Radiation Health and Safety Plan

Kaiser Aluminum & Chemical Corporation
Thorium Remediation Project
Tulsa, Oklahoma

Kaiser Aluminum & Chemical Corporation
Baton Rouge, Louisiana

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Baton Rouge, Louisiana

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Approval

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Thorium Remediation Project
Tulsa, Oklahoma

1.0 Purpose

The goals of the Radiation Health and Safety Plan (RHASP) are to minimize the potential risk of harm incurred by employees, contractors, visitors, and the general public as a result of radiation-related work activities, and to demonstrate compliance with applicable laws and regulations related to radiation protection and control of radioactive materials. This RHASP has been developed to guide generation and implementation of contractor radiation safety plans and procedures and to ensure that contractors develop plans and procedures to implement radiological controls for workers, visitors, and the general public commensurate with the risks associated with Thorium Remediation Project at the Kaiser Aluminum & Chemical Corporation (Kaiser), Tulsa, Oklahoma facility. Additional work plan contents are described in Sections 9.2.4, 10.0, and 11.0 of the Kaiser Decommissioning Plan (DP). Information about the current radiological status of the Kaiser facility is provided in Section 4.0 of the Kaiser DP and DP Addendum.

2.0 Scope

This RHASP is designed to supplement a Health and Safety Plan (HASP), Environmental Monitoring Plan (EMP), and Quality Assurance/Quality Control Plan (QA/QC Plan) and all other contractor prepared plans and applies to all contractors, visitors, and employees at the Kaiser Tulsa, Oklahoma facility. In preparing their HASP, EMP, QA/QC Plan, and all other plans, the Contractor shall, at a minimum, address all the elements described in this RHASP, Kaiser's Environmental Health and Safety Plan, and Kaiser's Quality Assurance Plan.

3.0 References

(1) Decommissioning Plan, Tulsa Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Revised May 2003.

(2) Decommissioning Plan Addendum, Tulsa Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Revised May 2003.

(3) Adjacent Land Remediation Plan for Kaiser Aluminum & Chemical Corporation, Tulsa, Oklahoma, Rev. 1, July 1999.

(4) Environmental Health and Safety Plan, Kaiser Aluminum and Chemical Corporation, Tulsa, Oklahoma, Rev. 3, October 2003.

(5) Quality Assurance Plan, Kaiser Aluminum and Chemical Corporation, Tulsa, Oklahoma, Rev. 2, October 2003.

(6) Title 10, Code of Federal Regulations, Part 19, "Notices, Instructions and Reports for Workers; Inspection and Investigations."

(7) Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation."

(8) Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

(9) Title 29, Code of Federal Regulations, Part 1910, "Occupational Safety and Health Standards."

(10) Title 29, Code of Federal Regulations, Part 1926, "Safety and Health Regulations for Construction."

(11) ANSI N323 - American National Standard Institute, "Radiation Protection Instrumentation Test and Calibration," N323-1978, 1978.

(12) Information Notice 96-18, Compliance with 10 CFR Part 20 For Airborne Thorium, dated March 25, 1996.

(13) Information Notice 96-28, Suggested Guidance Relating to Development and Implementation of Corrective Action, dated May 1, 1996.

(14) National Council on Radiation Protection and Measurements Report 127, Operational Radiation Safety Program, 1998.

(15) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.21, Health Physics Surveys for Byproduct Material at NRC-Licensed Processing and Manufacturing Plants, Revision 1, October 1979.

(16) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.25, Air Sampling in the Workplace, Revision 1, June 1992.

(17) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.7, Instructions for Recording and Reporting Occupational Radiation Exposure Data, Revision 1, June 1992.

(18) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.34, Monitoring Criteria and Methods to Calculate Occupational Radiation Doses, July 1992.

(19) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.36, Radiation Dose to the Embryo/Fetus, July 1992.

(20) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.9, Rev. 1, Acceptable Concepts, Models Equations, and Assumptions for a Bioassay Program, Revision 1, July 1993.

(21) U.S. Nuclear Regulatory Commission, NUREG-1460, Guide to NRC Reporting and Recordkeeping Requirements, Rev. 1, July 1994.

(22) U.S. Nuclear Regulatory Commission, NUREG-1506, Measurement Methods for Radiological Surveys in Support of New Decommissioning Criteria, 1995.

(23) U.S. Nuclear Regulatory Commission NUREG-1507, Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions, 1997.

(24) U.S. Nuclear Regulatory Commission NUREG-1575, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Revision 1, 1997.

(25) U.S. Nuclear Regulatory Commission NUREG-1549, Decision Methods for Dose Assessment to Comply With Radiological Criteria for License Termination, July 1998.

(26) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure, Revision 3, June 1999.

