DECOMMISSIONING PLAN FOR THE WHITTAKER CORPORATION'S GREENVILLE, PA SITE

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1.0 General Information

The Whittaker Corporation's Greenville, PA Facility, license number SMA-1018 (Ref. 2), conducted the processing of ferro-columbium and ferro-nickel alloys using an aluminathermic melting process beginning in the 1960's. This material contained trace amounts of natural thorium. The slag resulting from the process was stored on-site. In addition, some of the feed-metal scrap containing low levels of uranium contamination is also present on the site. The slag is stored in four separate sections on the Whittaker site as seen in Figure 1.1. The Whittaker site is located approximately 6 km south of Greenville, PA on Crestview Drive, as seen in Figure 1.2. The site is approximately 2.3 hectares and is located between the Greenville Metals Plant and the Shenango River, as seen in Figure 1.3.

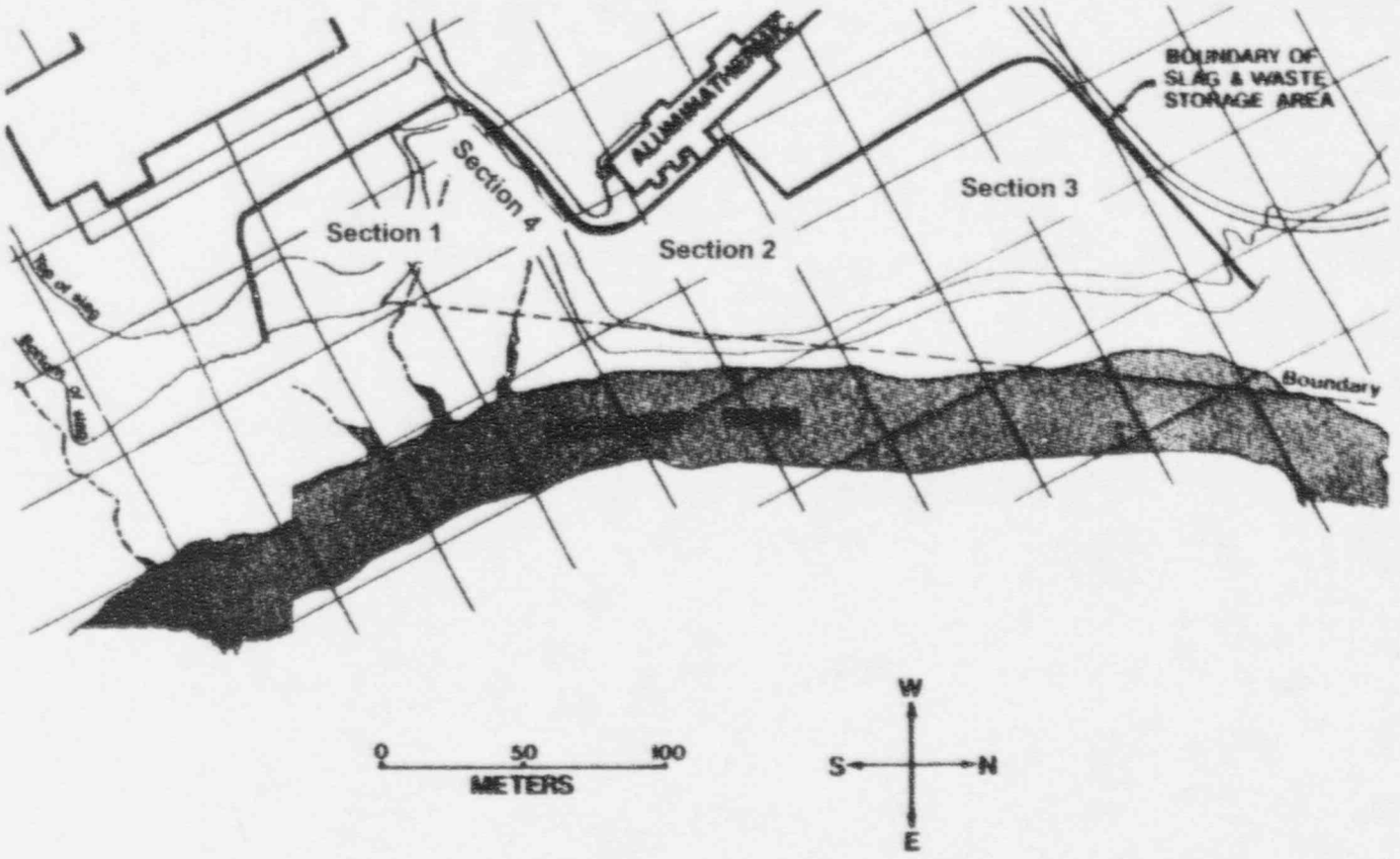


Figure 1.1 Location of Slag

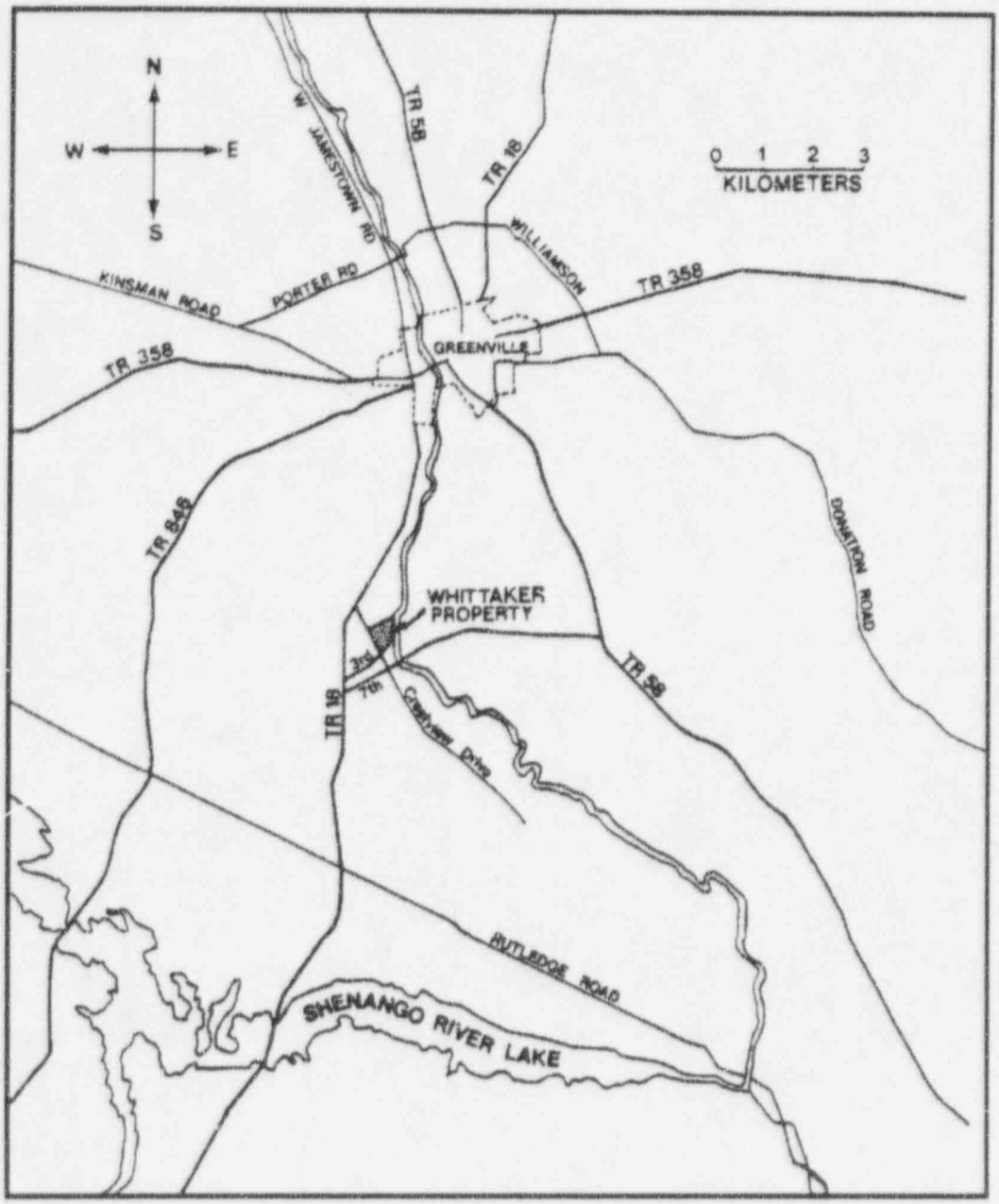


Figure 1.2 Map of Area

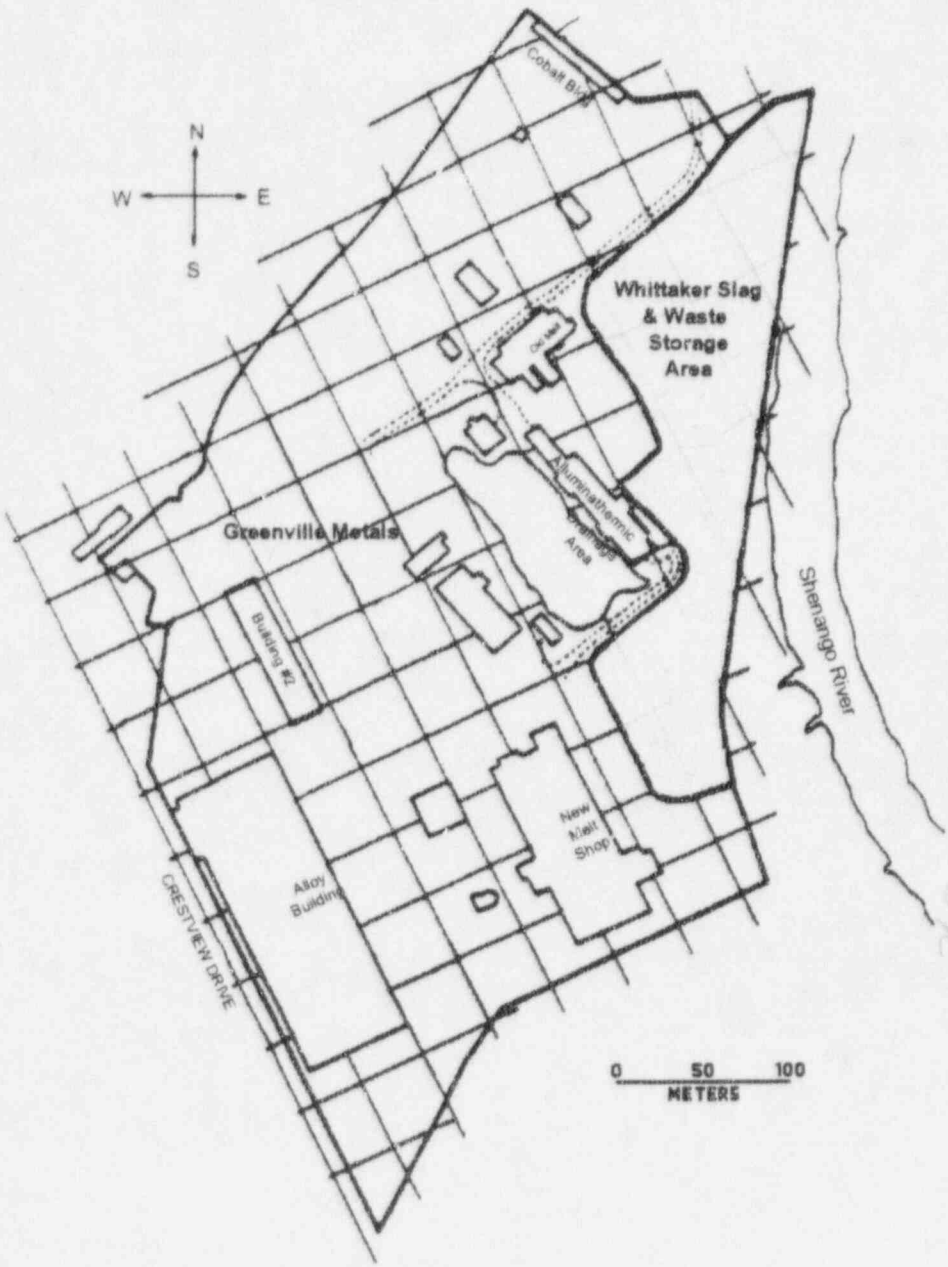


Figure 1.3 Location of Whittaker Site

2.0 Description of Planned Decommissioning Activities

This section provides a description of the procedures required for decontamination and decommissioning (D&D) the Greenville site. The decommissioning responsibilities and schedule are also presented in this section.

2.1 Decommissioning Objective, Activities, Tasks, and Schedules

2.1.1 Decommissioning Objective, Activities, and Tasks

