perform whole body frisk

8.0 EMPLOYEE TRAINING ASSIGNMENTS

8.1 General

All employees working onsite who are exposed to hazardous substances, health hazards, or safety hazards; their supervisors; and the management responsible for the site must receive training before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances or safety or health hazards. Training for handling radioactive material is presented in Section 5.0 of the Radiological Control Plan. Employees will not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility.

8.2 Initial Training

General site workers engaged in hazardous substance removal or other activities that may expose workers to hazardous substances and health hazards may be required to receive a minimum of 40 hours of offsite instruction, and a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor, if deemed appropriate. Training regarding radiation protection and contamination control will consist of onsite training, including an examination. A passing grade of 80% must be obtained to successfully complete the required radiation worker training.

8.3 Management and Supervisor Training

Onsite management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations will receive 40 hours of initial training, three days of supervised field experience, and at least eight additional hours of specialized supervisory training.

8.4 Refresher Training

Employees, managers, and supervisors will receive refresher training annually.

Selected supervisory personnel will be required to receive additional training, such as First Aid and CPR.

9.0 MEDICAL SURVEILLANCE

9.1 General

The following employees who participate in field activities involving hazardous waste are included in the Medical Surveillance Program.

- All employees who may be exposed to hazardous substances or health hazards at or above the permissible exposure limits, without regard to the use of respirators for 30 days or more per year.
- All employees who wear a respirator as required by CFR 1910.134.
- All employees who are injured because of overexposure from an incident involving hazardous substances or health hazards.

9.2 Frequency of Medical Exams

Medical examinations and consultations will be made available to the employees discussed above on the following schedules:

- Prior to assignment.
- At least once every 12 months, unless the physician believes a longer interval (not greater than biennially) is appropriate.
- As soon as possible upon notification that the employee has developed signs or symptoms indicating possible overexposure.

9.3 Medical Surveillance Program

A medical surveillance program is in place covering the requirements of 29 CFR 1910.120(f) for hazardous waste work, including the use of respirators and other personal protection equipment. Additional guidance for medical surveillance for radiation workers is provided in Section 14.0 of the Radiological Control Plan. In general, the site program provides the following:

9.3.1 Surveillance

Pre-employment Screening

Annual Medical Examinations

Follow up Examinations, when appropriate

9.3.2 Treatment

Emergency - Treatment of medical emergencies will be handled by emergency room personnel and as described in Section 16.0 of the Radiological Control Plan.

Non-emergency (on a case-by-case basis) - Treatment of medical non-emergencies will be performed by the employees private physician.

9.3.3 Recordkeeping

Records of employees' physical examinations will be stored onsite and maintained as part of the WSMPS Remediation Project Files.

9.3.4 Program Review

The Health and Safety Program including this plan will be reviewed on an annual basis for completeness and effectiveness.

10.0 STANDARD OPERATING PROCEDURES

10.1 Organizational Structure and Responsibilities

Responsibility for health and safety passes from the Project Manager to the Site Safety Coordinator to the Radiation Control Supervisor for the Zircaloy Burn Area Remediation Project.

10.2 Reporting of Accidents and Unsafe Conditions

If an accident occurs, the Site Safety Coordinator and the injured person(s) are to complete an Accident Report Form for submittal to the Project Manager. The Project Manager should ensure that follow up action is taken to correct the situation that caused the accident.

10.3 Heat Stress/Cold Stress

If site work is to be conducted during the winter, cold stress is a concern to the health and safety of personnel. With regard to the wearing of Tyvek suits, because such disposable clothing does not "breathe," perspiration does not evaporate and the suits can become wet. Wet clothes combined with cold temperatures can lead to hypothermia. If the air temperature is less than 40 degrees Fahrenheit (°F) and an employee perspires, the employee must change to dry clothes. Table 10-1 describes the signs and symptoms of cold stress.

Wearing PPE also puts a worker at a considerable risk of developing heat stress. Table 10-2 describes the signs and symptoms of heat stress. This can result in health effects ranging from heat fatigue to serious illness or death. Consequently, regular monitoring and other precautions are vital.

For workers wearing standard work clothes, recommendations for monitoring and work/rest schedules are those approved by ACGIH and NIOSH. Workers wearing semipermeable PPE or impermeable PPE should be monitored when the temperature in the work area is above 70°F. To monitor the worker, the following should be measured:

- Heart Rate. The radial pulse should be counted during a 30-second period as early as possible in the rest period.
    - If the heart rate exceeds 110 beats per minute at the beginning of the rest period, the next work cycle should be shortened by one third and the rest period should be kept the same.
    - If the heart rate still exceeds 110 beats per minute at the next rest period, the following work cycle should be shortened by one third.

- Oral Temperature. A clinical thermometer (three minutes under the tongue) or similar device should be used to measure the oral temperature at the end of the work period (before drinking).
  - If the oral temperature exceeds 99.6°F (37.6 degrees Celsius (°C)), the next work cycle should be shortened by one third, without the rest period being changed.
  - If the oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, the following work cycle should be shortened by one third.
  - A worker should not be permitted to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

Initially, the frequency of monitoring depends on ambient temperature (see Table 10-3). The length of the work cycle is determined by the frequency of physiological monitoring described above.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important, because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. To avoid heat stress, the following steps should be taken:

- Work schedules should be adjusted.
- Shelter (air conditioned, if possible) or shaded areas should be provided to protect personnel during rest periods.
- Workers' body fluids should be maintained at normal levels to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat — i.e., eight fluid ounces (0.23 liter) of water must be ingested for approximately every eight ounces (0.23 kilogram) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, the worker should be encouraged to drink more. The following strategies may be useful:
  - Water temperature should be maintained at 50°F to 60°F (10° to 15.6°C).
  - Small disposable cups that hold about four ounces (0.1 liter) should be provided.

10.4 Use of Handtools and Portable Power Tools

Handtools should be kept in good repair and used only for their designed purposes. Proper protective eyewear should be worn when using handtools and portable power tools. Unguarded sharp edged or pointed tools will not be carried in employees' pockets.

The use of tools with mushroomed heads, split or defective handles, worn parts, or other defects will not be permitted. Tools that have become unsafe will be reconditioned before reissue or discarded.

Throwing or dropping of tools from one level to another will not be permitted; rather, containers and hand lines should be used for transporting tools from one level to another.

Non-sparking tools will be used in atmospheres where sources of ignition may cause fire or explosion.

Electric powered shop and hand tools will be of the double insulated, shock proof type or be effectively grounded. Power tools should be operated only by designated employees who are familiar with their use.

Portable grinding tools will not be used without properly installed safety guards. Guards and tool rests should be maintained in proper adjustment. Grinding wheels should not be operated at speeds in excess of the manufacturer's safe ratings. Cracked or defective wheels will not be used.

Portable circular saws should be equipped with guards that automatically enclose the cutting edges. Cracked or defective blades will not be used. Also, power saws will not be left running when unattended.

Portable pneumatic tools should be inspected periodically to ensure good mechanical condition. Pneumatic tools will be operated with safety clips or retainers installed to prevent the tools from accidentally being discharged from the chuck. Air hoses should not be disconnected from equipment until the pressure has been shut off and exhausted from the line. Safety lashing will be provided at all hose and tool connections on air lines over 0.5 inch in diameter. Leaking or defective hoses should be replaced.

When not in use, tools will not be left on scaffolds, ladders, or overhead working spaces. Containers should be provided to hold tools and prevent them from falling.

10.5 Use of Ropes, Chains, and Accessories

The use of ropes and chains will be governed by the instructions on usage and safety limits as recommended by the manufacturer. Ropes and chains should be inspected before use, and their loading should not exceed the manufacturer's safety limits.

Hooks used in hoisting personnel or in hoisting loads over or in the immediate vicinity of workers should be made of forged steel and equipped with safety keepers. When shackles are used under these conditions, they should be of the locking type or the pin should be secured to prohibit turning.

Load lifting accessories, such as sheaves, shackles, hooks, headache balls, etc., should be obtained from a reputable manufacturer. The use of job fabricated lifting accessories is expressly prohibited. Load lifting accessories that show excessive wear or have been bent, twisted, or otherwise damaged will be removed from service.

10.5.1 Slings

When in use, slings should be inspected daily for labeling/tagging (i.e., load test date) and for signs of overloading, excessive wear, or damage. Defective slings should be removed from service and repaired or replaced before reuse.

Proper storage should be provided for slings to prevent any damage that would impair their strength. They should be protected from sharp, rough, or square corners to prevent cutting or breaking of fibers, strands, or chain links.

10.5.2 Wire Rope

The safe performance of wire rope or cables can be ensured by rigid periodic inspection and by proper use and care.

The maximum allowable load for wire hoisting rope must not exceed the safe working load prescribed by the manufacturer or the ultimate strength of the rope divided by the safety factor. Commercial end fastenings, clips, and zinc sockets must be properly applied to develop maximum strength. Wire rope should be removed from hoisting or load carrying service when kinked or when any one of the following conditions is observed:

- The existence of 12 randomly distributed broken wires in one rope lay, or four broken wires in a single strand in one rope lay.
- Evidence of corrosion or heat damage.
- One broken wire, rust, or corrosion adjacent to a socket or end fitting (this requires removal from service or resocketing).
- Distortion, stretching, elongation, or abnormal reduction in diameter.

Wire rope found to be defective for hoisting or load carrying should be plainly marked as being unfit for such use.

Running lines of hoisting equipment located within eight feet of the ground or working level will be guarded; or access to the operating area can be restricted.

Rope clips attached with U-bolts should have the U-bolts on the dead end of the rope. When a wedge socket fastening is used, the dead or short end of the cable should be clipped to the live cable with a U-bolt or another approved fastener.

10.5.3 Fiber and Synthetic-Fiber Rope

In selecting fiber and synthetic fiber ropes for load carrying purposes, only the best quality rope should be used, with size and application in accordance with the manufacturer's recommendations. These ropes should be inspected frequently to ensure safe performance.

Proper care must be given to ropes to maintain good condition and high strength capacity. Fiber ropes should not be allowed to freeze after becoming wet, but should be cleaned carefully and dried in loose coils. Ropes should not be stored close to cement, lime, acids, or alkalies. Ropes that have been exposed to these materials should be removed from service.

10.5.4 Chains

Extreme care is necessary in the use and maintenance of all load carrying chains. They should be inspected by a competent person after each installation and regularly thereafter. Chains must not be subjected to a load greater than their rated safe loading, which is determined from capacity tables issued by the chain manufacturer.

Splicing broken chains by inserting a bolt between two links with the heads of the bolt and the nut sustaining the load, or by passing one link through another and inserting a bolt or a nail to hold it, is prohibited.

10.6 Drum Handling Procedures

10.6.1 Inspection

While it is not likely that drums (i.e., buried and uncovered) will be encountered during remedial activities, safety procedures for handling such drums should they be discovered are included for completeness. The appropriate procedures for handling drums depend on the drum contents. Prior to any handling, observations of drums should be conducted to gain as much information as possible about their contents. Observations should identify:

- Symbols, words, or other markings on the drum indicating that its contents are hazardous, e.g., radioactive, explosive, toxic, etc.
- Signs of deterioration, such as corrosion, rust, and leaks.
- Signs that the drum is under pressure, such as swelling or bulging.

Conditions in the immediate vicinity of the drums may provide information about drum contents and other associated hazards. Monitoring should be conducted around the drums using instruments such as organic vapor monitor or combustible gas indicator.

As a precautionary measure, personnel should assume unlabelled drums to contain hazardous materials until their contents are characterized. Drums may also be mislabelled and may not accurately describe their contents.

10.6.2 Planning

Drum handling should be carefully planned based on all available information. The results of the inspection can be used to determine: 1) if any hazards are present and the appropriate response, and 2) which drums need to be moved in order to be opened and sampled. A preliminary plan should be developed which specifies the extent of handling necessary, the personnel for the job, and the most appropriate procedures based on the hazards associated with the probable drum contents as determined by visual inspection. This plan should be revised as new information is obtained during drum handling.

10.6.3 Handling

Drums should only be handled if necessary. Prior to handling, all personnel involved should be warned about the hazards involved, and instructed to minimize handling as much as possible. In all phases of handling, personnel should be alert for new information about potential hazards. These hazards should be responded to before continuing routine handling operations.

TABLE 10-1

SIGNS AND SYMPTOMS OF COLD STRESS

Incipient frostbite is a mild form of cold stress characterized by sudden blanching or whitening of the skin.

Chilblain is an inflammation of the hands and feet caused by exposure to cold moisture. It is characterized by a recurrent localized itching, swelling, and painful inflammation of the fingers, toes, or ears. Such a sequence produces severe spasms, accompanied by pain.

Second-degree frostbite is manifested by skin with a white, waxy appearance and the skin is firm to the touch. Individuals with this condition are generally not aware of its seriousness, because the underlying nerves are frozen and unable to transmit signals to warn the body. Immediate first aid and medical treatment are required.

Third-degree frostbite will appear as blue, blotchy skin. The tissue is cold, pale, and solid. Immediate medical attention is required.

Hypothermia develops when body temperature falls below a critical level. In extreme cases, cardiac failure and death may occur. Immediate medical attention is warranted when the following symptoms are observed:

- Involuntary shivering
- Irrational behavior
- Slurred speech
- Sluggishness

TABLE 10-2

SIGNS AND SYMPTOMS OF HEAT STRESS

Heat rash may result from continuous exposure to heat or humid air.

Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

- Muscle spasms
- Pain in the hands, feet, and abdomen.

Heat exhaustion occurs from increased stress on various body organs, including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- Pale, cool and moist skin
- Heavy sweating
- Dizziness, fainting and nausea.

Heat stroke is the most serious form of heat stress. Temperature regulation fails, and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs. Competent medical help must be obtained. Signs and symptoms are:

- Red, hot and unusually dry skin
- Lack of or reduced perspiration
- Dizziness and confusion
- Strong, rapid pulse and coma.

Have workers drink 16 ounces (0.5 liter) of fluid (preferably water or diluted drinks) before beginning work. Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters of fluid per day are recommended, but more may be necessary to maintain body weight.

Encourage workers to maintain an optimal level of physical fitness. Where indicated, acclimatize workers to site work conditions.

Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure.

Train workers to recognize, identify, and treat heat stress.

TABLE 10-3

SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATIZED WORKERS[b]

ADJUSTED TEMPERATURE[a]	NORMAL WORK ENSEMBLE[c]	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.8°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

[a] Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent of the time the sun is not covered by clouds that are thick enough to produce a shadow (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows).

[b] For work levels of 250 kilocalories/hour.

[c] A normal work ensemble consists of cotton overalls or other cotton clothing with long sleeves and pants.