(27) U.S. Nuclear Regulatory Commission, Regulatory Guide 8.15, Acceptable Programs for Respiratory Protection, Revision 1, October 1999.

(28) U.S. Nuclear Regulatory Commission, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" in Policy and Guidance Directive FC 83-23.

(29) U.S. Nuclear Regulatory Commission NUREG-1660, Specific Schedules of Requirements for Transport of Specified Types of Radioactive Material Consignments.

4.0 ALARA

ALARA stands for "As Low as Reasonably Achievable." It is Kaiser's management policy to maintain radiation exposures to its employees, contractors, and the general public as far below the limits specified in 10 Code of Federal Regulations (CFR) 20 as is reasonably achievable. The ALARA program will be implemented through the training of employees and contractors, work procedures and practices, safety work permit use, good housekeeping, dust and contamination control practices, and, as necessary, use of personal protective equipment (PPE).

5.0 Radiation Safety Organization and Responsibilities

5.1 Kaiser Project Manager

Overall control and authority for management of decommissioning activities rest with the Project Manager (PM). Kaiser's Management team (PM, Health Physics Advisor/Radiation Safety Officer [HPA/RSO], and Site Administrator [SA]) collectively will ensure that the guidance provided in the RHASP is followed during the Thorium Remediation Project.

The responsibility of the Kaiser PM includes, but is not limited to, the following:

- Review and approval of plans and procedures to complete remedial actions and consult with the HPA/RSO for guidance on special issues, contractor plans and procedures and review of radiological health and safety issues; and
- Ensure that remediation activities and radiological safety practices meet the established environmental, health and safety, and QA requirements in accordance with the requirements of this RHASP and applicable permits/licenses and/or regulatory and contract requirements.

5.2 Kaiser HPA/RSO

The HPA/RSO shall be responsible for the radiological health and safety of all remediation activities involving radioactive material including the review of all elements of the contractor's radiation protection program and procedures for radiation work, radioactive material handling, packaging and transportation. The HPA/RSO may also review qualifications of personnel designated for certain positions in the Decommissioning Management Organization. The HPA/RSO shall have the responsibility and authority to terminate any work activities involving radioactive material at the site. The contractor radiation protection program will be reviewed prior to the start of work and annually by the HPA/RSO to ensure compliance with commitments.

Other duties and responsibilities of the HPA/RSO shall include the following:

- Reviewing contractor radiological hazard assessments and ensuring the implementation of appropriate radiation safety precautions.
- Performing routine reviews of radiological procedures and of the implementation and documentation of all work activities involving radioactive material.

- Reviewing unusual incidents involving radioactive material and providing recommendations on preventing recurrence of such incidents.
- Ensuring that the contractor has established appropriate criteria for determining the proper level of review and authorization for radiological work such as the safety work permit system.
- Ensuring that the commitments of the DP, RHASP, and permit conditions are met, and that all required records are maintained.
- Reviewing exposure results and ensuring that the contractor is issuing dosimetry devices and maintaining personnel dosimetry records, and providing required reports of personnel exposure on a timely basis for review and turnover to Kaiser.
- Ensuring that the contractor is maintaining records of radiological surveys, evaluations, and audits.
- Ensure that the contractor is arranging services for bioassay analysis if necessary.
- Ensuring that the contractor has established a training program for all personnel accessing restricted areas.

The HPA/RSO shall be accountable directly to the Kaiser PM.

The HPA/RSO may delegate on-site Radiation Safety duties to qualified personnel, at his discretion.

For the Thorium Remediation Project, the RSO has chosen not to use the Contractor Assistant RSO and will delegate certain RSO responsibilities to qualified personnel.

5.3 Contractor Project Manager (CPM)

The CPM is responsible for planning, managing, and coordinating all contractor activities in accordance with the contractor's written procedures. The CPM will report to the Kaiser SA and will ensure that remediation activities meet the established environmental, health and safety, QA requirements, technical performance, budgeting, and scheduling criteria. The CPM will be authorized to stop any activity that may be unsafe or is in violation of a regulatory requirement.

5.4 Contractor Health and Safety Supervisor

The Contractor Health and Safety Supervisor will be responsible for implementing measures that provide safe and healthy work conditions, for assuring radiation exposures are maintained ALARA, and for minimizing release of radioactive material to the environment.

5.5 Contractor Site Personnel/Individual Workers

Each individual assigned to the project is responsible for demonstrating familiarity with the radiation protection program, for strict adherence to the radiation protection rules and regulations, and for minimizing radiation exposure to the maximum extent practical. Flagrant or willful disregard of radiological protection rules, regulations, or practices shall result in disciplinary action. Each individual shall be provided training and, at the discretion of the HPA/RSO, successfully demonstrate competence through testing on the requirements of the radiation safety program.