The objective of the D&D of the Greenville site is to relocate the slag material into one area after performing a Risk Assessment that verifies that the risk associated with consolidation of slag to one area of the site would be minimal to the public and environment. This consolidation of material will allow over three quarters of the site to be free released and will reduce, to approximately one acre, the area containing the contaminated slag material. The remediation activities shall be broken up into the following tasks:

Task 1	Prepare Risk Assessment
Task 2	Planning and Preparation
Task 3	Mobilization
Task 4	Slag Remediation
Task 5	Final Survey
Task 6	Site Restoration
Task 7	Demobilization
Task 8	Preparation of Final Activities Report

2.1.2 Description

All areas in which the slag is stored are currently unoccupied. Remediation activities will be performed to relocate the slag from Sections 1, 3 and 4 to Section 2. Assessment of the site shows that there is a significant amount of slag remaining on-site, individual pieces of which are above the USNRC release criteria. It will be proven by leach testing in accordance with NUREG/CR-6232 (Ref. 10) that due to the composition of the slag the radioactivity is limited to the slag and no detectable contamination has leached into the soil. Therefore, there are no potential accident scenarios present because the contamination is fixed in the slag, which would have an impact on decommissioning safety.

A detailed description of the slag relocation activities presented in Section 2.1.1 is presented below.