11.0 HAZARD COMMUNICATION

11.1 General

The WSMPS Hazard Communication Program complies with the OSHA Hazard Communication Standard (HCS) found in 29 CFR 1910.1200 and 29 CFR 1926.59, which applies to any chemical present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency. Although waste materials are excluded from the OSHA requirement, decontamination chemicals for sampling apparatus or protective clothing (such as acetone or trisodium phosphate) and calibration standards (such as isobutylene gas) require Material Safety Data Sheets (MSDS).

11.2 Compliance Requirements

In order to comply with Hazard Communication Standard (29 CFR 1910.1200), WSMPS has determined that:

- All containers of hazardous chemicals must be appropriately labeled or tagged to identify the hazard and provide information on effects and appropriate protective measures.
- Labels, tags, or signs must be properly affixed and visible at all times while a hazard is present and removed promptly when the hazard no longer exists.
- Written information (MSDS) on hazardous chemicals will be available to all employees working with the substance.
- A notice from OSHA will be posted which details the OSHA Act of 1970.

12.0 FORMS

The following forms will be provided to the Site Safety Coordinator during final preparations for departure to the job site and are provided as Figures 12-1 through 12-6.

- Daily Instrument Calibration Checksheet (Form 12-1)
- Air Monitoring Data Sheet (Form 12-2)
- Plan Acceptance Form (Form 12-3)
- Plan Feedback Form (Form 12-4)
- Accident/Exposure Report Form (Form 12-5)
- Site Safety Briefing Form (Form 12-6)

The Plan Acceptance Form will be filled out by all employees working on the site. The Plan Feedback From will be filled out by the Site Safety Coordinator and any other onsite employee who wishes to fill one out. The Accident Report Form will be filled out by the Project Manager if an accident occurs. The Site Safety Briefing Form will be filled out by the Site Safety Coordinator and signed by all persons who received the site safety briefing.

ALL COMPLETED FORMS WILL BE MAINTAINED FOR RETENTION IN WSMPS REMEDIATION PROJECT FILES.

FORM 12-1

DAILY INSTRUMENT CALIBRATION CHECK SHEET

Project Name: ______________________________

Project Number: ______________________________

Instrument(s): ______________________________

Serial #(s): ______________________________

Date	Pure Air (Y/N)	Calibration Gas (PPM)	Battery Check (Good/Bad)	Calibrated By	Remarks

* *Proper calibrations of instruments shall be conducted immediately prior to site activities. Using felt tip pens/markers or similar items is not considered proper calibration and is not acceptable.*

AIR MONITORING DATA SHEET

Sampled By: ______________ Project Name: ______________ Page ____ of ____

Date: ______________ Project Number: ______________

Instrument Used: ______________ Calibration Date: ______________

Estimated Wind Direction: ☐ N ☐ S ☐ E ☐ W ☐ NE ☐ NW ☐ SE ☐ SW

Estimated Wind Speed: ☐ Calm ☐ Moderate ☐ Strong

Field Activities: ____

____

____

Background Level ______________ Location ______________

Sample Number	Time	Duration (minutes)	Location		Comments
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

FORM 12-3

PLAN ACCEPTANCE FORM
PROJECT HEALTH AND SAFETY PLAN

Instructions: This form is to be completed by each person to work on the subject project work site and returned to the Site Safety Coordinator prior to site activities.

Project No: ______________________________

Client/Progam: ______________________________

Date: ______________________________

I represent that I have read and understand the contents of the above Plan and agree to perform my work in accordance with it.

____
Signed

____
Print Name

____
Company/Office

____
Date

____
Signed

____
Print Name

____
Company/Office

____
Date

____
Signed

____
Print Name

____
Company/Office

____
Date

____
Signed

____
Print Name

____
Company/Office

____
Date

PLAN FEEDBACK FORM

Job Number ______________

Job Name ______________

Date ______________

Problems with plan requirements:

____

____

____

____

____

Unexpected situations encountered:

____

____

____

____

____

Recommendations for future revisions:

____

____

____

____

____

ACCIDENT/EXPOSURE REPORT

Employee Name ______________________ Date of Birth ______________

Home Address ______________________ Phone # ______________

Sex: ☐ Male ☐ Female Job Title ______________ Social Security # ______________

Office # _____ Office Location ______________ Date of Birth ______________

Hours Usually Worked: Hours per Day ____ Hours per Week ____ Total Hours Weekly ____

Where did accident or exposure occur? (include address) ______________________

____

County ______________ On Employer's Premises? ☐ Yes ☐ No

What was employee doing when injured? (be specific) ______________________

____

How did the accident or exposure occur? (describe fully) ______________________

____

____

____

What steps could be taken to prevent such an occurrence? ______________________

____

____

Object or substance that directly injured employee ______________________

____

Describe the injury or illness ______________ Part of body affected ______________

Name and address of physician ______________________

If hospitalized, name and address of hospital ______________________

Date of injury or illness ______________ Time of day ______________

Loss of one or more day of work? ☐ Yes ☐ No If yes, date last worked ______________

Has employee returned to work? ☐ Yes ☐ No If yes, date returned ______________

Did employee die? ☐ Yes ☐ No If yes, date ______________

Completed by (print) ______________________ Signature ______________

Title ______________________ Date ______________

An accident/exposure report must be completed by the Supervisor or Site Safety Coordinator immediately upon learning of the incident. The completed report must be immediately transmitted to the Office Administrative Manager.

FORM 12-6

SITE SAFETY BRIEFINGS

Job Name ______________________ Number ______________________

Date ______________ Start Time ______________ Completed __________

Site Location ____

Type of Work (general) ______________________________________

SAFETY ISSUES

Tasks (this shift) ____

____

Protective Clothing/Equipment ____

____

Chemical Hazards ____

____

Physical Hazards ____

____

Control Methods ____

____

____

Special Equipment/Techniques ____

____

Nearest Phone ____

Hospital Name/Address ____

Special Topics (incidents, actions taken, etc.) ______________________________

____

____

ATTENDEES

Print Name	Sign Name

Meeting conducted by: ____

APPENDIX D

RADIOLOGICAL EVALUATION OF THE "CLEAN" SOIL PILE AT BLAIRSVILLE, PA

Radiological Evaluation of the "Clean" Soil Pile at Blairsville

Westinghouse Electric Company LLC
Specialty Metals Plant
Blairsville, PA

May 28, 1999

-DRAFT-

Prepared By:

____

A. Joseph Nardi
Supervisory Engineer

Radiological Evaluation of the "Clean" Soil Pile at Blairsville

A. Background Information

During the summer of 1998, the soil beneath the original footprint of the Waste Processing building on the Westinghouse Blairsville Site was excavated as part of the remediation of the "Cow Palace Area" of the site (also referred to as the "Former Zircaloy Burn Area"). This former building was originally constructed and used for the processing and packaging of radioactive waste materials during the period from the mid 1950's to sometime in the mid 1960's. During June 1998, an initial excavation was made to relocate and excavate a pipe line that had been originally identified during an earlier site investigation.

After relocating the pipe it was found that two buried sumps were associated with the original floor drain system. Excavation in the area also found that the original concrete floors were also buried in the area. During the excavation of these features, a pile of soil was put aside. An effort was made to sort through that soil and remove non-soil components such as the concrete floor pieces. The sorted soil was then spread out in a mound about 4 feet thick in order to grid it out for radiological surveying and sampling. The total volume of soil in the pile is estimated to be about 43,000 cubic feet. A sampling program was then undertaken with the results indicating that the Uranium concentration in the soil was definitely above normal background levels of Uranium. This report compares the measured concentrations of Uranium against the applicable acceptance criteria or Concentration Guideline for Uranium.

The Concentration Guideline for contaminated soils is 30 picoCuries of total Uranium per gram of soil. This is based on the values provided to the NRC in the original Health and Safety Plan that was provided to the NRC in 1993. The normal analytical approach that is used for soil analysis is Gamma Spectrometry. This technique measure specific isotopes including Uranium-235 but is not capable of measuring other Uranium isotopes (Uranium-234 and Uranium-238) and therefore does not directly measure the total Uranium content of the soil. The accepted method is to measure the U-235 concentration and multiply it by a factor to correct to the total Uranium concentration. The appropriate multiplier to use depends on a number of considerations. The actual value is not a constant but is dependent on the enrichment process along with the level of enrichment that the Uranium has undergone. The following information provides a basis for the recommended value used in this evaluation.

B. Determination of the U-total/U-235 Activity Ratio

B.1 Value Used in Previous Work

In all previous work at the Blairsville site, the evaluation of analytical data has been based on the use of a value of 30 for the ratio of total Uranium activity (picoCi/gram) to Uranium-235 activity (picoCi/gram). This has been based on the knowledge that a ratio of 30 is considered to be conservative and has been accepted by the USNRC inspectors as such.

B.2 Dependence of Ratio on Enrichment

The specific activity of Uranium depends on the enrichment level since each isotope has a unique specific activity and the ratio of the isotopes changes as the Uranium is further enriched. A generally accepted equation to predict the specific activity of enriched Uranium is given by:

SA = (0.4+0.38*E+0.0034*(E^2))*10^-6
where:
SA = Specific Activity in Ci/gram
E = Enrichment in w/o U-235 expressed in % (i.e. E=2 for 2% U-235)

Using this equation provides the curve for Specific Activity shown on Figure 1. Given this information and the specific activity for the U-235 isotope, it is possible to directly calculate the ratio of U-tot/U-235 activity. The second curve on Figure 1 provides the activity ratio as a function of enrichment. This curve shows that the activity ratio ranges from the value of 50 for natural Uranium to a minimum of about 20 for low enriched Uranium and then increasing to about 30 for high enriched Uranium. The true ratio for natural Uranium is about 50 given the normal isotopic distribution of Uranium in nature. Although some samples of natural, depleted and high enriched Uranium have been found in the Cow Palace area, the bulk of the activity is present as low enriched Uranium.

The above equation is given in footnote 3 to 10CFR20 [paragraph 20.1001-20.2401], Appendix B. Some experience indicates that this equation may underpredict the specific activity by up to 40% at enrichments between 1% to 20% U-235 which covers the range of expected enrichments in this situation. However, the equation is only being used to establish the expected range of activity ratios and the not the absolute specific activity. The use of a multiplier that is slightly conservative will account for the uncertainty in the actual isotopic distribution.

The following provides an approximation of the expected values for the distribution of the three Uranium isotopes for three different enrichment levels.

Isotope	Natural Uranium	Low Enriched Uranium	High Enriched Uranium
Uranium Mass Distribution			
U-234	0.01%	0.03%	1%
U-235	0.71%	5%	90%
U-238	99%	95%	10%
Uranium Activity Distribution			
U-234	49%	82%	97%
U-235	2%	5%	3%
U-238	49%	13%	0.05%

B.3 Measured Value

In order to measure the actual activity ratio of the Uranium present in the Cow Palace area it is necessary to perform alpha spectrometry measurements on samples. While this technique is capable of measuring the concentration of each of the Uranium isotopes it is more expensive, takes a longer time to complete the analysis, and uses a small sample mass. This last consideration means that the results are more subject to micro-inhomogeneity issues within the sample and therefore the result for the total uranium concentration is less certain.

Table 1 provides the results of the alpha spectrometry measurements for various samples taken at Blairsville. This set of samples includes materials from both the Cow Palace area and materials recovered from the sumps in the Gauge Lab and Finishing area. In all cases the results support the curve presented in Figure 1 which indicates that a assumed specific activity ratio of 30 is conservative. The analytical data sheets are contained in Appendix A.

B.4 Recommendation on Use of Ratio

Based on the measured results, a more realistic value for the activity ratio of U-total to U-235 would be 25. This value still has some conservatism in it since the average for the measured values is 19.

C. Sampling Plan

In order to obtain a set of representative samples for the soil pile, the soil was spread out over an area to a depth of approximately 4 feet. This pile was divided into six sections of nearly equal size based on the shape of the pile and convenience for establishing a grid. Five samples were initially taken from each of the six sections for a total of 30 independent samples. A portion of each of the five samples from a section was also combined into two additional composite samples. One of these two composite samples was held on site and the other composite sample was submitted to the analytical laboratory. After an initial statistical analysis indicated that there was an insufficient number of samples to decide that the Concentration Guideline criteria had been met within the 95% confidence level, an additional 36 samples were collected. The sample locations and the division of the pile are shown in Figure 2.

All samples were taken using a back-hoe to dig a hole through the depth of the pile. Small aliquots were taken from each shovel-full of soil and combined into a container. The contents of the container was then mixed thoroughly by hand and the sample was taken from the contents of the container. The composite samples were taken from the five containers that represented a section. In order to obtain a representative sample for alpha spectrometry analysis, an additional composite was made at the analytical laboratory by forming a composite from the six field generated composite. This composite was also analyzed by gamma spectrometry.

D. Analytical Results

The analytical measurements for U-235 are shown in Table 2 for the 66 individual samples and seven composites. The analytical laboratory report sheets are included in Appendix A. For purposes of the statistical evaluation only the 66 independent samples were included. The composite samples were not used in the statistical evaluation. However a direct comparison of the values for the U-235 in pCi/g between the average of the five samples and the composite sample indicate good agreement. This confirms that the mixing of the samples was adequate.

Figure 3 presents the frequency distribution for the 66 individual samples given in Table 2 against the U-235 result (pCi/g) for the gamma spectrometry measurements. From this graph it appears that the distribution can be represented by a normal distribution.

E. Statistical Evaluation

There are two approaches that are accepted by the NRC for the statistical evaluation of results to determine if the data supports the conclusion that the criteria for release for unrestricted use is met. Report NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination" (published June 1992), is based on a statistical approach that assumes a normal distribution for the data. This report is still in draft form and is not officially accepted for general use by the NRC, however it has been accepted and authorized for use in specific cases. All of the building survey data was collected in compliance with the approach presented in this manual.

A second document titled "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (NUREG-1575), December 1997, is also available for use. This document has not been officially accepted by the NRC for general use but is the basis of all the guidance that is being currently issued by the NRC for license termination documentation. The statistical approach used in this document is based on non-parametric statistics. This approach is considered to be more powerfull and is applicable where the distribution of the data is not consistent with a normal distribution.

If the value of 30 had been used, the measured data would still have passed both of the MARSSIM tests. It would also have passed the first test in the NUREG/CR-5849 approach but would fail on the number of samples required. That statistical test indicates that an additional 40 samples would be required to meet the desired confidence level.

F. Conclusion

The measured U-235 concentrations and the statistical evaluation of the data supports the conclusion that the Uranium concentrations in the soil pile are less than the Concentration Guideline of 30 pCi/g at a confidence level of 95% or greater. Thus this pile of soil does not have to be disposed of as radioactive waste.

For purposes of this statistical evaluation it was decided to evaluate the data by both approaches as described below.