All individuals working in the restricted area shall have a working knowledge of the radiological protection rules, regulations, and procedures. This knowledge shall be obtained through current training and instruction/briefings commensurate with the individual's work assignment.

The Safety Work Permit (SWP) is the one document that the individual must be most familiar with for radiological conditions and precautions in the individual's work area. Each individual working in areas covered by a SWP must comply with and obey all requirements of the SWP

All contractor personnel shall report unusual conditions or circumstances involving radioactive material that may lead to a hazardous condition or noncompliance with safe radiological work practices.

5.6 Visitors

Persons visiting or conducting work at the Kaiser facility in Tulsa, Oklahoma are required to be familiar with Kaiser's health and safety requirements of the site. Visitors will be required to read and understand Kaiser's Visitor Health and Safety Plan Synopsis, sign in and out on the Visitor Log, and be accompanied by facility personnel while on the site.

Kaiser may delegate health and safety and site access authority to a qualified contractor. Site visitors will be required to comply with the contractor's requirements for visitors in the contractor's RHASP.

5.6.1 Visitor Activities

Visitor activities are limited to observation. Visitors are not to be present in restricted areas when remediation activities are being conducted. Under these conditions, visitors will have a limited potential for contact with contaminated materials. Persons accessing active remediation areas, exclusion zones, or contamination reduction zones; conducting activities other than observation; and unescorted visitors will be required to read and understand Kaiser's Health and Safety Plan and complete the facility orientation program.

5.6.2 Visitor Responsibilities

Visitors to the Kaiser facility are admitted as a courtesy and must leave when requested to do so. Visitors are responsible for signing in and out. All visitors are responsible for behaving in a mature manner and following instructions, particularly in emergency situations.

5.6.3 Prohibited Activities

Visitors may not smoke, drink, eat, chew gum or tobacco, or apply cosmetics while in the restricted areas of the Kaiser facility. Visitors may not enter the restricted areas unescorted.

5.6.4 Exposure Control

Visitors may be required to wear radiation dosimeters to evaluate exposure to radioactivity. Visitors may be requested to submit to a direct personal survey to detect incidental radiological contamination and prevent the spread of contamination to clean areas.

5.6.5 Personal Protective Equipment

Visitors accessing the restricted areas of the site must wear the required PPE for the area. As a minimum, visitors will wear rubber overboots. Hard-toe boots, hard hats, cotton coveralls, safety glasses, and gloves, and/or rain gear may be required depending on site conditions and operations at the time of the visit. Visitors who enter areas where respiratory protection is necessary must provide evidence that they possess the training, medical surveillance, and fit testing required by OSHA regulations.

5.6.6 Decontamination

Decontamination procedures will be utilized to remove contamination from persons, clothing, or objects. Overboots will be washed at the boot wash station and removed before leaving the contamination reduction zone. Disposable PPE and items requiring additional cleaning will be carefully removed and placed in the designated containers. Decontamination of the skin, if necessary, will consist of washing the affected area with soap and water.

6.0 Radiation Protection Program Elements in Contractor Radiological Plans

This section contains elements and guidance that shall be addressed in the remedial contractor's RHASP, procedures, and work plans.

6.1 Plans and Procedures

Contractor radiological plans and procedures shall be consistent with health and safety protection measures and policies as expressed in the appropriate Kaiser Environmental Safety and Health Plan, Kaiser QA Plan, Kaiser DP, Kaiser site manuals and procedures.

6.2 Training

The contractor shall establish a training program to meet the applicable training requirements specified by the NRC, Occupational Safety and Health Administration (OSHA), and the Department of Transportation. All employees and contractors will also receive training on the DP to ensure that all personnel understand the objectives of the plan and the routine operations and precautions to meet the plan objectives. The training program will include general radiation safety training/monitoring, site orientation, site-specific training, and training verification and documentation.

6.2.1 General Radiation Safety Training/Monitoring

At a minimum, all site personnel will be required to have radiation safety training commensurate with the radiological. The contractor will provide radiation dosimetry to personnel who enter restricted areas.

6.2.2 Site Orientation

Prior to entry into any restricted area of the Kaiser site, personnel and visitors will be given a site and radiological orientation. Objectives of this orientation will be to familiarize personnel and visitors to:

- recognize labeled or posted radioactive materials and understand the meaning of radiological warning signs;
- understand that as long as radiological control procedures and limits are followed, potential harmful effects to personnel and the environment from radioactivity will be minimized; and
- recognize and understand the meaning of, and proper response to, emergency signals.