Task 1 Prepare Risk Assessment

A risk assessment will be prepared for the final location of the slag at the Greenville site. Updates to this Decommissioning Plan will be provided based on the results of the risk assessment. This will include a revised cost estimate, project schedule and description of site restoration activities as determined from the assessment.

Doses from residual site activity will be calculated using the computer program RESRAD, Version 5.61 (Ref. 9), created by the Argonne National Laboratory. RESRAD is designed to determine the radiation dose to a critical population group from external radiation plus committed effective dose equivalent (CEDE) from internal radiation. The critical population group is defined as the group of people expected to receive the highest radiation exposure due to any foreseeable use of the site. RESRAD determines radiation dose by considering all plausible exposure pathways from contaminated soil. These pathways include:

- Direct exposure to external radiation from the soil
- Inhalation of contaminated dust and radon progeny
- Ingestion of plants grown with contaminated soil and water
- Ingestion of meat and milk from animals raised on contaminated plants and water
- Ingestion of aquatic foods from contaminated ponds
- Ingestion of contaminated drinking water
- Ingestion of contaminated soil

RESRAD bases its dose calculations on four factors:

1) Exposure scenarios
2) Source term
3) Exposure pathways
4) Dose conversion factors

The exposure scenarios are based on the foreseeable uses of the site. The scenarios determine the assumptions that will be used to tailor the exposure pathways to the particular scenario. RESRAD assumes that the worst-case scenario is the "Resident-farmer scenario." This scenario utilizes all of the RESRAD pathways to their maximum extent. RESRAD can also account for other situations such as the "Industrial" and "Resident" scenarios which assume the critical population group is not affected by all of the pathways to their maximum extent. The chosen scenario determines input variables (the extent of the contaminated area, the radionuclides present and their concentration, their decay rates, and the physical features of the land) and how the program parameters will be adjusted.

The source term is the rate at which radioactivity is released into the environment. The computer code internally calculates the source term change over time as the contaminants decay, leach into the water table and dissipate by erosion. The RESRAD user inputs the dimensions of the affected site, the radionuclides of concern and their concentrations.

The pathways (listed above) are the modes in which the radionuclides enter or affect the body. These are affected by assumptions for site utilization during the period of interest which are input by the RESRAD user. Depending on the exposure scenario, the RESRAD user will adjust the pathway parameters to accurately model the site characteristics.

The dose conversion factors are the mathematical models by which RESRAD calculates a radiation dose based on the source term and the pathways. The conversion factors used by RESRAD are based on models developed by the International Commission on Radiological Protection (ICRP). The input variables and assumptions do not affect the dose conversion factors. The RESRAD user may use the ICRP default values or modify the conversion factors to more accurately model the exposure scenario.

The output of RESRAD presents the calculated dose rate to an individual over time. This information is provided in summary and graphical formats. The graphs shows how the dose rate changes over time, while the summary shows how the dose rate is accumulated from the different pathways.

Three scenarios will be analyzed using RESRAD in conformance with PG-8-08, *Scenarios for Assessing Potential Doses Associated with Residual Radioactivity*. These scenarios are (a) worker, (b) resident and (c) resident farmer. A description of the three scenarios as given in PG-8-08 (Ref. 7) is as follows:

a) The first scenario is direct exposure to external radiation and inhalation of airborne radioactive material from contaminated soil to an onsite worker (Worker). This assumes that a worker is on-site 40 hours a week for a year. The worker does not drink any water from the site or eat any food grown on the site. The three pathways affecting the worker are direct exposure, inhalation and radon.

b) Scenario B is direct exposure to external radiation, and inhalation and ingestion of airborne radioactive material to an on-site resident who works off-site (Resident). This scenario assumes a family builds a house on-site but does not work on-site. It assumes the resident plants a small garden of vegetables and fruit. The six pathways which affect the resident are direct exposure, inhalation, radon, ingestion of groundwater, ingestion of vegetables and soil ingestion.

c) The last scenario is direct exposure to external radiation and inhalation and ingestion of radioactive material to an individual who lives on the site, ingests groundwater produced from beneath the site, and ingests food grown on the site (Resident Farmer). This assumes that a family builds a house on-site and farms the site for their perishable food. The six pathways which affect the resident farmer are direct exposure, inhalation, radon, ingestion of groundwater, ingestion of vegetables and soil ingestion.

Task 2 Planning and Preparation

This tasks includes preliminary engineering, planning and procedures required to perform the on-site activities in a safe and timely manner. This tasks also includes any meetings associated with planning project activities.

Task 3 Mobilization

The purpose of the mobilization is to ensure the efficient and timely movement of personnel and equipment to the site. Mobilization activities shall include procurement of equipment. All instrumentation will be calibrated and prepared to be on-site by start of work. A Site Specific Health and Safety Plan shall be prepared to ensure the safety of all personnel on-site during remediation activities. After travel to the site, a counting area shall be established in a low background area for all samples. The counting area shall be used to perform gamma spectroscopy of soil samples. Site background levels will then be verified with the Oak Ridge Institute of Science and Education (ORISE) data to enable a comparison of site radiological conditions with the acceptable guideline values.

Training and familiarization of workers with the Whittaker site will be performed under the mobilization efforts. Workers will be acquainted with the site and any hazards associated with the site or site activities.

The following steps are to be performed to ensure proper mobilization:

1. Procure Equipment
   a. Order Necessary Consumables
   b. Calibrate Instrumentation
   c. Schedule Heavy Equipment Rental
2. Ship Equipment to Site
   a. Package Equipment
   b. Ship Equipment
3. Travel to Site
4. Perform Personnel Monitoring
   a. Collect Bioassay
   b. Assign TLDs
5. Establish Counting Laboratory
   a. Setup Gamma Spectroscopy System
   b. Response Check Hand Held Instrumentation
   c. Determine Site Background Values
6. Orient Workers
   a. Perform Necessary Radiation Worker Training
   b. Familiarize Personnel with Site
   c. Review Safety Concerns

Task 4 Slag Remediation

The remediation activities will occur in Section 1, 3 and 4. The soil will be excavated from these areas using a front end loader and excavator and moved by dump trucks to Section 2. The following steps will be performed to ensure the safe and timely removal of the material:

1. Setup Air Monitoring
   a. Setup low volume air sampler in excavation area. Samplers will be established up wind and down wind of work activities.
   b. Perform representative lapel sampling on workers performing excavation activities. The lapel sampling schedule will be determined by the Site Supervisor.
   c. Change air filters daily. The Site Supervisor will be responsible for changing the air filters daily, counting them and recording the results in the site log book.
2. Establish Travel Routes
   a. Setup cones to establish the travel area between the southern area (Sections 1 & 4) and the center area (Section 2). This area will be determined after negotiation with Greenville Metals.