E1. NUREG/CR-5849 Evaluation
Table 3 provides the statistical evaluation of the data using the statistical approach given in NUREG/BR-5849. In this approach there are two considerations: 1) Is the measured data less than the concentration guideline at the 95% confidence level, and 2) Have enough samples been taken to demonstrate that the measured data satisfies the guideline value at the desired level of confidence. Using the measurement data for the 66 samples, both tests are satisfied. Another requirement of NUREG/CR-5849 is that the maximum measured value be less than 3 times the concentration guideline value. This requirement is also met.

E2. MARSSIM Evaluation
Table 4 provides the statistical evaluation of the data using the statistical approach given in MARSSIM. There are two approaches used in MARSSIM depending on whether the radionuclide is present in the environment. Although Uranium is present in the environment at a level of about 1 pCi/g, using the statistical approach that accounts provides credit for that presence requires that an adequate number of background samples be taken and justified to permit the subtraction of background. Rather than do that in this case, the statistical approach utilized assumes that all Uranium measured is due to operational contamination. This is conservative and is not a significant factor when the normal background is much lower than the concentration guideline value.

The same two considerations discussed above in Section E1 apply also to this statistical evaluation. Using the measurement data for the 66 samples, both tests are satisfied. One point should be noted. The highest vale of N given in Table I.3 in MARSSIM is 50 whereas the value of N is 65 for the data set. Therefore it was necessary to perform a linear interpolation of the table to obtain the Critical Value of 43 used in Table 4. Another point to note is that according to the MARRSIM Sign Test procedure, all adjusted values that are equal to zero are discarded. That accounts for using a value of N=65 when there are 66 samples.

E3. Summary of Statistical Evaluation
The statistical evaluation by both methods demonstrates that the measured data supports the conclusion that the uranium concentration of the "clean" soil pile meets the concentration guideline value of 30 pCi/g for total Uranium. Therefore the soil in this pile does not have to be disposed of as radioactive waste. This evaluation was performed using the activity ratio of 25 to calculate the total Uranium concentration from the measured U-235 concentration value. As noted in Section B.1 above, a value of 30 for the activity ratio has typically been used in the past. As noted in Table 1, the alpha spectrometry measurements indicate that even a activity ratio of 25 is conservative since the average is 19 for the measurements.

Table 1
Uranium Isotopic Information
Based on Alpha Spectrometry Measurements

	Lab ID	Sample Description	Concentration (picoCi/gram) U-234	U-235	U-238	U-total	Activity Ratio U-tot/U-235	Uranium Enrichment % U-235
1	9809-0254w (A1)	Bag Shipment Composite	160.00	8.21	9.35	177.56	21.63	12%
2	9809-0255w (A1)	"Clean Dirt" Pile Composite	21.80	1.10	3.14	26.04	23.67	5%
3	9809-0256w (A1)	Sample from under road	113.00	8.08	15.80	136.88	16.94	7%
4	99-03196-03	Composite from Sumps in Building	3079.00	253.20	323.30	3655.50	14.44	11%
5	99-03196-04	Composite from Sumps in Building	3352.00	174.90	371.40	3898.30	22.29	7%
6	99-03196-05	Composite from Sumps in Building	3538.00	249.00	459.20	4246.20	17.05	8%
7	99-03196-06	Composite from Sumps in Building	1544.00	104.50	221.00	1869.50	17.89	7%
						Average	19.13	8%

Table 2
Uranium-235 Results
Based on Gamma Spectrometry Measurements

See Note 1	Sample #	Sample Location Information			U-235 pCi/g	Uncertainty pCi/g	Notes
		Section	Sample Point	Coordinates (x,y)			
1	3054	1	1	60,-8	0.53	0.36	
2	3055	1	2	48,-8	1.45	0.38	
3	3056	1	3	53,-5	1.44	0.37	
4	3057	1	4	60,-2	0.87	0.37	Average for Samples #3054-3058 (pCi/g)
5	3058	1	5	48,-2	1.27	0.46	1.11
	3060	1	Composite of 1-5		2.76	0.60	Composite Sample of #3054-3058
6	3061	2	1	60,2	0.72	0.34	
7	3062	2	2	48,2	1.15	0.46	
8	3063	2	3	53,3	0.69	0.30	
9	3064	2	4	60,4	0.55	0.28	Average for Samples #3061-3065 (pCi/g)
10	3065	2	5	48,4	1.17	0.38	0.86
	3067	2	Composite of 1-5		0.94	0.37	Composite Sample of #3061-3065
11	3068	3	1	60,6	0.68	0.30	
12	3069	3	2	48,6	0.76	0.36	
13	3070	3	3	53,7	1.04	0.31	
14	3071	3	4	60,8	0.59	0.31	Average for Samples #3068-3072 (pCi/g)
15	3072	3	5	48,8	1.20	0.40	0.85
	3074	3	Composite of 1-5		0.95	0.33	Composite Sample of #3068-3072
16	3075	4	1	60,12	0.92	0.36	
17	3076	4	2	48,11	0.82	0.35	
18	3077	4	3	53,13	0.77	0.28	
19	3078	4	4	60,14	0.76	0.27	Average for Samples #3075-3079 (pCi/g)
20	3079	4	5	48,14	1.23	0.36	0.90
	3081	4	Composite of 1-5		1.24	0.40	Composite Sample of #3075-3079
21	3082	5	1	60,16	0.89	0.34	
22	3083	5	2	48,16	0.68	0.34	
23	3084	5	3	53,17	0.82	0.33	
24	3085	5	4	60,18	0.58	0.30	Average for Samples #3082-3086 (pCi/g)
25	3086	5	5	48,18	0.98	0.39	0.79
	3088	5	Composite of 1-5		0.91	0.33	Composite Sample of #3082-3086

Table 2 (Continued)
Uranium-235 Results
Based on Gamma Spectrometry Measurements

See Note 1	Sample #	Sample Location Information			U-235 pCi/g	Uncertainty pCi/g	Notes
		Section	Sample Point	Coordinates (x,y)			
26	3089	6	1	43,6	2.00	0.47	
27	3090	6	2	39,6	0.70	0.33	
28	3091	6	3	41,14	0.60	0.34	
29	3092	6	4	44,16	1.11	0.38	Average for Samples #3089-3093 (pCi/g)
30	3093	6	5	39,16	2.12	0.53	1.30
	3094	6	Composite of 1-5		1.02	0.29	Composite Sample of #3089-3093
	9809-0255w	1 to 6	Composite		0.75	0.08	Composite of above Composite Sample
31	1126	1	6		0.96	0.15	
32	1127	1	7		0.71	0.12	
33	1128	1	8		0.77	0.11	
34	1129	1	9		1.07	0.16	
35	1130	1	10		1.38	0.19	
36	1131	1	11		1.22	0.16	
37	1132	2	6		0.94	0.15	
38	1133	2	7		0.83	0.13	
39	1134	2	8		0.77	0.13	
40	1135	2	9		1.22	0.17	
41	1136	2	10		1.12	0.2	
42	1137	2	11		0.843	0.1	
43	1138	3	6		0.10	0.15	
44	1139	3	7		0.49	0.11	
45	1140	3	8		1.00	0.14	
46	1141	3	9		0.61	0.12	
47	1142	3	10		0.93	0.15	
48	1143	3	11		0.78	0.13	
49	1144	4	6		0.93	0.15	
50	1145	4	7		1.09	0.14	
51	1146	4	8		0.88	0.13	
52	1147	4	9		0.74	0.14	
53	1148	4	10		0.57	0.11	

Table 2 (Continued)
Uranium-235 Results
Based on Gamma Spectrometry Measurements

See Note 1	Sample #	Sample Location Information			U-235 pCi/g	Uncertainty pCi/g	Notes
		Section	Sample Point	Coordinates (x,y)			
54	1149	4	11		0.84	0.13	
55	1150	5	6		0.52	0.10	
56	1151	5	7		1.00	0.16	
57	1152	5	8		0.88	0.14	
58	1153	5	9		0.70	0.12	
59	1154	5	10		0.85	0.14	
60	1155	5	11		1.16	0.15	
61	1156	6	6		0.61	0.11	
62	1157	6	7		0.77	0.12	
63	1158	6	8		0.53		
64	1159	6	9		0.59	0.10	
65	1160	6	10		0.89	0.14	
66	1161	6	11		1.39	0.19	

Note:
Only the 66 samples noted in this table were treated as independent samples and used for the statistical analysis. The results for the analysis of the composite samples and the mathmatical average for the corresponding set of samples are presented in the notes column for comparison purposes.

Table 3
Statistical Evaluation of Data Using NUREG/CR-5849 Approach

	Sample #	U-235 pCi/g	Total U* pCi/g	Comments
1	3054	0.53	13.2	
2	3055	1.45	36.3	Note:
3	3056	1.44	36.0	* - The total Uranium value is obtained by
4	3057	0.87	21.9	multiplying the measured value of the
5	3058	1.27	31.8	U-235 concentration by 25.
6	3061	0.72	18.0	
7	3062	1.15	28.8	
8	3063	0.69	17.3	
9	3064	0.55	13.7	
10	3065	1.17	29.3	
11	3068	0.68	16.9	
12	3069	0.76	19.0	
13	3070	1.04	26.0	
14	3071	0.59	14.9	
15	3072	1.20	30.0	
16	3075	0.92	23.1	
17	3076	0.82	20.5	
18	3077	0.77	19.3	
19	3078	0.76	19.0	
20	3079	1.23	30.8	
21	3082	0.89	22.2	
22	3083	0.68	16.9	
23	3084	0.82	20.6	
24	3085	0.58	14.6	
25	3086	0.98	24.5	
26	3089	2.00	50.0	
27	3090	0.70	17.4	
28	3091	0.60	14.9	
29	3092	1.11	27.8	
30	3093	2.12	53.0	
31	1126	0.96	24.1	
32	1127	0.71	17.8	
33	1128	0.77	19.3	
34	1129	1.07	26.8	
35	1130	1.38	34.5	
36	1131	1.22	30.5	
37	1132	0.94	23.5	
38	1133	0.83	20.7	
39	1134	0.77	19.2	
40	1135	1.22	30.5	
41	1136	1.12	28.0	
42	1137	0.843	21.1	
43	1138	0.10	2.6	
44	1139	0.49	12.3	
45	1140	1.00	25.0	
46	1141	0.61	15.2	
47	1142	0.93	23.2	
48	1143	0.78	19.4	

Table 3 (Continued)
Statistical Evaluation of Data
Using NUREG/CR-5849 Approach

	Sample #	U-235 pCi/g	Total U* pCi/g	Comments
49	1144	0.93	23.1	
50	1145	1.09	27.3	
51	1146	0.88	21.9	
52	1147	0.74	18.6	
53	1148	0.57	14.2	
54	1149	0.84	21.1	
55	1150	0.52	13.1	
56	1151	1.00	24.9	
57	1152	0.88	22.0	
58	1153	0.70	17.6	
59	1154	0.85	21.2	
60	1155	1.16	29.0	
61	1156	0.61	15.2	
62	1157	0.77	19.2	
63	1158	0.53	13.3	
64	1159	0.59	14.8	
65	1160	0.89	22.2	
66	1161	1.39	34.8	
	Concentration Guideline Value		30	pCi/g
	# of Samples		66	
	Average		22.63	pCi/g
	Std. Dev		8.32	pCi/g
	Degrees of Freedom		65	
	t(95%) Factor		1.670	From Table B-1 of NUREG/CR-5849
	Comparison Value		24.4	pCi/g, Equation 8-13 in NUREG/CR-5849
Is Comparison Value < Concentration Guideline?			Yes	
Factor for Estimating # of Samples Required			0.886	See definition, Table B-2 of NUREG/CR-5849
Number of Samples Required			12	From Table B-2 of NUREG/CR-5849
Were an adequate number of samples taken?			Yes	

Table 4
Statistical Evaluation of Data Using MARSSIM Approach

	Sample #	U-235 pCi/g	Total U* pCi/g	Sign Test** Adj. Value	Sign***	Comments
1	3054	0.53	13.2	16.8	1	
2	3055	1.45	36.3	-6.3	0	Note:
3	3056	1.44	36.0	-6.0	0	* - The total Uranium value is obtained by
4	3057	0.87	21.9	8.2	1	multiplying the measured value of the
5	3058	1.27	31.8	-1.8	0	U-235 concentration by 25.
6	3061	0.72	18.0	12.1	1	
7	3062	1.15	28.8	1.3	1	** - The Adjusted Value is calculated by
8	3063	0.69	17.3	12.8	1	subtracting the Total U concentration from
9	3064	0.55	13.7	16.3	1	the Concentration Guideline Value of 30 pCi/g.
10	3065	1.17	29.3	0.8	1	
11	3068	0.68	16.9	13.1	1	*** - When the Adjusted Value is positive
12	3069	0.76	19.0	11.1	1	the Sign is given a value of 1, otherwise
13	3070	1.04	26.0	4.0	1	it is given a value of 0.
14	3071	0.59	14.9	15.2	1	
15	3072	1.20	30.0	0.0		---This data point is not used in the statistical
16	3075	0.92	23.1	6.9	1	evaluation in accordance with the MARSSIM
17	3076	0.82	20.5	9.5	1	procedure.
18	3077	0.77	19.3	10.7	1	
19	3078	0.76	19.0	11.0	1	
20	3079	1.23	30.8	-0.8	0	
21	3082	0.89	22.2	7.9	1	
22	3083	0.68	16.9	13.1	1	
23	3084	0.82	20.6	9.5	1	
24	3085	0.58	14.6	15.5	1	
25	3086	0.98	24.5	5.5	1	
26	3089	2.00	50.0	-20.0	0	
27	3090	0.70	17.4	12.6	1	
28	3091	0.60	14.9	15.1	1	
29	3092	1.11	27.8	2.3	1	
30	3093	2.12	53.0	-23.0	0	
31	1126	0.96	24.1	5.9	1	
32	1127	0.71	17.8	12.2	1	
33	1128	0.77	19.3	10.8	1	
34	1129	1.07	26.8	3.3	1	
35	1130	1.38	34.5	-4.5	0	
36	1131	1.22	30.5	-0.5	0	
37	1132	0.94	23.5	6.5	1	
38	1133	0.83	20.7	9.3	1	
39	1134	0.77	19.2	10.8	1	
40	1135	1.22	30.5	-0.5	0	
41	1136	1.12	28.0	2.0	1	
42	1137	0.843	21.1	8.9	1	
43	1138	0.10	2.6	27.4	1	
44	1139	0.49	12.3	17.7	1	
45	1140	1.00	25.0	5.0	1	
46	1141	0.61	15.2	14.8	1	
47	1142	0.93	23.2	6.8	1	
48	1143	0.78	19.4	10.6	1	

