

Quality Assurance Plan

**Kaiser Aluminum & Chemical Corporation
Thorium Remediation Project
Tulsa, Oklahoma**

**Kaiser Aluminum & Chemical Corporation
Baton Rouge, Louisiana**

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Approval

The plan has been approved by:



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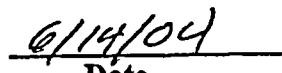


Date

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Date

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Figure

Figure 3-1 – Decommissioning Management Organization

**Quality Assurance Plan
Kaiser Aluminum & Chemical Corporation
Thorium Remediation Project
Tulsa, Oklahoma**

1.0 Purpose

This Quality Assurance Plan (QA Plan) describes the minimum requirements that will be used to assure the precision, accuracy, completeness, and representativeness of the data for remediation of the former Kaiser Aluminum & Chemical Corporation (Kaiser) facility located in Tulsa, Oklahoma. This QA Plan for the remedial action of the Kaiser facility also presents guidelines on specific procedures that will be developed by the responsible organizations to collect quality data. This QA Plan addresses the following:

- The QA objectives of the project.
- QA and quality control (QC) procedures that will be prepared and implemented to achieve these objectives.
- Staff organization and responsibility.

The QA Plan will be used in conjunction with other approved Kaiser, Contractor, and Consultant plans, work instructions, and general procedures to ensure that decommissioning goals are achieved.

2.0 Project Description

In November 1993, the U.S. Nuclear Regulatory Commission (NRC) inspected the Kaiser facility as part of the Terminated License Review Project and found residual contamination at levels exceeding the NRC's criteria for unrestricted release. NRC notified Kaiser that its facility was put on the Site Decommissioning Management Plan (SDMP) list in August 1994.

The purpose of the thorium remediation project is to safely decommission the Kaiser facility to meet the NRC requirements for unrestricted use such that residual radioactivity distinguishable from background will not result in a total effective dose equivalent (TEDE) to an average member of a critical group (resident farmer) that exceeds 25 millirem per year (mrem/yr) and reduce residual radioactivity to levels that are as low as reasonable achievable (ALARA).

The remediation alternative chosen for implementation requires excavating material with a net thorium-232 (Th-232) activity concentration greater than the established Derived Concentration Guideline Level of 3.0 picocuries per gram (pCi/g), based on a dose limit criterion of 25 mrem/yr. Material with Th-232 activity concentrations greater than 31.1 pCi/g will be segregated and disposed off site as either exempt or nonexempt material at a permitted facility. Material with activity concentrations less than 31.1 pCi/g Th-232 will be placed in the Pond Parcel excavation as backfill. The average Th-232 content of the below-criteria material is estimated to be 7 pCi/g. A layer of clean soil obtained from an off-site source will be placed over the below-criteria fill and graded in a manner to direct drainage away from the site, after which the site will be revegetated.

3.0 Project Organization, Responsibilities, and Personnel Qualifications

Responsibility for the development, implementation, and revision of the QA Plan for the thorium remediation project is shared by corporate and on-site personnel.

3.1 Corporate Responsibility

The Kaiser Project Manager (PM) is responsible for the overall direction of the thorium remediation project. This includes ensuring that activities that affect health and safety and measurements demonstrating compliance with regulatory requirements are accomplished in accordance with this plan.

The specific goals of the QA Program are as follows:

- To prevent the uncontrolled release of radioactive materials off site.
- To ensure that the radiation exposure to workers and to the public from decommissioning activities is below the limits established in 10 Code of Federal Regulations (CFR) Part 20 and maintained ALARA.
- To minimize potential impacts on the health and safety of the public.
- To meet the requirements for the packaging and shipping radioactive and hazardous wastes, as delineated primarily in 10 CFR Part 71, 49 CFR Parts 172 and 173, and the disposal site Waste Acceptance Criteria (WAC), as well as the NRC Final Waste Classification and Waste Form Branch Technical Position as applicable.
- To ensure that work practices employed during all phases of the project are controlled to comply with requirements, that waste is characterized and measured for proper disposition, and that the quality of radiological measurements is suitable to permit regulators to release the site.
- To prevent the unnecessary spread of radiological contamination to uncontaminated areas and minimize the amount of waste generated.