3. Excavate Soil and Slag
   a. Provide dust respirators for workers.
   b. Exhume soil and slag using a front end loader and an excavator.
   c. Scan soil every foot until virgin soil is reached.
4. Load Soil and Slag into Dump Trucks
   a. Mist loading activities as necessary for dust mitigation. This will be determined by the Site Health and Safety Officer. Do not over spray soil.
   b. Transfer soil to dump trucks using the front end loader.
5. Move Soil and Slag to Section 2
   a. Transport soil and slag from sections 1, 3 and 4 to section 2.
   b. Dump soil and slag.
   c. Water spray dumping activities as necessary for dust mitigation.
   d. Level soil and slag using front end loader.
6. Decontaminate Paved and Concrete Surfaces
   a. Scan surfaces 100%.
   b. Decontaminate elevated areas. Decontamination will be accomplished using a chipping hammer to remove the elevated concrete. Any concrete removed will be disposed of in the center storage area (Section 2).
   c. Perform coring at cracks and broken areas of paved surfaces.
   d. Sample soil from coring to determine if contamination has entered the soil.
   e. Remove paved surfaces and soil if contamination is present under the paved surfaces. The paved surfaces will be removed using a chipping hammer or the excavator bucket. The soil will be removed with a shovel or the excavator.

Task 5 Final Survey

Survey of the three areas will be performed in accordance with NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination (Ref. 3)." The areas will be considered affected and will be gridded using 10 meter intervals. Each gridded area will be referenced using an alpha-numeric grid system to facilitate the referencing of survey locations.

The remediated areas will be scanned by keeping the detector as close as possible to the surface while moving it back and forth and walking at a speed of about .5 meters per second. Locations of elevated readings shall be marked with a stake for further remediation.

Direct measurements shall be obtained from all paved surfaces. One (1) one minute direct beta-gamma and one (1) one minute direct alpha surface contamination reading will be taken from areas of highest elevated activity identified during the surface scan. The Ludlum 2221 meter and 44-9 GM pancake probe or equivalent shall be used to perform the beta-gamma direct measurements,

while the Ludlum 2221 meter and 43-5 alpha scintillation probe or equivalent will be used to perform the alpha direct measurements.

Soil samples shall be obtained to verify the contamination and counted using gamma spectroscopy. Surface samples shall be obtained from the top 15 cm of soil.

The following steps shall be performed to ensure the accuracy of the final survey:

1. Grid area in 10 m by 10 m grids.
2. Establish alpha-numeric reference system.
3. Perform 100% walk over scan.
4. Perform one direct reading in each affected paved grid.
5. Mark areas of elevated readings with stakes.
6. Collect a minimum of 4 soil samples from each grid to confirm clean.
7. Remediate remaining hot spots.

Task 6 Site Restoration

Based on the findings of the risk assessment, site restoration activities will be performed. At a minimum the area will be covered with soil and seeded. All equipment will be surveyed and decontaminated if necessary before being used for the restoration activities. This decommissioning plan will follow the recommendations deemed appropriate for the site according to the risk assessment. This section will be changed to reflect the findings of the risk assessment upon completion of the assessment.

Task 7 Demobilization

Upon conclusion of the remediation activities and the final survey, the site will be cleaned of all rubbish generated by the work activities. Any materials used for contamination control will be decontaminated and disposed of as clean waste. All equipment will be surveyed and decontaminated, as required, prior to shipment off-site. The following steps are to be performed during demobilization:

1. Survey and decontaminate heavy equipment. This will be done by sweeping the trucks and equipment to remove the remaining soil and slag. If necessary, a decontamination solution and cloth will be used on the equipment.
2. Survey and decontaminate small tools. This will be done by brushing off the remaining soil. If necessary, a decontamination solution and cloth will be used on the equipment.
3. Break down gamma spectroscopy system.
4. Pack and ship equipment.

5. Clean area of refuse. Any clean garbage generated during the activities will be disposed of properly. Any contaminated waste such as cloths and dust masks will be disposed of in 55 gallon drums and stored on-site within the secured area.
6. Travel from site.

Task 8 Prepare Final Activities Report

After demobilization activities are completed, a final report will be prepared detailing the on-site activities. The report will contain the methods and procedures used to remediate the area and the results from the final survey of the remediated areas. Any deviations in planned activities will be provided as well as any unusual occurrences that took place on-site.

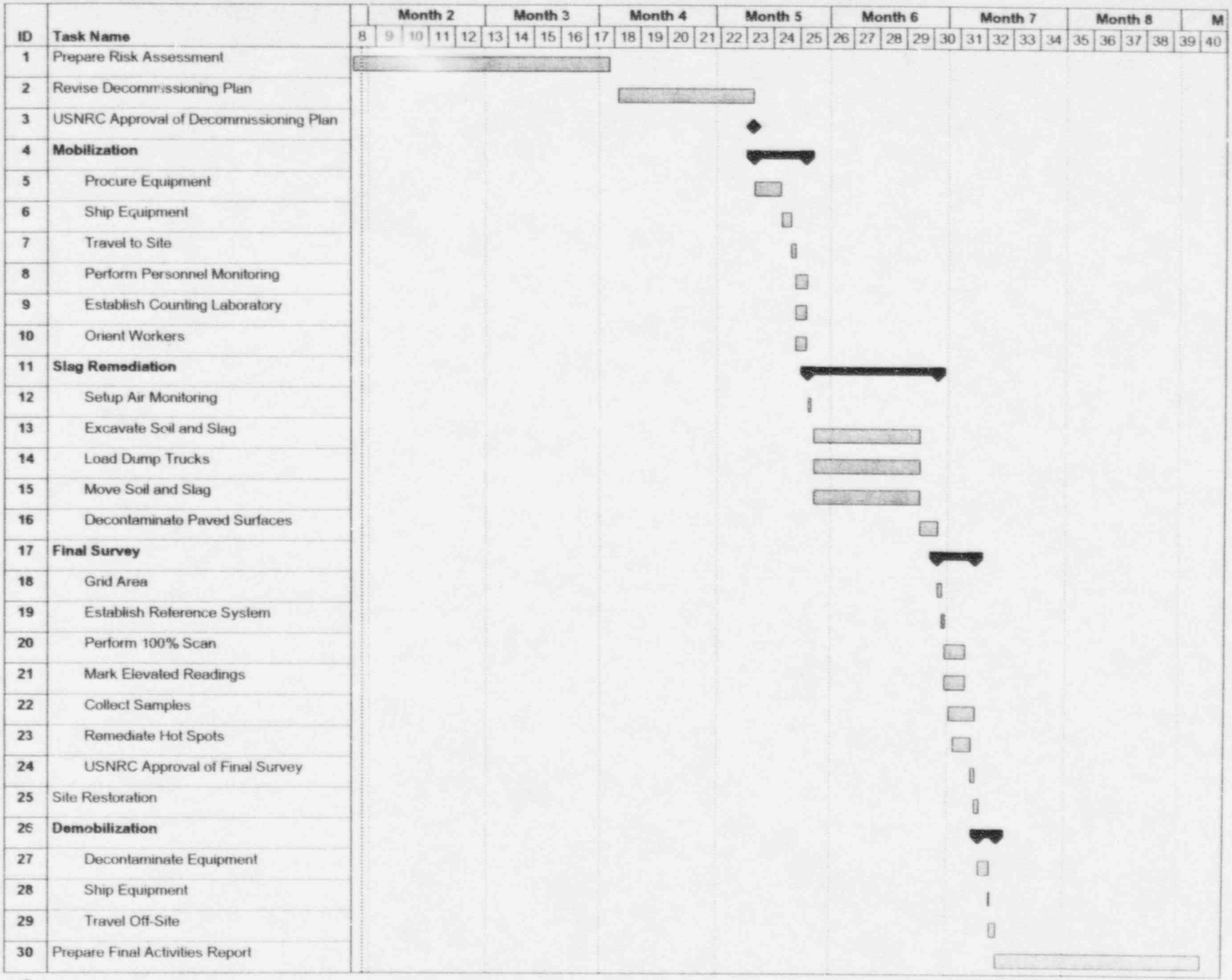
2.1.3 Procedures

All decommissioning activities and tasks shall be performed in accordance with site specific health physics procedures. All final surveying procedures, techniques and documentation, instrumentation, and sample analysis will follow the guidelines established in NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination."