Table 4 (Continued)
Statistical Evaluation of Data
Using MARSSIM Approach

	Sample #	U-235 pCi/g	Total U* pCi/g	Sign Test** Adj. Value	Sign***	Comments
49	1144	0.93	23.1	6.9	1	
50	1145	1.09	27.3	2.8	1	
51	1146	0.88	21.9	8.1	1	
52	1147	0.74	18.6	11.4	1	
53	1148	0.57	14.2	15.8	1	
54	1149	0.84	21.1	8.9	1	
55	1150	0.52	13.1	16.9	1	
56	1151	1.00	24.9	5.1	1	
57	1152	0.88	22.0	8.0	1	
58	1153	0.70	17.6	12.4	1	
59	1154	0.85	21.2	8.8	1	
60	1155	1.16	29.0	1.0	1	
61	1156	0.61	15.2	14.9	1	
62	1157	0.77	19.2	10.8	1	
63	1158	0.53	13.3	16.8	1	
64	1159	0.59	14.8	15.3	1	
65	1160	0.89	22.2	7.8	1	
66	1161	1.39	34.8	-4.8	0	
		Average	22.6			
		Std. Dev.	8.32	S+ value	55	Sum of the Sign Values
				N value	65	See Table I.3 in MARRSIM
		Critical Value for the Sign Test Statistic S+			43	and Page 8-12 of MARSSIM and Figure 4
		Is Critical Value < S+ value?			Yes	Passes Sign test at alpha = 0.005
				Delta	15	
				Delta/Sigma	1.8	See Table I.2 in MARSSIM
		Value of N required for alpha =0.01 and beta =0.01			32	and Page 8-12 of MARSSIM
		Is the number of samples taken > Value of N required			Yes	Adequate number of samples are available

Figure 1
Uranium Specific Activity and Activity Ratio vs. %Uranium-235

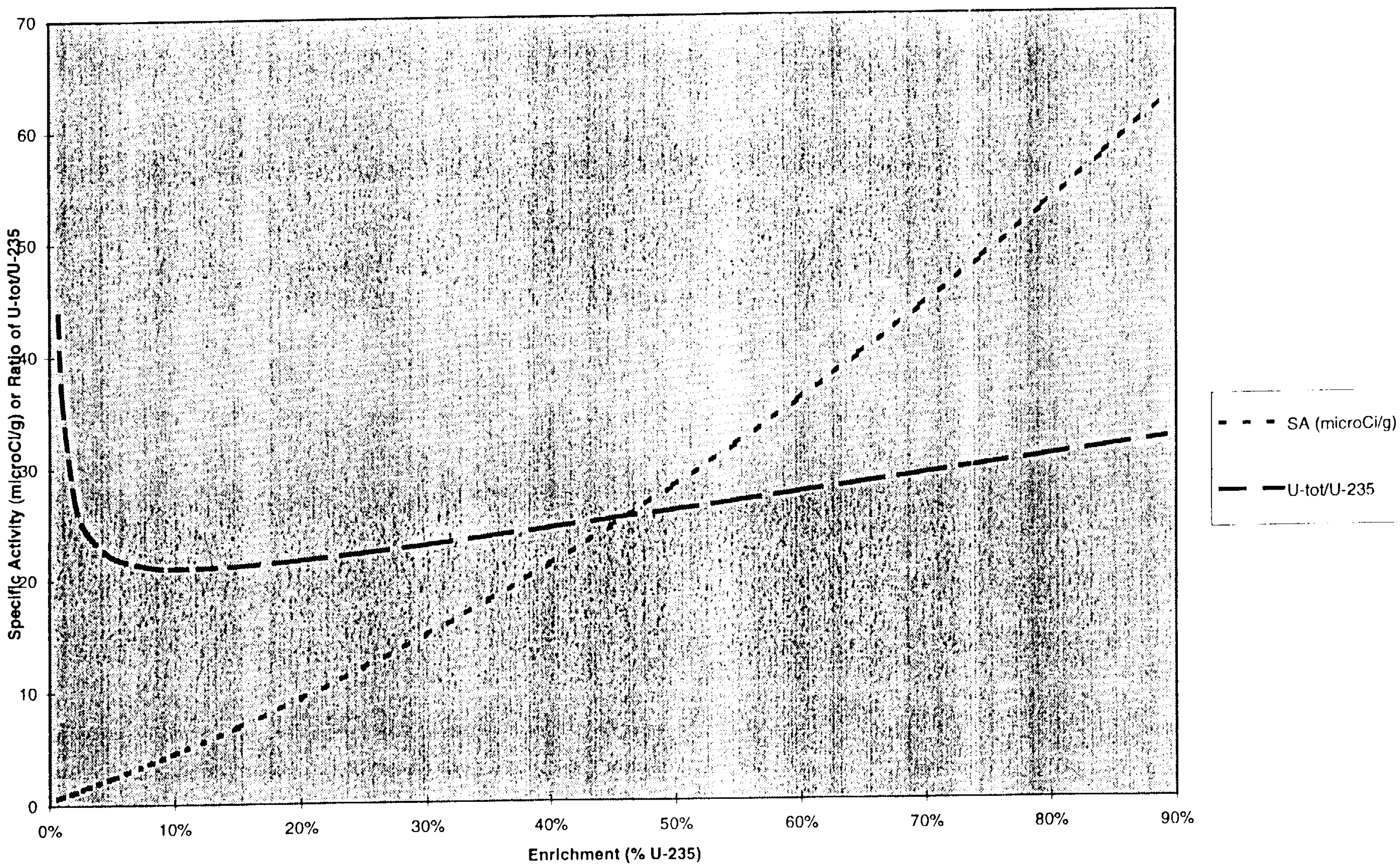
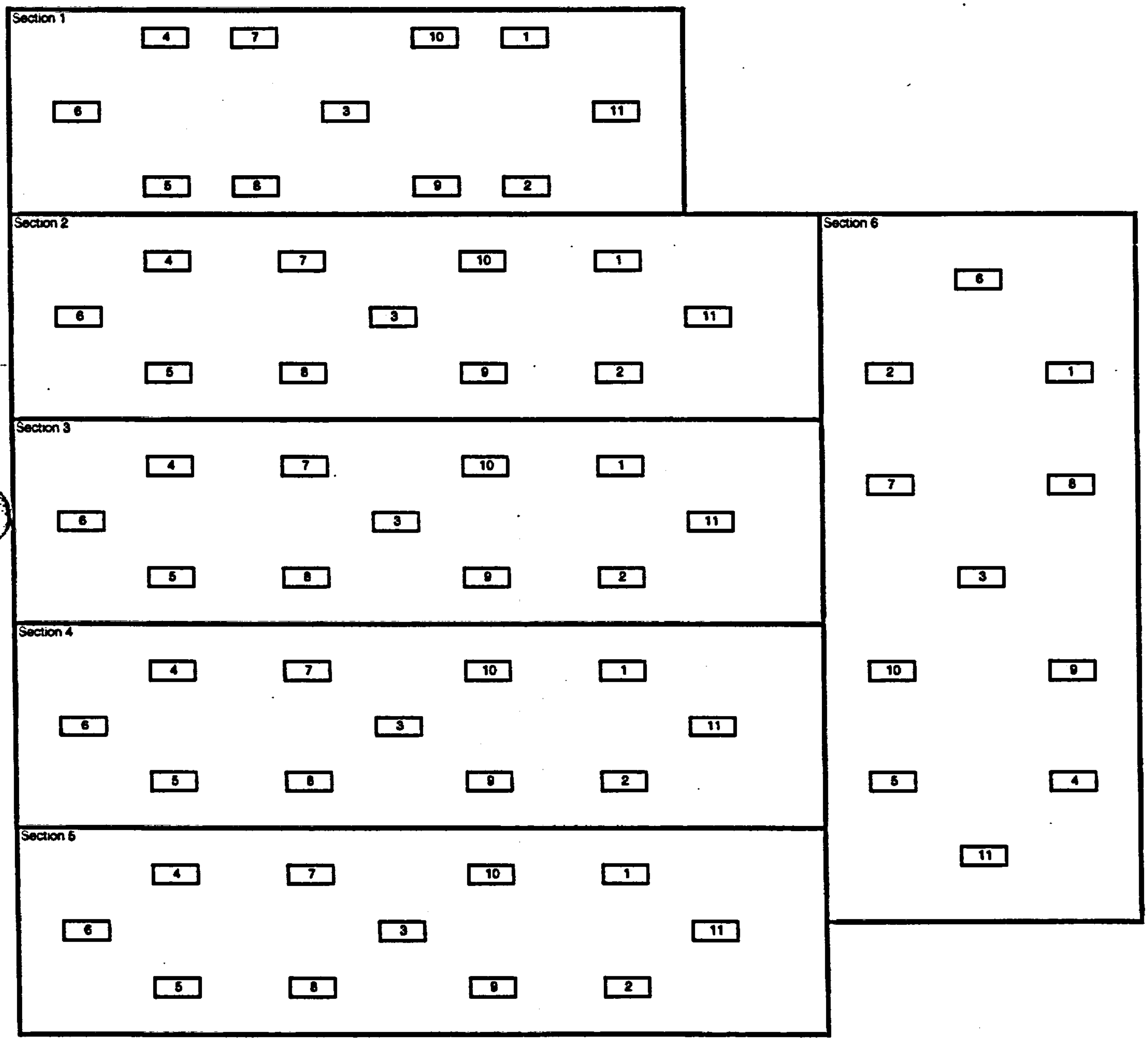


FIGURE 2
Sampling Pattern for Soil Pile



Notes:

1. This figure is not to scale
2. Samples 1 to 5 were taken in the first set.
3. Samples 6 to 11 were taken in the second set.

Figure 3
Distribution Frequency for U-235 Measurements

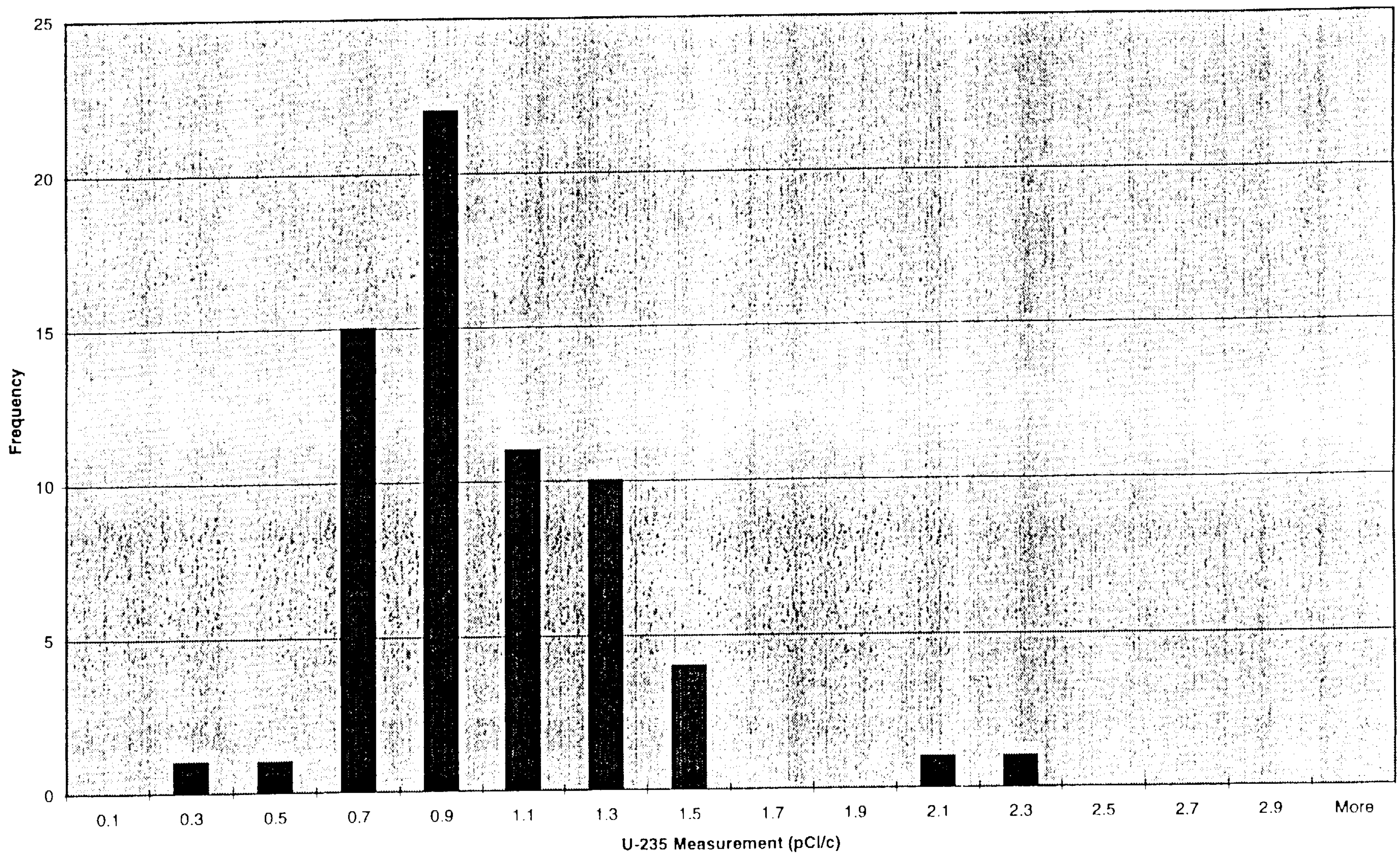
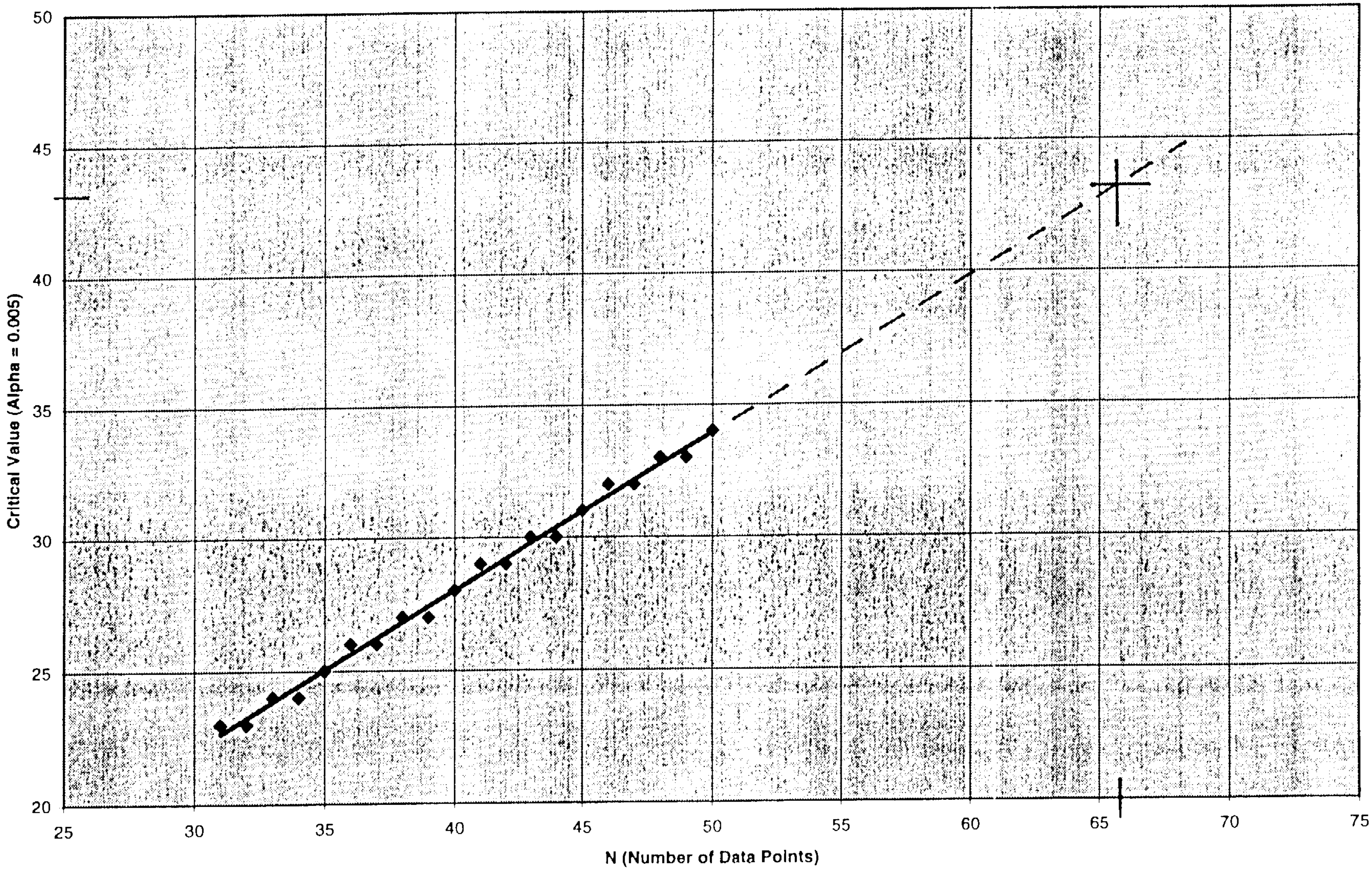