6.2.3 Site-Specific Training

Site-specific training will be required of all contractor personnel involved in day-to-day operations of the remediation project, project and management personnel who visit the site regularly, and other personnel identified by Kaiser's SA. Prior to being allowed unescorted access to the site and issuance of radiation dosimetry, each person shall demonstrate a basic knowledge of radiation worker training.

Radiation safety training for workers will be commensurate with their duties and responsibilities and the magnitude of the potential exposure to direct radiation and contamination in accordance with 10 CFR Parts 19 and 20.

Prior to the initiation of daily work activities, the CPM, or designee, will hold a "kick-off" meeting to familiarize workers with the day's activities and their associated procedures, SWPs and safety requirements. A roster will be maintained for each daily meeting. Changes to standard procedures as a result of unique project conditions will also be discussed during these "kick off" meetings. Procedure retraining will be provided as necessary prior to implementation.

6.2.4 Training Verification and Documentation

Personnel working on site will present evidence of general radiation safety training and past exposure history in accordance with 10 CFR Parts 19 and 20 and pertinent refresher training (e.g., training certificates, letter of certification) prior to performing work in restricted areas of the site. Initial and annual refresher training shall include instruction in the fundamentals of radiation protection. The degree of instruction will be determined by work assignment and will ensure that workers understand how radiation protection relates to their jobs. The minimum training provided to any worker will include, but not necessarily be limited to, the following subjects:

- Radiation monitoring techniques
- Radiation monitoring instrumentation
- Emergency procedures
- Radiation hazards and controls
- Concepts of radiation and contamination
- Provisions of applicable sections of 10 CFR Parts 19 and 20
- Responsibilities of workers and supervisors
- Reporting requirements for workers
- ALARA and exposure control procedures
- PPE

- Biological effects of radiation
- Radiation control zone procedures
- Safety Work Permits
- Waste Management

Records of individual training and qualifications will be maintained at the site until the completion of all remediation activities and will include the trainee's name, training date, subjects covered during training, written test results, and the instructor's name.

All contractor personnel will be required to have OSHA 1910.120 training and the contractor shall meet all the requirements in OSHA 1910.120. The contractor shall provide evidence of this training for each worker. In addition, all site personnel shall sign a statement certifying and acknowledging that they have received site-specific training and that they understand the potential site hazards and the necessary control measures to reduce and/or eliminate those hazards. Training documentation, including the content of site-specific training and any other subsequent training (e.g., periodic safety meetings and specific task safety meetings), will be submitted to Kaiser's SA .and will be maintained by the contractor for a suitable period to be specified by Kaiser. This information will be available for inspection by Kaiser.

NRC Form 3 shall be conspicuously posted in a sufficient number of places to permit employees working in or frequenting restricted areas to have access to a copy on the way to or from their place of work.

6.3 Work Zones and Access Control Points

Temporary work zones and control points shall be established at the boundary of restricted and unrestricted areas to control radiation exposure and limit the spread of radioactive material. Kaiser may delegate establishment of work zones and control points to a contractor.

Unrestricted Area means any area access to which is not controlled for purposes of protection of individuals from exposure to radiation and radioactive materials.

Restricted Area means any area to which access is managed for purposes of protection of individuals from exposure to radiation and radioactive materials. Within the restricted areas, different radiological control zones (RCZ) may be designated to aid in radiation exposure control and control of the radioactive materi-

als present. Such areas include, but are not limited to: RADIOACTIVE MATERIAL AREA, RADIATION AREA, CONTAMINATION AREA, and AIRBORNE RADIOACTIVITY AREA.

Temporary control zones and contamination reduction areas will be marked in the field using flagging tape or temporary construction fencing with appropriate signs. Temporary control zone or contamination reduction area barriers will remain in place until the work in the zone is completed or until the potentially hazardous conditions that caused an area to be designated as a control zone are eliminated. The signs will have the radiation symbol and appropriate wording to warn workers of the potential hazard.

Entry points to restricted areas will be posted in accordance with 10 CFR 20.1902. Instructions describing proper techniques of personal frisking, donning and doffing of protective clothing and other special entry requirements will be posted.

Personnel entering a restricted area shall have received the appropriate training or be escorted by trained personnel. Personnel entering a restricted area shall read and sign the appropriate SWP which acknowledges their understanding of and adherence to the requirements set forth in the applicable SWP.

A restricted area may include control points containing a step off area (pad) that separates the two sides. A personnel survey meter (frisker) will be available to be used for individuals to perform the required personnel survey upon exiting the control point.

Support zone/clean areas are to consist of areas of the site which are not contaminated and are not being used for the contamination reduction area. Effort will be undertaken to prevent the contamination of clean areas and the support zone/clean area. Personnel and equipment that enter the support zone/clean area after having been in the control zone or contamination reduction area will be surveyed and decontaminated, if necessary. Clean areas will be surveyed in accordance with a routine survey schedule.