All written procedures will be given a technical review, approved for safety and signed by the appropriate management. Any major changes which involve the deletion or addition of tasks, adverse impact on scheduling, or possible creation of new or greater potential hazards must be approved, in writing, by both the NES Project Manager and the Whittaker Corporation Program Manager and documented in the site procedures and site log book. Minor changes to this work plan (i.e., reordering of specific steps, allowing simultaneous tasks to be performed) must be approved by the NES Site Supervisor and documented in the site log book.

2.1.4 Schedules

The activities described in this Decommissioning Plan will be performed upon receipt of USNRC approval to proceed with the Risk Assessment. The duration and number of man hours for each work activity has been estimated based upon the work descriptions presented in Section 2.1.2. The decommissioning sequence and schedule is presented in Table 2.1.



ID	Task Name
1	Prepare Risk Assessment
2	Revise Decommissioning Plan
3	USNRC Approval of Decommissioning Plan
4	**Mobilization**
5	Procure Equipment
6	Ship Equipment
7	Travel to Site
8	Perform Personnel Monitoring
9	Establish Counting Laboratory
10	Orient Workers
11	**Slag Remediation**
12	Setup Air Monitoring
13	Excavate Soil and Slag
14	Load Dump Trucks
15	Move Soil and Slag
16	Decontaminate Paved Surfaces
17	**Final Survey**
18	Grid Area
19	Establish Reference System
20	Perform 100% Scan
21	Mark Elevated Readings
22	Collect Samples
23	Remediate Hot Spots
24	USNRC Approval of Final Survey
25	Site Restoration
26	**Demobilization**
27	Decontaminate Equipment
28	Ship Equipment
29	Travel Off-Site
30	Prepare Final Activities Report

◆ Denotes unknown time frame

Table 2.1 Project Schedule

The Risk Assessment will require approximately 2 months to complete. This time allows for preparation, Whittaker review and incorporation of Whittaker comments. After completion of the Risk Assessment the Decommissioning Plan will be updated which will require 5 weeks which includes Whittaker review time. Upon USNRC approval to begin site activities, weather permitting, the predeployment activities of engineering, planning, procedure writing, crew/equipment mobilization and radiation worker training will have an estimated duration of 3 weeks. The on-site activities will have an estimated total duration of 10 weeks. No time has been estimated for the site restoration activities until completion of the risk assessment.

An average crew of 1 Site Supervisor and 1 Project Engineer along with 3 Health Physics Technicians and 7 Equipment Operators would be required to complete the on-site activities in approximately 10 weeks.

2.2 Decommissioning Organization and Responsibilities

A flow chart of the project organization can be found in Figure 2.1. The following is a list of the responsibilities associated with the site work:

Whittaker Project Manager - The Whittaker Chief Financial Officer and General Counsel will be the contact person within the Whittaker Corporation for this project. He is the person responsible for the selection and oversight of the contractors and their activities.

Project Manager - Maintains overall responsibility for ensuring that all quality assurance requirements are fulfilled and that the project is completed within schedule and budget. The Project Manager is responsible for the project records, for ensuring remediation techniques are performed in a proper and safe manner and for conveying the work package to the workers. The Project Manager reports directly to the Whittaker Corporation Project Manager.

Site Supervisor - Ensures the overall implementation of the work plan, that individuals are properly trained in ALARA procedures, that all records are maintained, and that persons whose job responsibilities include possible exposure to radioactive materials have participated in the training courses required to perform their work in a safe manner. The Site Supervisor shall ensure project tasks are completed in a safe and timely manner.

All Individuals - Maintain occupational exposure to radiation and contamination ALARA by following safe work practices; comply with radiation work permit requirements; immediately report to the supervisor any conditions that may lead to an incident causing an unusual exposure; and participate in training appropriate for job assignments.

NES Management Oversight - Provide quality assurance checks of operations and documentation during decommissioning and decontamination activities.

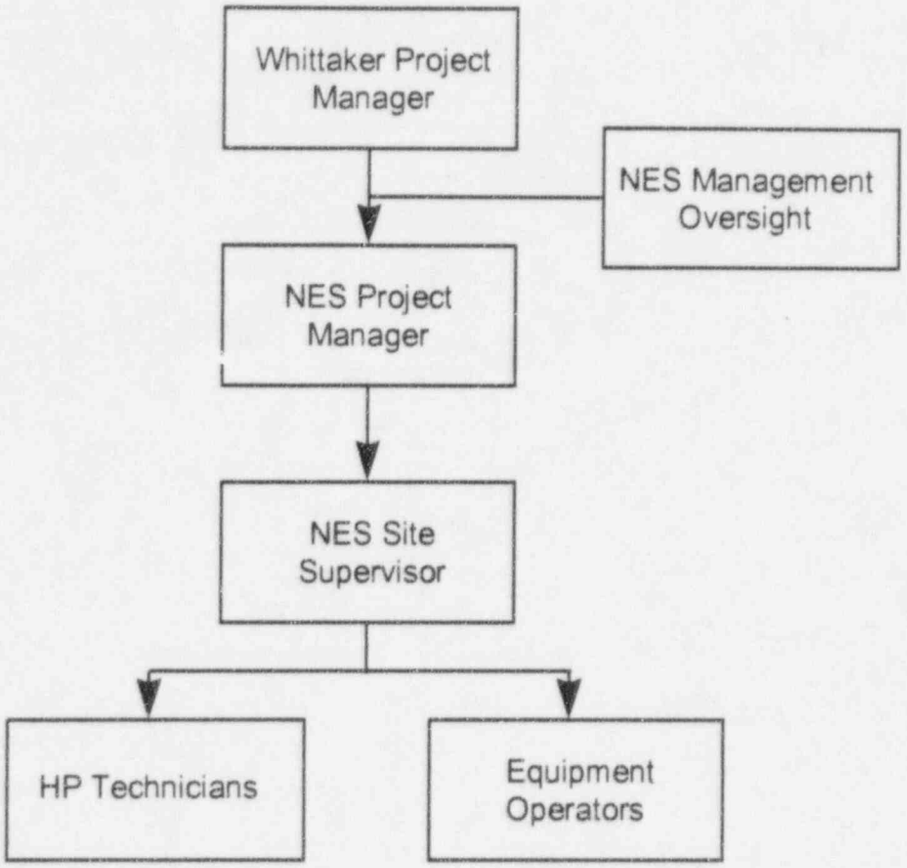


Figure 2.1 Organizational Flow Chart

2.3 Training

All employees shall be thoroughly trained in radiation practices and for all hazardous or potentially dangerous situations that may arise. This training will reduce the chances of injury and allow work to progress smoothly and in a timely manner.