FIGURE 4

Critical Value for Sign Test Statistic S+



APPENDIX E

SUMMARY OF FINDINGS FROM CUMMINGS/RITER INVESTIGATION CONDUCTED FROM 1994 TO 1996

SUMMARIES OF FINDINGS
FROM CUMMINGS/RITER INVESTIGATION CONDUCTED FROM 1994 TO 1996

DATA SUMMARY REPORT
SITE INVESTIGATION (PHASE I)
May 1995

The objective of this site investigation was to evaluate the nature and extent of COI in soils in the vicinity of potential source areas, shallow groundwater, surface water and sediment, and obtain an understanding of the shallow hydrogeologic regime at the Specialty Metals Plant.

The findings are summarized as follows:

- Unconsolidated deposits consisting of fill material, terrace deposits, and residual soil are present immediately beneath the Specialty Metals Plant. The unconsolidated deposits range from 5 feet to greater than 27 feet in thickness.

- The uppermost bedrock beneath the Specialty Metals Plant consists of brown to gray, fine-to-medium grained sandstone with gray shale interbeds. This unit corresponds to the Saltsburg Sandstone unit.

- The uppermost groundwater-bearing unit beneath the Specialty Metals Plant was encountered at depths ranging from 7 to 20 feet below ground surface and was associated with the unconsolidated deposits and the upper weathered bedrock.

- Groundwater flow within the uppermost groundwater-bearing unit tends to mimic surface topography, with flow from west to east across the site. The average hydraulic gradient on November 10, 1994 was approximately 0.02 ft/ft.

- Based on the one-time monitoring event conducted on November 10, 1994, the pond located south of the Specialty Metals Plant appears to act as a recharge point for the local shallow groundwater unit. In addition, the groundwater levels indicate a potential for shallow groundwater discharge to surface water drainage features near the Industrial Waste Treatment Plant. This relationship may be reversed, with surface water drainage into the shallow groundwater unit, further east along the drainage course.

- Slightly elevated (20 percent above background) field radiological readings were reported in two areas north of the railroad tracks: one in a shallow depression or impoundment, the other along a path leading to a natural gas well location.

- Field radiological readings twice background were detected in a field to the west of the north end of the Westro Building, primarily 150 to 200 feet west of the building.

- Field radiological readings 10 to 15 times background were reported in a mound adjacent to the main guard station, north of the visitors parking lot.

- Soil analytical results for pesticides, herbicides, and PCBs were below method detection limits for all soil samples tested.

- Soil samples exceeded the PADER interim criteria for two parameters; trichloroethene in Sample B-1, S-5, adjacent to the former 15,000 gallon above ground trichloroethene/1,1,1-Trichloroethane storage tank, and nickel in Samples B-39, S-5 and B-40, S-5, located in the fill area identified northeast of the Specialty Metals Plant.

- Soil radiological results indicate areas of the site exceed background and require additional delineation.

- Soil radiochemistry results for the surface and near-surface samples collected in the former zircaloy burn area indicate that some soil exceeds the release criteria of 30 pCi/g for uranium in soil. This area will require additional delineation.

- Soil radiochemistry results for the soil boring samples collected in the fill area northeast of the facility indicate radiological results that exceed background. This area will require additional delineation.

- VOCs cis-1,2-dichloroethene, trichloroethene, vinyl chloride, and methylene chloride were detected in sediments at sample locations SD-1, SD-2 and SD-3.

- Surface water Samples SW-1 and SW-2 collected from drainage channels located downstream from the Specialty Metals Plant contained concentrations of trichloroethene (7.5 µg/l and 50 µg/l, respectively). These constituents were not present in previously obtained upstream samples.

- Groundwater sampled from shallow site monitoring wells exceeded the Pennsylvania MCLs for pH, total iron, total manganese and gross alpha for both the upgradient and downgradient monitoring wells, indicating these levels represent background groundwater quality.

- The active groundwater drain (GW-1) near the existing sludge drying beds contained concentrations of trichloroethene at 150 µg/l. Monitoring Well MW-2 located downgradient of the sludge drying beds also contained concentrations of fluoride (2.7 mg/l) and trichloroethene (12 µg/l) above the MCLs.

- Groundwater samples from Well MW-3, located south of the Westro Building, exceeded MCLs for 1,1-dichloroethene (1500 µg/l) and vinyl chloride (220 µg/l).

- Groundwater samples from Well MW-9A, located 75 feet southeast (downgradient) of the Industrial Waste Treatment Plant Building, exceeded MCLs for total chromium (0.052 mg/l), total mercury (0.0027 mg/l), 1,1-dichloroethene (20 µg/l), trichloroethene (22,000 µg/l) and vinyl chloride (49 µg/l).

Respectfully submitted,
Cummings/Riter Consultants, Inc.

William A. Baughman, P.G.
Project Manager

Patrick F. O'Hara, P.E.
President

WAB/PFO/jmc

SUMMARIES OF FINDINGS FROM CUMMINGS/RITER INVESTIGATION CONDUCTED FROM 1994 TO 1996

DATA SUMMARY REPORT PHASE II INVESTIGATION December 15, 1995

The objectives of this site investigation were to evaluate the nature and extent of COI in shallow and deep groundwater, in soils in the northeast fill area, and in four areas identified by Westinghouse where radiological readings exceeded background levels, and to obtain an understanding of the shallow and deep hydrogeologic regime and the surface water/groundwater relationship at the Specialty Metals Plant.

The Phase II FSP findings are summarized as follows:

- Unconsolidated deposits consisting of fill material, terrace deposits and residual soil are present immediately beneath the Specialty Metals Plant. The unconsolidated deposits range from approximately 8.0 to 69.0 feet in thickness.

- The bedrock underlying the Specialty Metals Plant consists predominately of tan, gray and brown, fine to medium-grained sandstone interbedded at depths with shale, sandy shale, gray, black and red-brown shale, and coal seams. The uppermost unit corresponds to the Saltsburg Sandstone Member of the Conemaugh Group.

- The attitude of the bedrock units underlying the Specialty Metals Plant strike north 45° east and dip to the northwest at an approximate rate of 2.8°.

- The uppermost groundwater-bearing unit beneath the Specialty Metals Plant is associated with the unconsolidated deposits and upper weathered bedrock.

- Groundwater flow within the uppermost groundwater-bearing unit tends to mimic surface topography, with flow from west to east across the site. The average horizontal hydraulic gradient on September 18, 1995 was 0.02 ft/ft.

- Transmissivity of the shallow aquifer was estimated as 573.9 gpd/ft with a hydraulic conductivity of 47.8 gpd/ft^2 from the constant rate aquifer test.

- The Aquifer pump test results indicate that shallow groundwater recovery wells may be effective for source removal. However, their effectiveness for hydraulic control will be limited.

- Based upon the aquifer pump test results, groundwater associated with the unconsolidated deposits/weathered bedrock unit is considered to be an aquifer under the PADEP Pennsylvania Land Recycling Act 2 (1995) due to an estimated yield from a spring or a well in the amount of greater than 200 gallons per day, year round.

- Based on the bimonthly water level measurements for a three-month period, the pond located south of the Specialty Metals Plant appears to act as a recharge point for the local shallow groundwater unit. In addition, based on water level data in the shallow and deep companion wells, a downward vertical hydraulic vertical gradient exists indicating that the shallow aquifer associated with the unconsolidated deposits provides recharge to the underlying bedrock aquifer.

- Groundwater sampled from shallow site monitoring wells had reported levels of aluminum, manganese, and sodium for both the upgradient and downgradient monitoring wells that exceeded the PADEP criteria (1995). These levels appear to represent background groundwater quality.

- Samples from the active groundwater drain (GW-1) near the existing sludge drying beds contained trichloroethene at 190 µg/l. Samples from Monitoring Well MW-2 located downgradient of the sludge drying beds also contained fluoride (5.11 mg/l), nitrate (12.1 mg/l) and trichloroethene (26 µg/l) and 1,2-dichloroethene (total) (620 µg/l).

- Groundwater samples collected from shallow wells located south of the Westro Building near the location for the former 1,1,1-trichloroethane/trichloroethene above ground storage tank and "Triclene Pit" contained chlorinated aliphatic hydrocarbons above the PA Standards (1995).

- Groundwater samples collected from shallow Well MW-9A, located 75 feet southeast (downgradient) of the Industrial Waste Treatment Plant Building, exceeded the PA Standards (1995) for trichloroethene (12,000 µg/l) and 1,2-dichloroethene (total) (620 µg/l).

- Groundwater occurs in the bedrock with circulation occurring predominately through secondary porosity in the form of fractures and bedding plane partings in the sandstone, shale, and coal units.

- Groundwater flow within the bedrock flows northeast across the site towards the Conemaugh River. The average horizontal hydraulic gradient on September 18, 1995 was 0.03 ft/ft.

- Groundwater sampled from site monitoring wells screened in the Saltsburg Sandstone had elevated levels of manganese and sodium for both upgradient and downgradient monitoring wells that exceeded the PADEP criteria (1995). These levels appear to represent background groundwater quality.

- Groundwater samples from Well MW-15, located within the Saltsburg Sandstone Formation northeast of the fill disposal area (downgradient), exceeded the PA Standards for trichloroethene (1,100 μg/l).

- Areas where groundwater in both unconsolidated deposits and bedrock exceed interim the PADEP criteria for site related contaminants have been identified. The extent of shallow groundwater impacted by VOCs south of the Westro Building is defined. The extent of VOCs in the bedrock aquifer has not been defined. However, the bedrock units monitored at the site subcrop east of the Specialty Metals Plant, and are bounded by the site physical setting.

- Radiological surveys of three previously identified areas on the site (Areas 1, 2, and 3) established that the above background radiation readings were due to variations in naturally occurring radioactive materials.

- Various surveys (radiological, trenching, and magnetometer) of Area 4, the former Zircaloy burn area, identified subsurface anomalies. Near surface deposits of various rubble were found, some of which exhibit above background radiological readings. There are indications of the possible presence of subsurface metals unrelated to known site features.

- Radiological analysis of soil samples taken from the northeast fill area combined with borehole logging results and downhole NaI Spectral results, indicate variations in radiation levels due to naturally occurring radioactive materials. Soil sample S-5 from Borehole B-48 and the associated borehole logging at a depth of about 8 to 11 feet bgs identified the presence of a deposit of sand which exhibits radiation levels that indicate the probable presence of naturally occurring uranium and thorium.

- Soil samples collected from the northeast fill area exceeded interim the PADEP criteria for nickel in samples B-45, S-3 and S-7; B-47, S-5 and S-9; B-48, S-5 and S-9; and B-49, S-3. As described in the Data Summary Report (Cummings/Riter, 1995a) the other soil samples were generally found not to exceed the PADEP interim criteria (1993) for any other substances.

Please note that the PADEP is expected to publish additional information on soil cleanup criteria in December 1995 as part of an update of the PADEP's Technical Manual for Act 2, 1995 of the Pennsylvania Legislature.

Based upon the summary of findings described herein, the following remedial objectives are hereby suggested:

- Groundwater extraction with subsequent treatment should be considered for the shallow groundwater impacted by VOCs south of the Westro Building. The remedial objective is to reduce and control VOCs in this area as a potential source.

- Although groundwater associated with bedrock was not found to be impacted over most of the site area; the occurrence of VOCs in a shallow bedrock aquifer (the Saltsburg Sandstone) east of the Specialty Metals Plant near the facility property line should be further evaluated. The remedial objective is to further evaluate the extent and migration potential of these substances in the Saltsburg Sandstone.

As stated in Section 7.0, elevated levels of non-radiological contaminants have not been identified in a significant number of soil samples. Soil remediation for non-radiological parameters does not appear to be necessary. The occurrence of radiological substances in soils continues to be investigated by Westinghouse. It is recommended that these actions be discussed with representatives of the PADEP. A remedial design work plan and schedule would then be submitted to the PADEP for review and comment prior to implementation.

Respectfully submitted,
Cummings/Riter Consultants, Inc.