6.4 Radiation Exposure Control

Remediation activities at the Kaiser site will be controlled such that no occupationally exposed worker will exceed any 10 CFR 20 occupational limits set forth in 10 CFR 20 Subpart C and shall be kept ALARA. These limits apply to all Radiation Workers 18 years of age or older. Internal dose to a specific organ is given as Committed Dose Equivalent (CDE), while the internal dose relative to a whole body

exposure is given as Committed Effective Dose Equivalent (CEDE). External dose is expressed as Deep Dose Equivalent (DDE), Shallow Dose Equivalent (SDE) and Lens of the eye Dose Equivalent (LDE).

The annual occupational exposure limits from 10 CFR 20 are as follows:

- TEDE (CEDE + DDE) 5 rems (0.05 Sv)
- Lens of Eye (LDE) 15 rems (0.15 Sv)
- Other Organs (CDE + DDE) 50 rems (0.5 Sv)
- Skin or Extremity (SDE) 50 rems (0.5 Sv)

The dose to an embryo/fetus due to occupational exposure of a woman who has declared her pregnancy in writing is limited to 0.5 rems (0.005 Sv) TEDE during the entire pregnancy. Data relating to dose to the embryo/fetus of a declared pregnant worker or former declared pregnant worker will not appear on her NRC Form 4 or Form 5. Such data will only be provided to other individuals upon written request by the declared pregnant worker authorizing release of the data. The data may be provided to the declared pregnant worker herself upon verbal request. As part of the radiation safety training (and refresher training) and prior to issuance of a radiation dosimeter, women authorized to receive radiation exposure will be given specific instruction regarding prenatal exposure risks to a developing embryo and fetus. This instruction will include information contained in the Appendix to NRC Guide 8.13 "Instruction Concerning Prenatal Radiation Exposure".

Upon their initial visit to the site, personnel will be required to complete and sign a NRC Form 4. Personnel without a signed, up-to-date, NRC Form 4 or equivalent current year occupational exposure history on site shall be limited to a dose accumulation of less than 0.1 rem (0.001 Sv) TEDE until the individual to be monitored provides current year dose history. Visitor's exposures shall be limited too less than 0.1 rem (0.001 Sv) TEDE in a year. Note that persons (visitors) who need to exceed this limit, or enter a contamination area, airborne radioactivity area, or a radiation area shall complete Radiation Worker Training and fully participate in the personnel monitoring program.

10 CFR 20 specifically limits anyone under the age of 18 years of age to doses not exceeding 0.1 rem (0.001 Sv) TEDE. Individuals under the age of 18 will not be permitted to enter any radiologically restricted area at the Kaiser site.

Remediation activities at the Kaiser site will be controlled such that: 1) no member of the public shall receive a TEDE in one calendar year exceeding 0.1 rem (1 mSv) in accordance with 10 CFR 20 Subpart D, 2) the dose in any unrestricted area from external sources shall not exceed 2 mrem (0.02 mSv) in any one hour, and 3) air emissions of radioactive material into the environment (excluding Radon) are controlled to preclude release to the environment of airborne radioactivity greater than the concentration limits of 10 CFR 20, Appendix B, Table 2, Column 1.

6.5 Personnel External Exposure Monitoring

Individual dose monitoring is performed to demonstrate compliance with the dose limits in 10 CFR 20 and to assess successful implementation of ALARA. Individual dose monitoring includes internal and external exposure. Procedures for the issue, collection, processing, and recording of personnel radiation dosimetry and exposures shall be utilized. Dosimetry will be analyzed at a frequency not to exceed quarterly. Written dosimetry reports of exposure will be issued annually to each person issued a dosimeter.

Personnel dosimetry for radiation workers shall include a whole body radiation badge. When the whole body is exposed uniformly, the radiation dosimeter shall be worn on the frontal area of the torso between the neck and the waist. Deep dose and shallow dose monitoring devices shall be worn in areas receiving the highest applicable dose. If relocation of the whole body dosimeter is required, the SWP will specify where the dosimeter is to be worn.

Radiation dosimeters will be processed only by vendors that maintain a processing program that is currently accredited by the National Voluntary Laboratory Accreditation Program for the energies and types of radiation expected to be encountered at the Kaiser site.

If monitoring is performed for personnel exposure to gamma radiation, it will be done using radiation dosimetry and/or radiation survey meters. The radiation exposure rate survey meter for occupational gamma surveys on this project will have a minimum detection rate of approximately 5 μR/hr.

When not in use, radiation dosimeters are stored in a designated low background area.

Lost or damaged radiation dosimeters shall be immediately reported to immediate supervisor.