The Site Supervisor is responsible for job instruction with appropriate emphasis on the safety aspect of each task, and for determining when retraining/refresher is necessary. The Site Supervisor shall establish training programs for those personnel performing quality affecting activities to confirm their understanding of the quality assurance documents and requirements, and to verify they are proficient in implementing these requirements. These training programs shall ensure the following:

- Personnel responsible for performing quality affecting activities receive instruction on the purpose, scope, and implementation of applicable controlling procedures.
- Personnel performing such activities are trained and qualified, as appropriate, in principles and techniques of the activity being performed.
- The scope, the objective and the method of implementing the training programs are documented.
- Methods are provided for documenting training sessions, describing content, attendance, date of attendance, and the results of the training session, as appropriate.

Records of all training sessions shall be maintained which include the instructor's name, the training date and the person's names who attended the training sessions.

There will be a daily briefing by the Site Supervisor to discuss the following:

1. To review work that was performed the previous day, discuss potential problem areas, and ensure that everyone understands the tasks that are to be performed during the current day.

2. The briefing will be used to check the following:
   a. The necessary tools and equipment are available.
   b. Each worker knows how to perform their assigned tasks.
   c. Each worker understands the radiological conditions of the area in which they will be working.

2.4 Contractor Assistance

All decommissioning activities and tasks will be performed by NES, Inc. The Whittaker Corporation will maintain the responsibility for ensuring that the licensing conditions are met during the D&D activities.

3.0 Description of Methods Used for Protection of Occupational Public Health and Safety

This section discusses the health physics program to be used at the site with a description of air and personnel monitoring and contamination control practices. It contains the necessary information to ensure the protection of the workers and the environment against radiological hazards.

3.1 Facility Radiological History Information

3.1.1 Radiological Material Used at the Greenville Site

The Greenville Site conducted the processing of ferro-columbium and ferro-nickel alloys using an aluminathermic melting process beginning in the 1960s. The Whittaker site is located approximately 6 km south of Greenville, PA on Crestview Drive as seen in Figure 1.2. The site is approximately 2.3 hectares and is located between the Greenville Metals Plant and the Shenango River as seen in Figure 1.3. The site is broken up into three areas: the northern, consisting of Section 3; central consisting of Section 2; and southern, consisting of Section 1 and 4.

The northern section (Section 3) contains a mound of slag mixed with other rubble and waste. The eastern portion of the northern area is more heavily vegetated with evidence of an area of spilled tar and the indication of asphalt paving having been present. There are three-sided bins located at the northern entrance which contain slag material covered with vegetation and small trees. These bins sit on a concrete pad which extends south. The concrete pad extends under the mound and is visible on all sides of the mound. To the south of this mound is an area with open-top, three-sided steel bins in two back-to-back rows which also sit on the concrete pad. The bins contain waste materials consisting of some low-level waste source material and ordinary non-toxic industrial waste packaged in old rusting drums. There are drums which are in good condition stored on the concrete pad just south of the storage bins. The northern area also houses numerous large metal objects which appear to be radiologically uncontaminated.

The central area (Section 2) is predominately slag. The area is clearly defined by the presence of green and black glassy slag as well as a porous rocklike slag. The central area is mainly flat and near the center is a mound that appears to contain the material that was removed from the industrial buildings on the adjacent property when they were decontaminated and released for unrestricted use in 1986. This slag extends over the area off the bank into a ravine to the south of the area. The bank appears to have been built out over the years by the slag. The slag however, has not been built up on the bank to the east of the area extending down to the river. The bottom of the east ravine has a few scattered large pieces of slag at a good distance from the river.

The southern area (Sections 1 & 4) consists of scattered pieces of slag and a gravel soil mixture which sits above a large ravine leading to the river. The northern side of the area contains scrap material which appears to be uncontaminated. There is no evidence of any large pieces of slag nor of highly elevated readings in the southern area.

3.1.2 Operating Occurrences Affecting Decommissioning Safety

There are no known operating occurrences that would affect the safety of the personnel during decommissioning. All contamination is contained within the individual pieces of slag which are deposited throughout the areas of concern. Gross exposure rates based on the annual monitoring range vary based on the location throughout the site. Typical background values range from 3-8μR/h with higher values of 35-90 μR/h found which can be attributed to nearby slag.

3.2 Ensuring that Occupational Radiation Exposures Are As Low As Reasonably Achievable (ALARA)

The Project Manager of the remediation activities shall be responsible for appropriating the necessary resources needed to establish ALARA goals, ensure all exposures fall within limits and are ALARA within these limits. The Site Supervisor shall ensure individuals under his supervision are properly trained in ALARA procedures and all records are maintained. The Site Supervisor will ensure persons whose job responsibilities include possible exposure to radioactive materials have participated in the training courses required to perform their work in a safe manner.

A Radiation Work Permit (RWP) will be issued for site activities. A RWP is a means of providing the radiological conditions under which work in a radiologically controlled area will be performed. The RWP provides controls to ensure the work is accomplished in a radiologically safe manner while maintaining personnel radiation exposure as low as reasonably achievable (ALARA). The RWP will be prepared by the Site Supervisor and will be approved by the Project Manager prior to the start of the task. A copy of the RWP to be used on-site can be found in Figure 3.1.

All personnel making an entry under an RWP shall comply with the requirements, instructions and precautions of the RWP. All full-time personnel entering the controlled area will be monitored using a thermoluminescent dosimeter (TLD). Part-time personnel and visitors will be monitored using a self-reading dosimeter (SRD). A log of individual exposures will be maintained.

Figure 3.1 Radiation Work Permit

LOCATION			RWP NO
EQUIPMENT NAME/NUMBER	INITIATED BY	ESTIMATED PERSON HOURS	DATE IN FORCE
JOB DESCRIPTION: BE SPECIFIC			DATE EXPIRES
			EST PERSON-REM
			TOTAL EXPOSURE-REM

RADIOLOGICAL CONDITIONS

GEN CONTAMINATION LEVEL dCv/100 cm2	MAX CONTAMINATION LEVEL dCv/100 cm2	GEN AREA RADIATION LEVEL MREM/hr	HOT SPOT RADIATION LEVEL REM/hr
AIRBORNE PARTICULATE ACT uCi/ml	GASEOUS ACTIVITY uCi/ml	RADIOIODINE ACTIVITY uCi/ml	TOTAL NO. of M.P.C.s

SURVEYED BY _____ DATE _____

RADIOLOGICAL PROTECTION SUPPORT

☐ INITIAL ☐ ON CALL ☐ INTERMITTENT ☐ CONTINUOUS

PROTECTIVE CLOTHING				RESPIRATORY GEAR	
LAB COAT				COTTON GLOVES	
COVERALLS	1 pr ☐	2 pr ☐		RUBBER GLOVES - 1 pr ☐	2 pr ☐
PLASTIC SUIT TOP				SURGICAL GLOVES	
PLASTIC SUIT BOTTOM					
PAPER COVERALLS					
HOOD				FULL MASK FILTER	
FACE SHIELD				SUPPLIED AIR MASK	
RUBBER OVERSHOES				SUPPLIED AIR HOOD	
PLASTIC SHOE COVERS	HIGH			[illegible]PER	
	LOW			[illegible]	