Patrick F. O'Hara, P.E.
President

William A. Baughman, P.G.
Project Manager

PFO/jmc

ADDENDUM
DATA SUMMARY REPORT- PHASE II INVESTIGATION
December 30, 1996

The objectives of the Phase II groundwater assessment were to identify the source area for VOCs identified in groundwater in the vicinity of the Industrial Waste Treatment Plant, and to further assess the extent of VOCs in groundwater in the downgradient (east) direction. In addition, an evaluation of a former lagoon area was completed.

The findings of this assessment are summarized as follows:

- Unconsolidated deposits consisting of fill material, terrace deposits and residual soil are present immediately beneath the Specialty Metals Plant. The bedrock underlying the unconsolidated deposits at the Specialty Metals Plant consists predominately of tan, gray and brown, fine to medium-grained sandstone interbedded at depths with shale, argillaceous sandstone, and coal seams. The uppermost unit corresponds to the Saltsburg Sandstone Member of the Conemaugh Group.

- Groundwater flow within the uppermost unconsolidated deposits tends to mimic surface topography, with flow from west to east across the site. The average horizontal hydraulic gradient on September 27, 1996 was 0.01 ft/ft. This groundwater-bearing unit is unsaturated along the eastern limits of the Specialty Metals Plant.

- Groundwater flow within the Saltsburg Sandstone unit tends to flow northeast towards the Conemaugh River. The average horizontal hydraulic gradient on September 27, 1996 was 0.03 ft/ft. The bedrock aquifer is recharged by groundwater associated with the overlying unconsolidated deposits, where saturated.

- The results for groundwater sampling and analysis identify areas where VOC and inorganic concentrations exceed PADEP proposed human health standards for non-residential groundwater. The extent of VOCs in groundwater east of the Specialty Metals Plant has been further defined by the analytical results for groundwater samples collected from Wells MW-20, MW-21, MW-22 and the seep locations (Seep Nos. SP-1, SP-2, and SP-3).

- The TAL metal results for groundwater samples collected during this investigation and the previous Phase II upgradient groundwater monitoring results (Cummings/Riter, 1995) indicate that TAL metal concentrations above PADEP proposed standards represent background groundwater quality.

- The results for this groundwater investigation, combined with the previous Phase II investigation results identify the presence of three separate source areas for VOCs in groundwater at the Specialty Metals Plant, identified as follows:
  - South of the Westro Building at Monitoring Well MW-12A;
  - South of the Industrial Waste Treatment Plant at Monitoring Well MW-19A; and
  - The Northeast Fill area at Monitoring Well MW-15.

- The VOC results for monitoring wells previously sampled (MW-2, MW-9A, MW-12A and MW-15) were consistently lower for this event than the VOC concentrations reported in September 1995 (Cummings/Riter, 1995).

- Residual soil concentrations at the Industrial Waste Treatment Plant area and the Northeast Fill area were not found to be elevated, and do not represent a substantial source of VOCs. One soil sample from the area south of the Westro Building located in the vicinity of the former 15,000 gallon above ground TCE/1,1,1-TCA storage tank exceeded the PADEP proposed cleanup standards for TCE.

- Passive soil gas samples collected east of the Northeast Fill area reported VOC concentrations (trichloroethene, 1,1,1-trichloroethane, cis-1,2-dichloroethene and trans-1,2-dichloroethene) above the method detection limit in an area between the Northeast Fill area and Seep No. SP-1.

- The former lagoon area does not contain "waste-like" materials (i.e. sludge), but does contain debris (i.e., metal, wire, and concrete slabs).

- Small quantities of processed uranium were identified directly associated with the surface of a small percentage of the debris encountered in the former lagoon area. These specific results, however, are not representative of the average concentrations present.

In general, the radiation levels observed were consistent with normal background levels. No further investigation of the former lagoon area is warranted.

- The groundwater radiological analyses are generally consistent with what would be expected for naturally occurring uranium and radium. A few specific analysis results are not consistent either with prior analysis or with other radiological results for the same sample.

- The gamma spectrum results for the groundwater seep sample collected at Location SP-3 indicates that this area is being influenced by the presence of other materials present at the base of the fill area. Since this area is currently under remediation, further samples should be collected for radiological analysis from this location after completion of the remediation.

APPENDIX F

QUALITY ASSURANCE PROJECT PLAN

CONTROLLED COPY NO. _______

QUALITY ASSURANCE PROJECT PLAN FOR THE CHARACTERIZATION/REMEDIATION OF THE FORMER ZIRCALOY BURN AREA WESTINGHOUSE SPECIALTY METALS PLANT SITE BLAIRSVILLE, PENNSYLVANIA

Revision 0, June 2000

— B. Koh & Associates, Inc. —
11 West Main Street
Springville, NY 14141

QUALITY ASSURANCE PROJECT PLAN FOR THE CHARACTERIZATION/REMEDIATION OF THE FORMER ZIRCALOY BURN AREA WESTINGHOUSE SPECIALTY METALS PLANT SITE BLAIRSVILLE, PENNSYLVANIA

Revision 0, June 2000

Approved:

Coordinator of Quality Assurance

Approved:

Westinghouse Program Manager

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INTRODUCTION

This Quality Assurance Project Plan (QAPP) is to be utilized in conjunction with the Site Remediation Plan *(B. Koh & Associates, Inc., April 2000)* and the Radiological Control Plan *(B. Koh & Associates, Inc., March 2000)* for the remediation of the Westinghouse Specialty Metals Plant Site (WSMPS). This QAPP presents the policies, organization, objectives, functional activities and specific quality assurance (QA) and quality control (QC) activities to ensure the validity of data generated in the conduct of the site characterization, remediation and final radiological survey activities. The purpose of the program is to ensure that all technical data generated are precise, accurate, representative, complete, comparable, and will ultimately withstand regulatory agency scrutiny.

Quality assurance comprises those planned and systematic actions necessary to provide adequate confidence that a structure, system or component will perform satisfactorily in service. Specifically, QA consists of overview checking to verify that the technical and quality control procedures have been properly implemented to produce accurate data. The objective of a QAPP for site characterization, site remediation, and final site radiological survey is to ensure confidence in the sampling, analysis, interpretation and use of data generated for this purpose on a cost effective basis.

Quality control consists of a system of checks on field sampling and laboratory analysis (through the use of field blanks, duplicates, documentation of all sample movement, chain-of-custody records, etc.) to provide supporting information on the quality of the methods employed and on the data generated. All technical and QA/QC procedures will be in accordance with applicable professional technical standards, government regulations and guidelines, and specific project goals and requirements. This QAPP is prepared consistent with USNRC Draft NUREG/CR-5849, USEPA QAMS 005-80 and ANSI/ASME NQA-1 1989.

This QAPP incorporates the following principle activities:

- Survey, sampling and statistical design.
- Sample collection, control, chain-of-custody and analysis.
- Document control and records management.
- Audit, review and surveillance of project activities.
- Review of project reports, plans, procedures, and other documents.

Radiological samples will be collected in the field in accordance with approved technical field procedures and sent to a qualified laboratory for analysis. Analyses of the samples will be conducted in accordance with documented and approved laboratory procedures and an approved Quality Assurance Plan.

Field surveillances will be conducted, if deemed necessary, to verify that proper sampling techniques and chain-of-custody procedures are followed. Field data compilation, tabulation, and analysis will be checked for accuracy. Calculations and other post-field tasks will be reviewed by senior project personnel who are independent of actual field work.

Instrumentation and equipment used to take field measurements will be maintained and calibrated in accordance with established procedures. Records of calibration and maintenance will be kept by assigned personnel. Field testing and data acquisition will be performed following strict guidelines, as described herein.

Document control, review and management procedures will be used to coordinate the distribution, identification and labeling, storage, retrieval, and review of all data collected during all sampling tasks.

Audits, surveillances and reviews of field and laboratory activities will be performed to assure such activities are in compliance with the technical and quality requirements established for this project.

1.0 PROJECT DESCRIPTION

The WSMPS project involves the characterization/remediation and final survey of the Former Zircaloy Burn (FZB) Area located in Blairsville, Pennsylvania. Site characterization and remediation of the site will be carried out under the responsibility of Westinghouse.

1.1 Project Overview

During the period from approximately 1955 to 1961, fuel manufacturing operations were conducted at the WSMPS facility using enriched uranium in both metal and oxide forms. This involved both highly enriched uranium for the Navy fuel program (under work for the Bettis Atomic Power Laboratory) and low enriched uranium for atomic power plants (under License SNM-37 from the U.S. Atomic Energy Commission). AEC license SUC-509 authorized Westinghouse to perform research and development for fuel elements using depleted uranium at the Blairsville facility. This license was terminated on December 31, 1964. As part of a Nuclear Regulatory Commission (NRC) program to ensure that AEC and NRC licenses that have been terminated meet the NRC's current criteria for release for unrestricted use, the Blairsville site was determined to require additional review.

Beginning in 1993, Westinghouse personnel performed preliminary screening measurements in areas of the facility where licensed material had been handled. Several interior and exterior areas have since been characterized and remediated.

Records indicate that the radioactive wastes were processed and packaged in the area known as the FZB Area (or Cow Palace) of the Blairsville site in addition to other potential areas. The investigation into the FZB Area was initiated in 1995. Several reports included data from the initial investigations. The results of the initial investigations did not indicate the presence of significant radioactive contamination.

During remediation activity to remove an underground pipe and sumps in the FZB Area conducted in June 1998, evidence of more significant radioactive contamination of the area was identified. Subsequent investigation and characterization has identified a variety of uranium contamination, including low enriched, high enriched, depleted uranium, and processed unenriched uranium.

1.2 General Objectives

Westinghouse has identified the following objectives to completing the project:

- Conduct a detailed assessment of the radiological condition of the FZB Area
- Conduct appropriate remedial actions
- Conduct a final radiological survey of the FZB Area
- Prepare the documentation necessary to complete the project and release the FZB Area for unrestricted use

1.2.1 General Data Quality Objectives

A Remediation Plan *(B. Koh & Associates, Inc., April 2000)* has been prepared to provide quality data for use in the documentation of site radiological characteristics (see Section 1.3). Data collected during site activities will be used for: (1) evaluation of the qualitative and quantitative measurement and extent of site contaminants; (2) preparation of remedial and decontamination actions; and (3) establishment of information base to support final termination surveys of the site.

The data from air, surface samples, soil, etc., will be compared, as applicable, to established state and federal guidelines. Background values will be compared to site values and statistical analysis applied to the data where appropriate.

In all cases, after validation, analytical data will be examined to determine if the residual uranium remaining on the WSMPS poses any significant impacts to the environment and potential receptors.

1.3 Program Overview

The Remediation Plan *(B. Koh & Associates, Inc., April 2000)* is comprised of the following major activities:

(1) Survey and sampling activities.

(2) Decontamination/remediation activities.

(3) Data management and analysis.

(4) Comparison of data with established release limits.

(5) Reports and deliverables.

The site characterization surveys, remediation and final radiological survey and sampling methodologies presented in the remediation plan conform to the regulations and guidelines set forth in the following documents to the extent they are applicable to this type of activity.

- Draft NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination *(NRC, June 1992)*.

- NRC Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product, Source or Special Nuclear Material, August 1987.

- Code of Federal Regulations, Title 10, Part 20, Standards for Protection Against Radiation.

- EPA Test Methods for Evaluating Solid Wastes, Third Edition, November 1986 (SW-846).

- EPA Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, December 1980 (QAMS 005/80).

- American Society of Mechanical Engineers (ASME/NQA-1, 1989), Quality Assurance Program Requirements for Nuclear Facilities.

- WSMPS Radiological Control Plan *(B. Koh & Associates, Inc., March, 2000).*
- WSMPS Remediation Plan and Addendum (B. Koh & Associates, Inc., April, 2000)

1.4 Project Organization and Responsibilities

The characterization/remediation activities at the FZB Area and surroundings at the WSMPS will be performed by a team composed of qualified and experienced personnel. The WSMPS Remediation Project Organization is shown in Figure 1-1.

This organizational structure results in the use of established safety, quality assurance and administrative systems, plans, procedures, and qualified and experienced personnel to effectively manage the remediation operations in a manner that protects the health and safety of the workers, the general public, and the environment. This organizational structure also ensures the independence of the safety and quality assurance related functions for the project. Furthermore, this organizational structure ensures that the established remediation project objectives will be met.

1.4.1 Key Westinghouse Specialty Metals Remediation Project Plant Roles, Responsibilities and Authority

Key positions are filled by those individuals that are responsible for assuring the safe and expedient characterization and/or remediation of the WSMPS. Key positions for the WSMPS Remediation Project are described below.

1.4.1.1 Westinghouse Organization

1.4.1.1.1 Program Manager

The WSMPS Program Manager (PGM) has overall responsibility and authority for the planning and management of characterization and remediation activities. The PGM is responsible for ensuring that the WSMPS project activities meet the established environmental health and safety and quality assurance requirements, technical performance, and budgeting and scheduling criteria.

1.4.1.1.2 Remediation Project Review Committee

The WSMPS Remediation Project Review Committee (PRC) has overall responsibility and authority to exercise management controls necessary to assure safe implementation of the site characterization and/or remediation activities, including matters related to health and safety, licensing, quality assurance and regulation. The committee will consist of a minimum of three people. The membership includes persons with experience in areas such as management, radiological protection, industrial hygiene, safety or quality assurance. The membership of the PRC is appointed by the PGM. The PRC reports directly to the PGM. All members of the committee have the authority and responsibility to issue stop work orders for any matters involving health and safety.

The PRC holds meetings on at least a monthly basis to review project operations. The responsibility of the committee includes:

- Review and approval of Radiation Control Plan and Procedures.
- Review and approval of work plans and procedures.
- Review and approval of QA Plan.
- Assuring implementation of the Radiation Control Plan, Remediation Plan and QA Plan.
- Conducting reviews of project activities.

The PRC will work together with the WPM, Contractor Project Manager (CPM) and the Project Radiation Safety Officer (PRSO) to ensure that all health and safety protection measures and controls, including radiological protection, are carried out.

1.4.1.1.3 Project Manager

The WSMPS Project Manager (WPM) has overall responsibility and authority to exercise management controls necessary to assure safe implementation of the site characterization and/or remediation activities, including matters related to health and safety, licensing, quality assurance and regulation. This responsibility and authority includes implementation of the Radiological Control Plan, Remediation Plan and QA Plan. The PM reports directly to the PGM. The PM will work together with the Contractor Project Manager (CPM) and the Project Radiation Safety Officer (PRSO) to ensure that all radiological protection and control measures are carried out.

Additionally, the WPM will review and approve all radiation control plans and procedures, work plans and procedures, and QA plans that are developed for the project activities.