Certain radionuclides given to personnel for medical diagnostic purposes can result in measurable radiation levels for some period after receiving the treatment. The dose received from this treatment is exempt from regulation. Badged employees shall notify the HPA/RSO if they have received such treatment. In such a situation, the person may be restricted from wearing dosimetry until the medical isotope is eliminated from the body to the extent that it will not affect dose measurements. The only purpose of restricting this individual from wearing dosimetry is to avoid including radiation exposure from the medical isotope to that received from Kaiser remediation activities. Such personnel shall also be restricted from entering areas requiring monitoring for radiation until the medical radionuclide is eliminated from the body to the extent that it will not affect personnel monitoring.

6.6 Internal Exposure Monitoring

Internal exposures will be assessed singly or by a combination of measurements of: 1) airborne radioactivity in work areas; 2) quantities of radionuclides in the body, and 3) quantities of radionuclides excreted from the body.

Internal exposure monitoring shall be performed to assess the dose to personnel who are likely to receive, in 1 year, an intake in excess of 0.1 ALI (annual limit on intake) in 10 CFR 20, Appendix B, Table 1, Column 2 or if the committed effective dose equivalent to declared pregnant worker is likely to exceed 0.05 rem (0.5 mSv).

Kaiser and its Contractors will maintain the internal exposure of persons to radioactive materials ALARA. The use of engineered controls will be employed to the maximum extent practical. If engineered controls are not adequate as demonstrated by work area air sampling, then respiratory protection will be considered to control internal exposures to radioactive materials. Internal exposure monitoring will generally consist of airborne exposure monitoring (air sampling).

6.7 ALARA

The radiation protection responsibility at the Kaiser site is to maintain exposures ALARA for employees, visitors, contractors, the public, and the environment. This responsibility is carried out by means of the following:

- Information and policy statements to employees.
- Periodic management audit of operational efforts to maintain exposures ALARA.
- Delegation of sufficient authority to the HPA/RSO to enforce regulations and administrative policies regarding radiation safety.
- Administrative direction to ensure that any new operation that may affect radiation protection will be planned or designed in consultation with or approval from the HPA/RSO or designee.
- Contractor prepared ALARA review and approval procedure.

6.8 QA/QC Program

The RHASP is subject to management controls and QA requirements. In addition to general QA review and independent oversight, surveillances and audits shall be performed as needed to assess whether the quality controls are adequate to assure radiological safety requirements are met. The contractor shall designate a Quality Control Supervisor (QCS) who will report to the CPM. The QCS will communicate and coordinate directly with the CPM and will have the delegated responsibility and authority to direct and control contractor QC functions to assure that QC objectives are met. Responsibilities of the QCS include coordination of contractor QC activities and ensuring that appropriate quality management, policy, training, and verification controls are present. The QCS shall provide all necessary QC information to the CPM, Kaiser's SA, and the RSO/HPA.

Radiological surveys, including sampling and analysis, are performed in order to evaluate the effectiveness of remediation efforts in maintaining adequate radiological controls and to evaluate materials for removal and disposal.

Health Physics instrumentation and equipment as well as respiratory protection equipment is inspected prior to use. Equipment failing the inspection due to equipment malfunction, poor calibration, or inappropriateness due to use restrictions, are identified, marked, and not used.

Periodic surveillances and audits of the Health Physics Program shall be conducted. The audits are performed by the Kaiser RSO/HPA. Unusual events will be investigated as they occur in accordance with a written corrective action process.

Contractor personnel will determine the quantity, performance specifications, calibration, maintenance and testing requirements and capabilities for radiation detection, monitoring, and sampling instrumentation and equipment. Contractor personnel and/or vendors will be responsible for calibration, maintenance, proper storage of such equipment, and the control of the instrument check sources.

Selection criteria for portable and laboratory counting equipment are based upon the types of radiation to be detected, maintenance and calibration requirements, ruggedness, interchangeability, and upper and lower limits of detection capabilities. MARSSIM contains a list of the typical types of radiation detection instruments to be used during remediation of the Kaiser site.

Radiation detection and sampling instrumentation and laboratory counting instruments utilized for radiation safety purposes will be calibrated before initial use, after major maintenance, and on a routine basis. Portable radiation detection and sampling equipment/instrumentation will be calibrated annually by a qualified vendor in accordance with ANSI N23.17A-1978 guidance for each type of radiation of concern at the site. All calibrations will consist of performance checks on each scale range of the instrument with a radioactive source of known activity traceable to the National Institute of Standards and Technology. Portable instrumentation operability criteria and QA procedures (such as source checks each day the instrument is in use) in compliance with Table 10.1 of NCRP Report 127 shall be implemented.