NON-PROTECTIVE CLOTHING			
COTTON LINERS		SURGEON CAP	

DOSIMETRY	
FILM BADGE	
LOW RANGE DOSIMETER	
HIGH RANGE DOSIMETER	
DOSE RATE METER	
TLD BADGE	
NEUTRON METER	
NEUTRON BADGE	
MULTI-BADGE	
EXTREMITY	
TLD RING - Left Hand	
TLD RING - Right Hand	
FILM BADGE/TLD - Left Foot	
FILM BADGE/TLD - Right Foot	

SPECIAL INSTRUCTIONS

- ☐ TAPE GLOVES AND FOOTWEAR TO COVERALLS
- ☐ WEAR DOSIMETER ON INNER COVERALLS
- ☐ SET UP LOCAL CONTROL ZONE (Radiation or Contamination)
- ☐ WEAR DOSIMETRY ON HEAD
- ☐ AIRBORNE SAMPLE TO BE TAKEN AS SPECIFIED
- ☐ FIRE WATCH REQUIRED
- ☐ CONFINED SPACE ENTRY CONTROLS
- ☐ HARD HATS REQUIRED
- ☐ INDUSTRIAL HAZARD MITIGATION (SPECIFY)
- ☐ HEARING PROTECTION REQUIRED
- ☐ EYE PROTECTION REQUIRED
- ☐ FILTERED EXHAUST VENTILATION REQUIRED
- ☐ JOB PLAN MEETING
- ☐ ENCLOSED CONTAINMENT REQUIRED
- ☐ OUTER PERSONAL CLOTHING NOT TO BE WORN
- ☐ EVALUATE LOCATION OF WHOLE BODY DOSIMETRY
- ☐ RADIOLOGICAL OR HAZARDOUS CONDITIONS TO BE RE-EVALUATED AFTER WORK COMMENCES
- ☐ CHEMICAL HAZARD
- ☐ SCAFFOLDING SAFETY

RWP APPROVED DATE	RWP APPROVED DATE	RWP CLOSE DATE
RCS	SS	RCS

1 DEACTIVATION ☐	2 ROUTINE MAINTENANCE ☐	3 SPECIAL MAINTENANCE ☐	4 WASTE - PROCESSING ☐	5 REFUELING INSPECTION ☐	6 INSERVICE INSPECTION ☐

3.3 Health Physics Program

3.3.1 Radiological Contamination and Personnel Monitoring

3.3.1.1 Air Monitoring

High volume and low volume air samples will be performed during excavation activities. Air monitoring shall also be established in the sample preparation area. Air concentration values in contaminated areas will be within the guidelines established in 10 CFR Part 20, App. B, "Standards for Protection Against Radiation (Ref. 5)." If the values exceed the guidelines the Site Supervisor will issue the appropriate respiratory protection the necessary personnel.

3.3.1.2 Personnel Monitoring and Protection

Controls such as personnel monitoring, area radiation surveys, posting, shielding, training and control of work activities involving radioactive material will minimize external exposure and will be implemented as necessary. All personnel will participate in a bioassay program before the commencement of work, including baseline in vitro examination (i.e., urine analysis) at the start of work and again upon completion of the project. Internal exposure shall be monitored by performing the in vitro counts.

Radiological monitoring of radiation exposure levels and airborne radioactivity will be conducted to confirm work place conditions and to identify areas requiring postings. Surveys for radiation, surface contamination and airborne radioactive materials will be performed as specified in technical work documents and RWPs. Only properly trained Health Physics Technicians will perform surveys to meet regulatory requirements. Assessment of radiological conditions will include a sufficient number of survey points to characterize the radiation present and to verify boundaries. Surveys will be performed before, during and at the completion of work that has the potential for causing changes in levels of radiation and radioactivity.

3.3.1.3 Methods of Contamination Control

Entrance into the radiological work areas will require radiation worker training. Personnel who do not have the required training will be escorted by a trained individual while in the area. Workers shall sign the RWP and be fitted with the required protective clothing and equipment. The RWP is an administrative mechanism used to establish radiological controls for intended work activities. The RWP informs workers of area radiological conditions and entry requirements, including pre-job briefing, training and protective clothing. All workers shall be

required to sign the RWP. Workers shall also be briefed about the current facility conditions and wear personal dosimetry, as appropriate. Postings shall be used to alert personnel to the presence of radiation and radioactive materials. Postings shall follow established color schemes and verbiage. In areas of ongoing work activities, the dose rate and contamination level, or range of each, shall be included with each posting as applicable. Area identification techniques, such as rope and tape, shall indicate the boundaries of the work area.

Control of radioactive contamination is achieved by using engineering controls and worker performance to contain contamination at the source, reduce areas of contamination and promptly decontaminate areas that have become contaminated. Examples of engineering controls to be utilized are the use of mist during excavation activities to mitigate the amount of airborne. The dump truck driving route will be designated by the use of cones to limit the area requiring surveying or decontamination. The implementation of a contaminated tool crib in the processing area shall minimize the use of radiologically clean tools or equipment.

Personal protective clothing will be worn only if deemed necessary. This will ensure any waste generated by the remediation activities will be kept to a minimum.

All material leaving the controlled area will be 100% scanned with the appropriate survey instrumentation and the results documented on the appropriate survey forms. This survey will ensure that the item is either not contaminated or properly handled for either decontamination or disposal as radioactive waste.

3.3.2 Instrumentation and Equipment Use

All detection instruments used will be certified as acceptable for detecting radiation levels appropriate to the Greenville site. Records of calibration and periodic operational checks of fixed and portable laboratory radiation measuring equipment shall be maintained. These records shall include frequencies, methods, dates, personnel training and traceability of calibration sources to the National Institute of Science and Technology or other acceptable standards. Section 4.3 of this report contains the required specifications for instrumentation used in the D&D.

The following contains a list of equipment used for surveying activities:

Instrument	Use	Radiation
TLD	Daily personnel exposure	gamma
Ludlum 2221 with AC-3 probe	Fixed alpha release surveys	alpha
Ludlum 2221 w/44-9 GM probe	Fixed beta-gamma release surveys	beta/gamma
Bicron Micro-Rem meter	General area exposure rate measurement	gamma
Canberra Inspector	Spectroscopy for Soil Samples	gamma

3.3.3 Quality Assurance in the Health Physics Program

A radiological records management program will be established by the Project Manager. This program will ensure that the auditable records and reports are controlled through the stages of creation, distribution, use, arrangement, storage and retrieval. Radiation dose records will be maintained for all contractor and subcontractor employees. The Site Supervisor shall also maintain training records which summarize the scope of the training, the instructor's name, the training dates, and the names of the individuals who attended.

The elements of this plan include, in part, controlled procedures for performing all decommissioning activities, daily instrument performance checks, data review including routine surveys, radiation work permits and the use of properly calibrated equipment.