1.4.1.2 Contractor Organization

1.4.1.2.1 Project Manager

The Contractor Project Manager (CPM) is responsible for managing contractor personnel and other resources necessary to carry out the specific characterization/remediation project or activity. The CPM will work closely with the PRSO to ensure work being conducted by contractor personnel is in accordance with the requirements specified in the Health and Safety Plan, Radiological Control Plan and related procedures and QA Plan. The CPM reports directly to the WPM.

1.4.1.2.2 Quality Assurance Coordinator (Optional)

The Contractor Quality Assurance Coordinator (QAC) reports to the Program Manager for administrative activities and for quality assurance guidance. The QAC communicates and coordinates directly with the CPM on project-related matters. The QAC has the delegated responsibility and authority to direct and control QA functions to assure that the QA objectives are met as specified in the site specific Quality Assurance Project Plan (QAPP).

The QAC is responsible for the coordination, integration, and overview of project QA activities and for ensuring that the appropriate quality management, policy, training, and verification controls are present.

The QAC is responsible for QA audits and surveillances, for prompt correction of conditions which could adversely affect quality, and for providing documented evidence that the required quality levels have been maintained in all remediation work activities.

1.4.1.2.3 Project Radiation Safety Officer

The Contractor Project Radiation Safety Officer (PRSO) is responsible for developing and implementing policies and procedures in accordance with NRC Regulations (Title 10 CFR Parts 19 and 20) and any other applicable requirements/regulations. The PRSO reports directly to the CPM. The PRSO has direct recourse to the PGM to prevent unsafe practices or to halt an operation which is deemed radiologically unsafe. The PRSO is also responsible to oversee and control the day-to-day radiation protection activities in accordance with the requirements contained in the Radiological Control Plan.

Specific duties of the PRSO may include, but are not limited to, the following:

(1) Provide training to project personnel.

(2) Verify that site personnel receive (or have received) appropriate radiological training.

(3) Verify implementation of the Radiological Control Program, including ALARA.

(4) Provide technical expertise to on-site radiation safety personnel.

(5) Conduct periodic radiation safety audits at the site.

(6) Interface between site radiation safety personnel and site management.

(7) Review surveys conducted during and after the site activities.

(8) Implement additional health and safety requirements as directed by the PM.

(9) Develop and implement radiation control procedures specific to the project.

Qualifications of the Project Radiation Safety Officer are:

(1) A Bachelors of Science degree in Engineering or Science.

(2) A minimum of 5 years of applied radiation protection experience.

(3) Previous training consistent with Regulatory Guide 10.4, Item 7, Topics.

The PRSO will also serve as the Environmental Safety and Health Coordinator (ES&HC). The ES&HC is responsible for the industrial and environmental safety functions during characterization and/or remediation activities. The ES&HC is responsible for ensuring implementation measures provide safe and healthy work conditions, for maintaining radiation exposures as low as reasonably achievable, and for minimizing release of radioactivity and chemicals to the environment. This is accomplished through the review of work plans, instructions, procedures, monitoring and surveillance, training, and investigation and evaluation of routine monitoring data and unusual events.

1.4.1.2.4 Environmental Safety and Health Coordinator

The Environmental Safety and Health Coordinator (ES&HC) is responsible for the industrial and environmental safety function during characterization and remediation activities. The ES&HC is responsible for ensuring implementation measures that provide safe and healthy work conditions, for maintaining radiation exposures as low as reasonably achievable, and for minimizing release of radioactivity and chemicals to the environment. This is accomplished through the review of work plans, instructions, procedures, monitoring and surveillance, training, and investigation and evaluation of routine monitoring data and unusual events. The ES&HC reports to the Project Manager (CPM). The PRSO will also serve as the ES&HC.

1.4.1.2.5 Laboratory Manager (Optional)

The Contractor Laboratory Manager (LM) reports to the CPM. The LM is responsible for managing the laboratory activities for in-house and onsite laboratories and for the subcontractor laboratory services. The LM is responsible for ensuring that the chemical and radiological sampling and analyses for the characterization and/or remediation activities are performed in accordance with approved procedures and Quality Assurance programs. The LM is also responsible for ensuring that the laboratory data is compiled, validated, and appropriate evaluation and comparisons to establish limits performed.

1.4.1.2.6 Field Operations Supervisor

The Contractor Field Operations Supervisor (FOS) reports directly to the CPM. The FOS is responsible for ensuring that characterization and/or remediation activities are being performed in accordance with plans, procedures, and design requirements established for the remediation project.

1.4.2 Minimum Qualifications for Key Positions

1.4.2.1 Westinghouse

1.4.2.1.1 Program Manager

The Program Manager must possess a BS degree in engineering or science and have a minimum of 10 years nuclear experience. Five years of this experience should involve management of nuclear projects.

1.4.2.1.2 Project Manager

The Project Manager must possess a BS degree in engineering or science and have a minimum of 10 years of nuclear experience, including five years of broad management experience.

1.4.2.2 Contractor

1.4.2.2.1 Coordinator of Quality Assurance (Optional)

The Coordinator of Quality Assurance must possess a BS degree in science or engineering and have a minimum of two years experience in quality assurance, or quality control related activities.

1.4.2.2.2 Radiation Safety Officer

Qualifications of the Project Radiation Safety Officer are:

(1) A Bachelors of Science degree in Engineering or Science.

(2) A minimum of 5 years of applied radiation protection experience.

(3) Previous training consistent with Regulatory Guide 10.4, Item 7, Topics.

1.4.2.2.3 Environmental Safety and Health Coordinator

The Environmental Safety and Health Coordinator must possess a BS degree in science or engineering and have two years experience in the nuclear field or a high school diploma with at least five years experience in the nuclear field and at least 2 years in the environmental safety and health area.

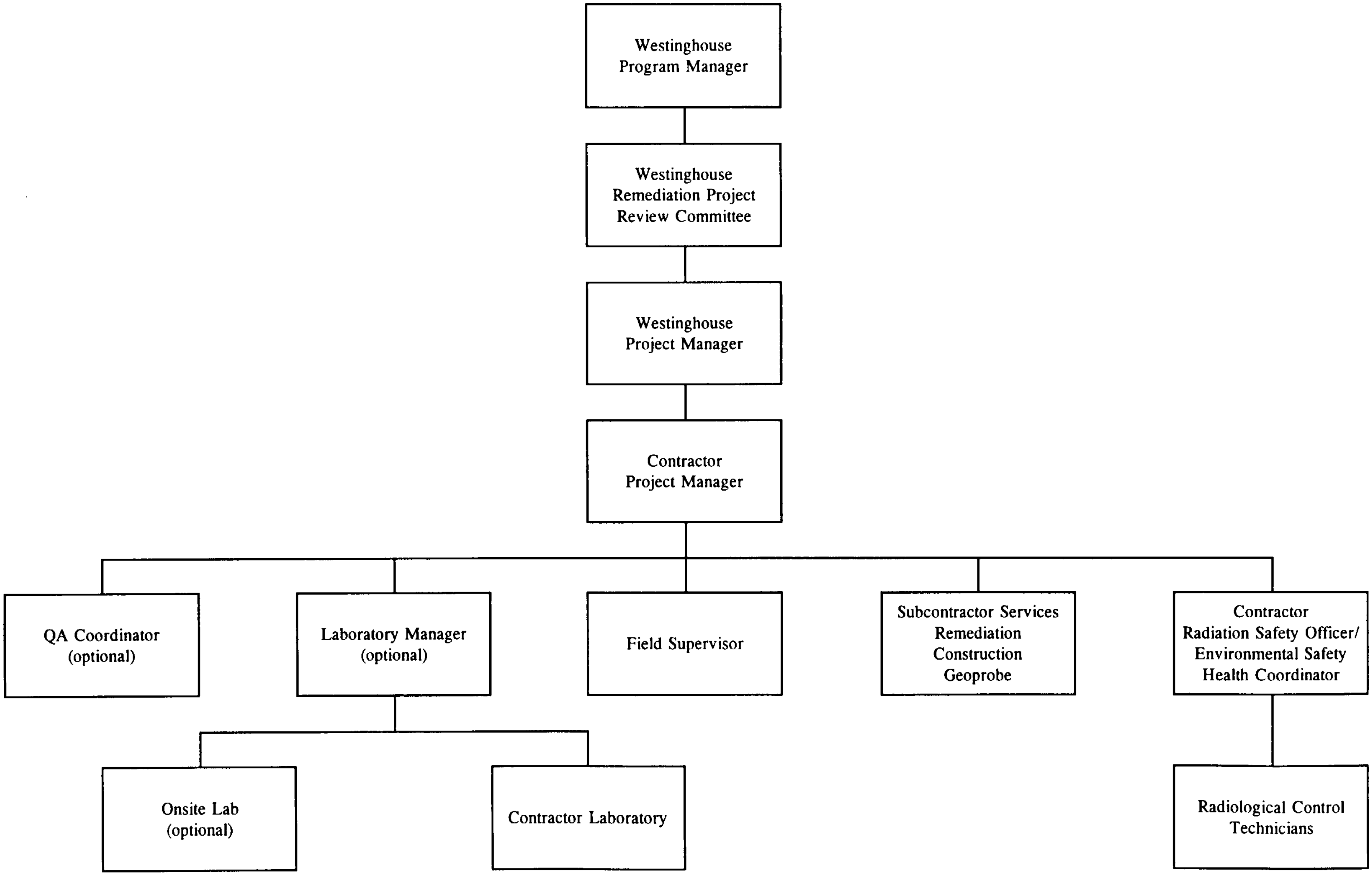
1.4.2.2.4 Laboratory Manager (Optional)

The Laboratory Manager must possess a BS degree in science or engineering and have five years experience in nuclear related operations or remediation activities. Three of these years should be in laboratory analysis.

1.4.2.2.5 Field Operations Supervisor

The Field Operations Supervisor must possess a BS degree in science or engineering and have five years experience in supervision of field activities, such as decontamination and decommissioning, remediation, site characterization, or a high school diploma and ten years experience in supervising such activities.

FIGURE 1-1
ORGANIZATION CHART FOR WSMP PROJECT ACTIVITIES



2.0 QUALITY ASSURANCE PROGRAM

2.1 QA Project Plan Description

It is WSMPS policy to establish appropriate QA program controls for all work related to remediation and final radiological survey activities at the WSMPS. This QAPP has been developed to address project personnel responsibilities and activities in support of the characterization and remediation of the FZB Area and surroundings. The plans and procedures identified in this QAPP have been selected to control site remediation and final radiological survey activities.

This plan and related implementing procedures are designed to provide adequate levels of control for all of these quality affecting activities. The plan is prepared consistent with the requirements of NUREG/CR-5849, EPA QAMS 005-80, and ASME/ANSI-NQA-1, 1989, as applicable.

The primary objective of this QAPP is to provide a procedural framework that will ensure that site remediation, sample taking, and final survey activities meet overall project requirements, other applicable requirements, and are consistent with established scientific practices.

The QAPP, all implementing procedures, and all subsequent revisions are subject to review and approval by the WSMPS Project Manager and QA Coordinator prior to use.

2.2 Quality Assurance Objectives for Measurement Data

All measurements taken as part of the remediation or final radiological survey of the WSMPS will be made to ensure that analytical results are representative of the media and conditions measured. For each major measurement parameter, Quality Assurance objectives for precision, accuracy, representativeness, completeness, and comparability will be developed, as appropriate. Unless otherwise specified, all data must be calculated and reported in units consistent with other organizations reporting similar data to allow comparability of databases among organizations.

Data quality objectives for accuracy and precision for each measurement parameter will be based on prior knowledge of the measurement system employed and method validation studies using replicates, spikes, standards, calibrations, recoveries, etc., and the requirements of this project.

2.3 Training and Qualification of Project Personnel

All Remediation Project personnel will be trained in the specific application of this QAPP and related implementing procedures, to the level and extent appropriate for their assigned work activities (see Appendix A). Additional levels of technical training will be invoked at the discretion of the WSMPS Project Manager or individual subcontractor managers, as necessary, to ensure that the skill levels of assigned personnel are commensurate with the technical and quality needs of a particular task.

Qualification of project personnel to perform work on this project will be based on a combination of academic and professional experience and project specific training. Position descriptions will be prepared by the project personnel supervisor which identify the qualification requirements that must be met for performing the required task (see Appendix B). Certification that personnel backgrounds (education and experience) meet the minimum education and experience requirements will be verified by the Project Manager (see Appendix C).

2.4 Control of Computer Software Configuration and Application

Development of computer models or software is not anticipated under the current scope of work for the WSMPS Project. If packaged or "canned" computer programs are utilized (i.e., RESRAD), care will be taken to ensure that the proper version is used.

3.0 PLANS, PROCEDURES, INSTRUCTIONS, AND DRAWINGS

3.1 General

Activities affecting quality, including those of contractors, subcontractors, and suppliers will be prescribed and performed in accordance with approved plans, procedures, instructions, and/or drawings. These plans, procedures, instructions and/or drawings will be readily available to project personnel at the location requiring their use.

QA and technical requirements for all activities affecting quality will be specified by means of individual QA or technical plans and/or procedures. Preparation, review, approval, distribution, and revisions of QA and technical plans and/or procedures will be controlled. The QAPP will be reviewed and approved by the WPM, CPM and the QAC. The technical plans, procedures and/or drawings will be reviewed and approved by the Site Supervisor, Project Radiation Safety Officer and the Project Manager. All instructions, plans, procedures, and drawings developed or implemented for the WSMPS Project will be retained as project QA records.

4.0 DOCUMENT CONTROL

Distribution of this QAPP, technical plans and procedures will be controlled. Documents are controlled during review, approval and distribution to ensure that those persons responsible for achieving and ensuring the project objective are met, understand such documents, and have approved current copies (and revisions) at the work locations where the activity is to be performed before work commences.

Controlled copies will be distributed to the WSMPS Project Manager, Project Manager, Project Radiation Safety Officer, Site Supervisor, and the QA Coordinator, and to other project personnel performing or supervising work, as deemed appropriate.

5.0 IDENTIFICATION AND CONTROL OF MATERIALS, PARTS, AND COMPONENTS

5.1 General

This section describes the identification and control of materials, parts, and components, including field and laboratory samples and materials. The identification and control measures assure that environmental data are traceable to the field and laboratory samples. The field and laboratory samples are traceable to the date and location of origin.

Storage, handling, and shipping of field and laboratory samples and materials are described in Section 9.

5.2 Description

5.2.1 Identification and Traceability

Identification of samples and materials is maintained on the field and laboratory samples and materials and in records traceable to the samples and materials.

The method and location of the identification are specified in the Technical Field Procedures, and are selected so as not to affect the function, quality, or properties of the field and laboratory samples, and materials. As a minimum, the field procedures delineate the following items:

(1) The location and physical method of identifying field and laboratory samples (i.e., use of labels or tags) and materials.