6.9 Radiation and Contamination Surveys

Routine radiation and contamination surveys will be performed in accordance with written procedures using calibrated instrumentation to ensure that personnel do not exceed occupational exposure limits and minimize personnel exposures ALARA. Contamination surveys are performed to ensure that personnel do not spread surface contamination beyond the controlled area and to minimize unnecessary external and internal exposure resulting from the intake of loose radioactive material by inhalation, ingestion, or skin absorption.

Radiation and contamination surveys will also be used to determine the effectiveness of the overall radiological contamination control and protection program. Information obtained from radiation and contamination surveys are used to evaluate operations and activities as well as operation processes and methods to assure personnel exposures are ALARA.

Radiation and contamination control surveys will be performed by qualified personnel, using instruments appropriate to the type of radiation and/or contamination and type of survey required.

Types of routine radiation and contamination control surveys include the following:

- Personnel Contamination Surveys (Self-Monitoring or Frisking) - Personnel contamination surveys (self-monitoring or frisking) are performed to detect and quantify the possible presence of radioactive material on the body or clothing. Self-monitoring (frisking) is a critical element of the contamination control program. Only individuals who are trained and qualified as radiation workers are permitted to perform self-monitoring. Visitors and non-radiation workers will be surveyed by qualified individuals.

  Personnel will be instructed in the proper method of removing protective clothing and monitoring for personal contamination as part of the formal radiation safety training program. Friskers and/or automated personal contamination monitors (PCMs) will be available at each exit from a controlled area or control point. In the event that personnel contamination is suspected or detected, appropriate HP personnel will be notified and appropriate action taken. In the event a person becomes radioactively contaminated that is not removed by simple decon techniques, then appropriate HP personnel will supervise further decontamination activities and evaluate the need for bioassay followup. Bioassay may be performed at the discretion of the HPA/RSO.

- Area Contamination Surveys - Routine surveys for radioactive contamination shall be conducted during remediation activities at the Kaiser site commensurate with the potential for contamination in the area. In general, area contamination surveys will be performed to provide data for determining radiological conditions that will be used for the issuance of SWPs and for termination of the SWP.

- Remedial Action Surveys - Surveys and sampling will be conducted to assess the effectiveness of decontamination activities.

- Tools, Equipment, and Vehicle Surveys - Tools, equipment, and vehicles in a restricted area will be surveyed for radioactive contamination before release into unrestricted environs.

- Shipping Surveys - Radiation and contamination surveys will be performed on radioactive material packaged to be shipped off site in accordance with 49 CFR requirements. Shipping surveys are considered QA records and will be stored and maintained as part of the Kaiser project file.

6.10 Airborne Radioactivity Control

Engineering controls will be utilized to the maximum extent possible to control the production of dust and airborne radioactivity during the Kaiser Remediation Project. Engineered controls may be, but are not limited to, water misting with, or without, dust control additives.

6.10.1 Locating Air Sampling Equipment

The combination of airborne radioactivity samplers and sample counting systems shall have a Minimum Detectable Activity (MDA) less than 10 percent of the most restrictive applicable derived air concentration (DAC). Airborne particulate surveys are performed with portable high- or low-volume air samplers as follows:

(1) In work areas when the potential or existing conditions exist that may generate airborne radioactivity at levels approaching 10 percent of the DAC.

(2) To ensure compliance with Airborne Radioactivity Area posting requirements.

(3) Sampling locations should be downstream of potential airborne radioactivity release points.

(4) The combination of sample collection volume, collection efficiency and counting system MDA should allow detection of intakes exceeding 10 percent of the applicable DAC.

(5) Signs shall be posted at entrances to areas where airborne radioactivity levels exceed or have the potential to exceed 30 percent of a DAC. These signs shall contain the conventional three-bladed magenta symbol on yellow background and the words "CAUTION, AIRBORNE RADIOACTIVITY AREA."

(6) In areas where there is the potential for airborne radioactivity in excess of 10 percent of the DAC, personal and/or area air samples will be collected to evaluate worker exposure. The results of air filter measurements in conjunction with worker stay times will be used to control worker inhalation (i.e., DAC-hour tracking).

The following process shall be used to assess compliance with Regulatory Guide 8.25 surveillance requirements.

(1) Review characterization survey(s) for thorium concentration in soil where work will be performed that will disturb soil or create dust.

(2) If the Th-232 + Th-228 is less than 200 picocuries per gram (pCi/g) soil, perform occasional air sampling near the dust source. If the Th-232 + Th-228 concentration is 200 pCi/g soil or greater, perform continuous, stationary air sampling near the dust source while workers are present.