3.4 Contractor Personnel

NES, Inc. is the approved outside contractor used by Whittaker Corporation for the D&D of the Greenville site. All safety practices and policies discussed in Sections 3.2 and 3.3 of this document will be followed to ensure the safety of the contractor personnel.

3.5 Radioactive Waste Management

Any radioactive waste generated as a result of the remediation activities will be characterized, packaged in 55 gallon drums, and remain the property of Whittaker Corporation. The waste will consist of personal protective clothing and equipment decontamination supplies. In the event that liquids are generated, they will be sampled and analyzed to determine if they are contaminated above radiological release criteria. If the liquids are contaminated, they will be absorbed and stored on-site.

4.0 Planned Final Radiation Survey

4.1 Method of Survey Performance

The final survey of the Greenville site will follow the methods and procedures outlined in NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." This contains all survey and radiological health support operation requirements which will be incorporated while performing the final survey. Instruments used to perform radiation surveys will be response checked daily or prior to operation. Performance of radiation surveys will include dose rate measurements of the general area. Swipe surveys for removable contamination on all equipment used will be reported in units of disintegrations per minute per 100 cm^2 (dpm/100 cm^2). For swipe surveys of small items covering less than 100 cm^2, the results will be reported in units of dpm per area swiped. Additionally, large area swipes should be used to supplement the standard swipe techniques. Direct integrated count measurements, scans and smears will be used on all affected equipment. For a detailed description of final survey procedures see Section 2.1.2.

4.2 Release Criteria and Background Radiation

All unrestricted release criteria shall follow the specifications of the USNRC SECY-81-576, "Disposal or On-site Storage of Residual Thorium or Uranium From Past Operation (Ref. 4)." These radiological limits are given in Table 4.1. Exposure rates of 10 μR/hr over background or twice background, whichever is limiting, will be used for exposure criteria. All contamination and exposure levels shall fall under these maximum detection limits in order to be released for unrestricted access.

Table 4.1 Maximum Concentrations Permitted Under Disposal Options

Kind of Material	Based on EPA Cleanup Standards
Natural Thorium (Th-232 + Th-228) with daughters present and in equilibrium	10 pCi/g
Natural Uranium (U-238 + U-234) with daughters present and in equilibrium	10 pCi/g

The criteria for release of the consolidated area will be specified in the revision to this decommissioning plan after completion of the risk assessment.

4.3 Instrumentation

Selection of instruments will be dependent upon the radiological conditions present at the Greenville site. All instrumentation used will be certified as acceptable for detecting radiation levels appropriate to the Greenville site. The primary contaminates are natural uranium and thorium. Gamma spectroscopy will be used on-site to analyze soil samples.

Health Physics technicians will ensure the proper operation of all portable radiological instruments and proper monitoring procedures as outlined in the National Council on Radiation Report Number 58, "A Handbook of Radioactivity Measurements (Ref. 6)." All portable survey instruments and self reading dosimeters will be calibrated by the instrument manufacturer or approved vendor to ANSI Standard N323. Calibrated survey instrumentation will be used throughout the project. All required calibration documentation, such as calibration data sheets and labels, will be kept current and accurate. Each instrument will be labeled with a calibration sticker indicating the calibration and calibration due date. Additional instrument operational checks will include battery checks, physical checks, high voltage checks, and response source checks.

The following is a list of equipment that will be used in the final survey of the Greenville Site.

Instrument	**Use**
TLD	Personnel exposure
Eberline RAS-1	Low volume air samples as specified by the SHSO
SAIC/Radeco H-809 VII	High volume air samples as specified by SHSO
Ludlum 2221 with 43-5 probe	Fixed Alpha/Personnel survey
Ludlum 2221 w/44-9 GM probe	Fixed beta-gamma/Personnel survey
Bicron Micro-Rem meter	General area exposure rate measurement
Ludlum 2929 phoswich detector	Smear counter for gross counts
Canberra Inspector	Spectroscopy for Soil Samples

4.4 Minimum Detectable Activities (MDAs)

Minimum Detectable Activities (MDAs) will be calculated for the survey instrumentation. Calculation of the MDAs determines the instrument detection sensitivity which gives the statistically determined quantity of radiation that can be detected at a preselected confidence level. The MDA is a deductive estimate of the minimum activity level which is practically measurable with a specific instrument. The MDA will be found by the following equation:

$$MDA = \frac{\frac{2.71}{T_s} + 3.29\sqrt{\frac{R_b}{T_b} + \frac{R_b}{T_s}}}{(efficiency)\,(\frac{probe\ area}{100\ cm^2})},$$

where,

R_b = background counting rate
T_b = background counting time
T_s = sample count time

4.5 Quality Assurance for the Final Survey

To assure all final survey results are accurate and uncertainties have been considered, a Project Management Plan (PMP) will be developed which will contain the quality assurance requirements for the project.

5.0 Funding

An estimate has been prepared of the anticipated costs, in 1996 dollars, to prepare a Risk Assessment and relocate the slag at the Greenville site. Whittaker Corporation has set aside sufficient funds to cover the cost of the relocation. The cost estimate includes project duration, manpower, and equipment requirements. The associated labor costs have also been calculated.

A summary of the estimated total cost for each activity performed during the decommissioning is presented below. Costs for site restoration have not been included because the scope will not be known until completion of the Risk Assessment and the recommendations of the Risk Assessment approved by the USNRC.

Task 1		99,500
Task 2		35,200
Task 3/7		4,100
Task 4/5		167,800
Task 6		To be determined
Task 8		10,500
Whittaker Project Manager Oversight		10,000
	Subtotal	327,100
	PA Sales Tax	19,600
	Subtotal	346,700
	20% Contingency	69,300
	Grand Total	416,000

6.0 Physical Security Plan and Material Control and Accounting Plan Provisions in Place During Decommissioning

No physical security plan or special nuclear material control is needed or planned. The Greenville site is a secured area with the entrance gate maintained by Greenville Metals at all times. Site wide security measures such as controlled entry and on-site security will apply to the site decommissioning.

7.0 References

1. ORAU, *Radiological Characterization of the Waste and Slag Storage Area Whittaker Metals Corporation Property, Greenville, PA*; July, 1988.

2. Whittaker Corporation's USNRC License No. SMA-1018.

3. USNRC NUREG/CR-5849, *Manual for Conducting Radiological Surveys in Support of License Termination*; December, 1993.

4. USNRC SECY-81-576, *Disposal or On-site Storage of Residual Thorium or Uranium from Past Operations*; October, 1981.

5. 10 CFR Part 20, *Standards for Protection Against Radiation*; U.S. Nuclear Regulatory Commission, February 26, 1993.

6. National Council on Radiation Protection, *A Handbook of Radioactivity Measurements*; Report No. 58.

7. USNRC Policy and Guidance Directive PG-8-08, *Scenarios for Assessing Potential Doses Associated with Residual Radioactivity*; May 1994.

8. Environmental Assessment Division, ANL, DOE, *Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0.*

9. RESRAD Computer Code, ver. 5.61, Environmental Assessment Division, Argonne National Laboratory, Department of Energy.

10. NUREG/CR-6232, *Assessing the Environmental Availability of Uranium in Soils and Sediments*; June 1994.