(2) The scheme to be used in assigning unique identification numbers to the original and to both parts when the field or laboratory sample or material is split.

(3) That the identification be controlled and maintained from the time of collection or receipt, through shipment, sample split, and subsequent use (i.e., chain-of-custody).

(4) That the shelf life of time-sensitive and perishable materials is identified and controlled, as required.

Before an item is used, the identification is checked by the user to assure that the correct field and laboratory samples and materials are used.

5.2.2 Sample Documentation

Standardized field tracking and reporting forms, such as field activity logs, chain-of-custody, etc., are employed to establish sample traceability and custody.

5.2.3 Laboratory Sample Control

The analytical laboratory is responsible to act as sample custodian for incoming samples. A sample custodian is authorized to sign for incoming field samples, to obtain documentation of shipments (i.e., bill of lading number), and to verify the date entered into the sample custody records. Laboratory sample custody logs consist of serially numbered standard laboratory tracking report sheets.

Reviewed and approved procedures are established at the laboratory for sample handling, storage, and dispersement for analysis.

5.2.4 Control of Archival Samples

Archival samples are collected, stored, and maintained in accordance with applicable field procedures.

6.0 CONTROL OF SPECIAL PROCESSES

No special process requirements (i.e., processes requiring prequalification of equipment, personnel, and procedures) are anticipated for the WSMPS Project. All site remediation and final radiological survey activities will be conducted using qualified individuals, appropriate and controlled/maintained equipment and field instruments, and approved procedures. However, should requirements for the use of such processes occur, the QAPP will be revised to include appropriate procedural controls.

7.0 CONTROL OF MEASURING AND TEST EQUIPMENT

7.1 General

This section describes the control of measuring and test equipment (M&TE) used in investigations, remediation and final radiological survey activities.

M&TE will be accurate, controlled, calibrated, adjusted, and maintained at prescribed intervals or prior to use against certified equipment having known relationships to nationally recognized standards (National Institute of Standards and Technology or equivalent) to maintain accuracy within specified limits.

The requirements of this section are applicable to the control of instruments; standards; and measuring, test, and analytical equipment used for measurement, inspection, and monitoring of remediation and final radiological survey activities.

7.2 Controls

The responsible user organization manager ensures that the following controls are implemented:

(1) Each piece of M&TE is uniquely identified (i.e., using the serial number).

(2) Date calibrated, date calibration is due, and the initials of the person who performed the calibration; or a note identifying the company that performed the calibration is documented as part of calibration records.

(3) Normal intervals between calibration for various types of M&TE are established and should be specified in the appropriate plan or technical procedure. This interval may be adjusted for specific pieces of M&TE based on the required accuracy and the M&TE's history of drifting, precision, purpose, and other characteristics that could affect accuracy.

The identification number of the equipment used to take each measurement is recorded with the original documentation of the results. The identification number is used to identify the measurements performed since the last calibration when a piece of M&TE was found to be out of calibration.

All standards used to calibrate M&TE have the following components:

(1) Ranges, precisions, and accuracies, adequate for the measurement requirements of the calibrated M&TE.

(2) An established history of stability.

(3) Known valid and documented relationships to nationally recognized standards (National Institute of Standards and Technology or equivalent) or accepted values of natural physical constants; if no nationally recognized standards exist, the acceptability of the calibration standard used is documented.

M&TE that is found out of calibration is documented using the nonconformance reporting process described in Section 13. The resolution of the nonconformance includes an evaluation of the validity and acceptability of measurements performed since the last calibration and an evaluation of the need for repeating original activity or test using calibrated equipment. The identification number is used to identify the measurements taken between calibrations.

The calibration system provides for recall of equipment for recalibration and confirms that the required recalibration is performed. Out-of-calibration devices are tagged or removed from service.

Records are maintained for each piece of calibrated M&TE. These records include, as a minimum, the following items:

(1) Identification of calibrating agency.

(2) Identification of M&TE (name; manufacturer; serial number and, when applicable, the range).

(3) Tolerance data.

(4) Date of calibration and next calibration due date.

(5) Identification of calibration standard.

(6) As-found reading.

(7) As-completed (final) readings.

(8) Indication of acceptance/rejection.

(9) Calibration points that were verified.

(10) Documentation of action taken in connection with any deviations, including modification, repair, or adjustment.

(11) Signature, initials, or stamp impression of person performing the calibration.

(12) Procedure used to calibrate and revision number of effective date (if calibrated by user of the instrument).

(13) Compensating corrections for environmental effects (when applicable).

(14) Limitations of use (when applicable).

Calibration test data are traceable to each item of equipment calibrated. Calibration frequencies will be specified in the technical plan or procedure used to control the work.

8.0 HANDLING, STORAGE, AND SHIPPING OF SAMPLES

8.1 General

This section describes the control of handling, packaging, shipping, preservation, and storage of samples and the cleaning/decontamination of sampling equipment used in site investigations and testing and final radiological survey to prevent damage, loss, deterioration, or misidentification. These activities are accomplished in accordance with the Final Radiological Survey Plan and appropriate Field Procedures.

8.2 Description

Qualified personnel are assigned by the Project Manager, Project Radiation Safety Officer and Site Supervisor to carry out handling, preservation, storage, cleaning, packaging, and shipping of environmental samples.

Responsible managers prepare, review, and approve field procedures that provide for the handling, storage, packaging, shipping, preservation, and storage of samples and the cleaning/decontamination of sampling equipment. These procedures should include the following items:

(1) Identification methods.

(2) Packaging (including type of container) and handling instructions.

(3) Modes of transportation (considering any time constraints).

(4) Time constraints of critical, sensitive, and perishable materials (shelf life, if applicable).

(5) Identification of special equipment and special protection or environmental conditions that preclude damage, loss, or deterioration.

(6) Interface and custody responsibilities.

(7) Safety considerations, if appropriate.

The sample handler verifies the correct identification of each sample and takes precautions to prevent contamination of the sample during handling, packaging, transportation, and processing.

The cleaning and decontamination of sampling equipment is addressed by applicable field procedures.

9.0 TIMELINESS

9.1 General

This section describes the policies and controls established to ensure that environmental media samples, field measurements, and other quality related site characterization or final radiological survey activities are taken, shipped, analyzed, and reviewed in a timely manner. The importance of timeliness and expediency is to ensure that the quality of the data is preserved and to ensure cost effective support to the overall project.

9.2 Policies and Controls

The individual (i.e., Site Supervisor) responsible for collecting, analyzing, and/or reviewing data will take appropriate action to adequately plan the required activity. The manager is responsible to ensure that individuals performing these activities are adequately qualified and trained and are using calibrated and maintained equipment/instrumentation, and are following approved plans or field procedures.

In addition to the above controls, the Site Supervisor is responsible to:

(1) Ensure that field procedures that involve sample collection, handling, storage, preservation, shipping, etc., address the importance of timeliness.

(2) Review and approve field procedures and other related procedures/plans in a timely manner to ensure the plans/procedures will be available for use before activities are initiated.

(3) Report immediately any nonconformance, safety issue or other related incident/event that may impact the quality of the samples, measurements and/or data.

(4) Satisfactorily resolve any required corrective action that he is responsible for in a timely manner.

10.0 QUALITY RECORDS

Records, log books, or forms used to document field activities (plans, technical procedures, survey results, analytical data, survey data) will be retained and managed as quality records. For the purposes of this project, the function of Record System Administrator will be assumed by Westinghouse.

Duplicate records and storage are required. Records will be stored onsite in the WSMPS offices. The project QA records file organization will be defined in the form of a records index, and will be prepared by the Project Secretary with guidance from the Project Manager, Project Radiation Safety Officer, QA Coordinator, and appropriate Subcontractor Managers.

11.0 AUDITS, SURVEILLANCE, AND MANAGERIAL CONTROLS

Internal audits will be performed of WSMPS Activities (remediation and final radiological surveys), as appropriate. Field surveillance/inspections will also be used to evaluate field activities to assure that the remediation activities are being performed in accordance with specified technical and quality assurance requirements.

All findings and observations will be resolved. After closure, information copies of all surveillance documentation will be made available to the WPM. All surveillance documentation will be retained as project QA records.

12.0 NONCONFORMING MATERIALS, PARTS, OR COMPONENTS

This section establishes a system for the identification, reporting, and resolution of nonconformances associated with the use of approved plans, procedures, drawings, or specifications. It provides for identification of causes, disposition, and implementation of corrective action measures that may be required to reduce or preclude future occurrences. Deficiencies and nonconformances may be reported by any individual or may be observed as a result of surveillance inspection activities as discussed in Section 11.0.

Nonconformance will be identified and documented on the Nonconformance Report (see Appendix D). All nonconformances will be resolved. Significant nonconformance or incidents will be reported to the WSMPS Project Manager, Project Manager, Site Supervisor and QA Coordinator immediately. All documentation related to nonconformances and corrective action will be retained as project QA records.

13.0 CORRECTIVE ACTIONS

As previously discussed, Section 12.0 provides for the identification of basic or "root" causes, disposition, and the implementation of corrective action measures that may be required in order to reduce or preclude the likelihood of future nonconformances. After corrective action completion and nonconformance closure, informational copies of all nonconformance and corrective action documentation will be made available to the WPM and appropriate subcontractor managers.

14.0 HEALTH AND SAFETY QUALITY ASSURANCE FOR SITE CHARACTERIZATION AND REMEDIATION PERSONNEL

Concern for site remediation and survey personnel should be as great as for the general public, since such personnel are more likely to encounter a higher radiation exposure before final cleanup or while in the process of locating areas in need of cleanup. In this regard, a Site Radiological Control Plan and a Health and Safety Plan have been prepared for site investigation, remediation, and final radiological survey activities. These plans assigns responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide for contingencies that may arise while conducting site investigation, remediation and final radiological survey activities at the WSMPS.

The provisions of the plan will be mandatory for all WSMPS, contractors, subcontractors, and employees engaged in onsite operations who will be exposed or will have the potential to be exposed to chemicals and radiation, as well as, general hazards associated with conducting the characterization/remediation.

APPENDIX A

READING ASSIGNMENT

WESTINGHOUSE SPECIALTY METALS PROJECT
READING ASSIGNMENT SHEET

Employee Name ____

Organization ____

Doc #	**Rev #**	**Document Title**	**Applicable Document**	**Initials/ Date Read**
	Rev 0	Site Radiological Control Plan	________	________
FP-01	Rev 0	Beta-Gamma Surveys	________	________
FP-02	Rev 0	Alpha Surveys	________	________
FP-03	Rev 0	Preparing a Reference Grid System	________	________
FP-07	Rev 0	Surface Soil Sampling	________	________
FP-08	Rev 0	Subsurface Soil Sampling	________	________
FP-14	Rev 0	Low-Level Radiation (Exposure Rate) Surveys	________	________
FP-15	Rev 0	Air Sampling	________	________
FP-16	Rev 0	TLD Issuance and Tracking	________	________
FP-18	Rev 0	Radioactive Waste Packaging	________	________
FP-19	Rev 0	Calibration and Maintenance	________	________
FP-20	Rev 0	Handling, Storage and Disposal of Radioactive Materials	________	________
FP-24	Rev 0	Alpha Counting Procedure	________	________
FP-25	Rev 0	Beta-Gamma Counting Procedure	________	________
FP-30	Rev 0	Surface Contamination Program	________	________
FP-31	Rev 0	Airborne Radioactivity Program	________	________
FP-32	Rev 0	General Radiological Survey	________	________

The documents as listed above have been read and understood.

______________________________ / ______________
Employee / Date

______________________________ / ______________
Project Manager / Date

APPENDIX B

POSITION DESCRIPTION REQUIREMENTS

POSITION DESCRIPTION REQUIREMENTS
POSITION TITLE:
DUTIES:
QUALIFICATION REQUIREMENTS
EDUCATION:
EXPERIENCE:
_______________ / _______________ Project Manager / Date _______________ / _______________ Coordinator of Quality Assurance / Date

APPENDIX C

PERSONNEL BACKGROUND CERTIFICATION

WESTINGHOUSE SPECIALTY METALS PLANT SITE
PERSONNEL BACKGROUND CERTIFICATION

Employee ____

Organization ____

Position Title ____

I have determined that this employee meets or exceeds the minimum education and experience requirements for this position and have verified that the above employee's education and experience information is correct.

______________________/______________

Project Manager / Date

APPENDIX D

INSTRUCTIONS FOR COMPLETING THE NONCONFORMANCE REPORT FORM COVER SHEET

NONCONFORMANCE REPORT

Page _____ of _____ NCR No ____________

1. PO or Authorization	2. Task	3. Rev

4. Number	5. Description of Nonconformance

6. Originator Date	7. Significant Condition Adverse to Quality ☐ Yes ☐ No CAR ID ____________

8. Evaluation, Proposed Disposition, Justification, and Action Taken (see attached sheet)

9. Closeout ☐ Disposition Effected as Directed ☐ Other (specify) ______________________	10. Task Manager Date 11. Coordinator of QA Date

12. Distribution

INSTRUCTIONS FOR COMPLETING THE NONCONFORMANCE REPORT FORM COVER SHEET

NCR Originator Complete blocks 1 through 12 as follows:

Block 1: Include, as applicable, the purchase order number or other authorization.

Block 2: Provide the title and number of the task directly affected by the nonconformance. Provide the name of the affected item or activity. Use the name specified on a drawing or procedure, when possible.

Block 3: Enter the revision number of the document specified in Block 2, when possible.

NCR Originator **Block 4**: Assign sequential numbers to identify the specific nonconformance.

NOTE: This form is intended to be used for more than one nonconformance when that condition occurs.

Block 5: Describe, in detail, the nonconformances. The nonconformance must be based on failure to meet the stated or implied purpose, or the written requirements. State the specific criteria that were not met and the actual observations. Attach or reference backup data, as necessary, to make the description clear.

Block 6: The NCR originator signs and dates in this block.

Coordinator of QA **Block 7**: Review the nonconformance and mark the appropriate block. Enter the identification of any Corrective Action Report initiated as a result of this review.

Task Manager **Block 8**: Describe the evaluation, proposed disposition, justification, and action taken to disposition the nonconformance.

NOTE: Description should be placed on attached sheet, as necessary.

Block 9: Verify satisfactory completion of the disposition and re-examination by checking the appropriate box.

NOTE: Any changes to the approved disposition require the same approvals as the original disposition.

Block 10: Sign and date if the disposition is satisfactory.

Coordinator of QA **Block 11**: Sign and date if the disposition is satisfactory.

Block 12: List the individuals (or organizations) that must perform activities as a result of the NCR disposition. In addition, list all other concerned parties, as appropriate. As a minimum, this should include the responsible Project Manager and Quality Assurance Coordinator.