(3) Following collection and measurement, compare the results with 10 CFR Part 20, Appendix B, Table 1, DAC limit, (2×10^{-12} µCi/ml). If the analytical results for the air samples exceed 10 percent of the DAC or 2×10^{-13} µCi/ml, the HPA/RSO will be alerted and respiratory protection such as supplied air or particulate masks may be provided for any workers in the affected area.

6.11 Respiratory Protection Program

With the application of process controls, engineering controls, and procedures to control concentrations of radioactive materials in air as required by 10 CFR 20.1701, the use of respiratory protection during the project is not anticipated. If engineering and process controls do not reduce the levels of airborne radioactivity below 1 derived air concentrations (DAC) limit (or when a worker could receive 12 DAC-hours in a week), the use of respiratory protection will be considered based on a prospective intake evaluation and consideration of industrial safety factors in accordance with 10 CFR 20.1702. The purpose of the respiratory protection program is to adequately limit intakes of airborne radioactive materials for workers in restricted areas and to keep the TEDE ALARA. The respiratory protection program shall incorporate the applicable requirements of 20.1701 - 20.1704, Appendix A of 10 CFR Part 20, and the applicable guidance in Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection," and NUREG-0041, Rev. 1, "Manual of Respiratory Protection Against Airborne Radioactive Material." The program will be implemented using written procedures to address all the elements of the respiratory protection program as required by 10 CFR 20.1703. Training, medical screening, and fit testing shall be performed prior to the issuance of National Institute for Occupational Safety and Health-certified respiratory protection equipment that is used to limit intakes of airborne radioactivity.

6.12 SWP and Work Controls

The SWP is an administrative tool used to control work occurring inside a restricted area and to inform personnel involved with the work of specific hazards and precautions in the work area when safety precautions and controls are not specified in a procedure.

Additionally, the SWP will instruct the workers as to what protective equipment will be needed and what monitoring will be required. Work involving thorium in a restricted area at the Kaiser site will be performed under the authority of a SWP or a procedure. Work will be administratively controlled via SWP and/or procedures. SWPs will be issued as necessary and reviewed weekly by the HPA/RSO or his designee. At a minimum, the SWP will include the following information:

- Task(s) to be performed
- Location of Task(s)
- Nonradiological Hazards Involved with the Task(s)
- Radiological Hazards Involved with the Task(s)
- Representative Radiological Survey Results
- Protective Measures and Engineering Controls
- Survey, Monitoring, and Dosimetry Requirements
- Special Use or Restraints
- Names and signatures of individuals performing the task(s)
- Issue and Expiration Dates

Prior to the initial start of work, a pre-job briefing shall be given to all personnel involved in performing the work. Personnel working under the SWP shall document (by their signature) that they have read and understand the SWP and that they have received and understand the instructions from the pre-job briefing, if performed. This applies to any and all subsequent SWP revisions.

6.13 Emergency Action Procedure

A procedure containing detailed instructions for medical, security, fire, and adverse weather emergency response shall be included with the contractor HASP.

6.14 Posting and Labeling

Areas where radioactive materials are present will be posted in accordance with the requirements of 10 CFR 20.1902. Containers of radioactive materials and sealed source materials will be marked with the standard radiation symbol and the words CAUTION RADIOACTIVE MATERIAL. Areas will be classified and posted as RADIATION AREAS or RADIOACTIVE MATERIAL AREAS, per 10 CFR 20.1902. In addition, areas where radioactive material is handled in a dispersible form, such that the potential for inhalation of airborne radioactivity exists, are designated as controlled contamination areas and will be posted as CONTAMINATION AREAS OR AIRBORNE RADIOACTIVITY AREAS. Radiological control personnel will routinely inspect the site for proper postings, damaged or missing postings, and evaluate the need for additional postings.

6.15 Records and Reports

Exposure results will be reviewed by the HPA/RSO. A copy of the dosimetry results as they relate to each named employee will be maintained on site and available for inspection. Personnel monitoring

reports will be maintained in accordance with guidance from NRC Regulatory Guide 8.7, Rev. 1, 1992. Records of surveys and radiation dosimetry results will be considered quality records and will be stored and maintained as part of the Kaiser Project Files. Summation of internal and external doses will be performed in accordance with 10 CFR 20 and appropriate regulatory guidance such as NRC Regulatory Guide 8.34.

Air sampling results will be periodically reviewed by the HPA/RSO. Records of all air sampling results and air sampling instrumentation calibrations will be considered quality records and will be stored and maintained as part of the Kaiser Project Files.

Records of individual exposures to radiation, radiation surveys and monitoring results, and the disposal of material will be maintained in accordance with 10 CFR 20 Subpart L (Records). Records related to the radiation safety program will be maintained as part of the Kaiser Remediation Project Files.