These goals are achieved through training and routine oversight provided by the Site Administrator (SA), Contractor Health and Safety Supervisor (Contractor H&S Supervisor), Lead Health Physics Technician (LHPT), and the Health Physics Advisor/Radiation Safety Officer (HPA/RSO).

Prior to the implementation of field activities, written procedures consistent with the approved decommissioning plan and current guidance will be prepared and reviewed by Kaiser management.

Revisions to the written procedures will be documented and kept as part of the Kaiser project file. Written procedures and plans will have the appropriately controlled Kaiser Project Manager signatures for review and approval. Contractor specific H&S Plans will be submitted to Kaiser as part of the project file.

3.2 Kaiser Management Team and Data Manager

Functional responsibilities of key personnel are described in the following parts of this section. Figure 3-1 depicts the Decommissioning Management Organization and reporting hierarchy.

3.2.1 Kaiser Project Manager (PM)

The Kaiser PM has the overall responsibility for planning and managing remediation activities at the Kaiser facility. The PM is responsible for ensuring that the Kaiser Remediation Project activities meet the established environmental, health and safety, quality assurance requirements, technical performance, and budgeting and scheduling criteria. In addition, the PM has the authority to make appropriate changes to this QA Plan as deemed necessary, as the remediation activities progress. The PM may stop any activity he believes may be unsafe or in violation of a regulatory requirement. The PM must possess a B.A./B.S. degree and have a minimum of 10 years management experience, including 5 years of health, safety, and environmental management experience, or equivalent experience.

3.2.2 Kaiser Site Administrator (SA)

Kaiser's SA is responsible for overseeing site remediation activities and day-to-day administration of contractor performance to assure that remediation activities are performed safely, in accordance with approved plans, design specifications, and government permits and regulations. Kaiser's SA has the authority to stop work that may be unsafe or that may violate an approved plan, design specification, government permit, or regulation. The SA or designee will conduct site orientation activities with visitors to the site. The SA reports directly to the Kaiser PM. The SA must possess a B.S. degree in science or engineering and have 2 years of management experience, or equivalent experience.

3.2.3 Kaiser QA Coordinator (Consultant)

The QA Coordinator (QAC) reports to Kaiser's SA for administrative activities and for QA guidance. The QAC communicates and coordinates directly with the SA on project-related matters, and has the delegated responsibility and authority to direct and control QA functions including final status surveys to assure that the QA objectives are met. The QAC reports to Kaiser's SA about QA matters.

Responsibilities of the QAC include overseeing that appropriate quality management, policy, training, and verification controls are present. Additional QAC responsibilities include conducting QA audits, surveillance of contractor activities, and correcting conditions which could adversely affect quality. The contractor will allow the QAC to inspect the work at any time and provide every reasonable facility and equipment necessary to inspect the work. The QAC is not authorized to revoke, alter, or waive any requirements of this plan. The QAC does have the authority to reject materials or suspend work. The QAC will possess a B.S./B.A. degree in science or engineering, or have equivalent experience and a minimum of 5 years' experience in QA-related activities.

3.2.4 Health Physics Advisor/Radiation Safety Officer (HPA/RSO)

Kaiser's PM will utilize an HPA to provide guidance on special issues and to review procedures. This position may be filled either by a Kaiser employee or by a contractor at Kaiser's discretion. The HPA will be responsible for the radiological health and safety of all activities involving radioactive materials. The HPA may also review qualifications of personnel designated for certain positions in the Decommissioning Management Organization. The HPA will serve as the RSO. In addition, the RSO will review the implementation and documentation of all work activities involving radioactive materials including surveying, dosimetry, compliance issues, instrumentation, audits, data interpretation, training, wastes, shipping and receiving, decommissioning, decontamination, and emergency response.

In accordance with the DP, the RSO can delegate limited day-to-day RSO duties to qualified personnel, if necessary. For the Thorium Remediation Project, the RSO has chosen not to use the Contractor Assistant RSO.

The RSO will possess a minimum M.S. degree in health physics or a related field and have a minimum of 5 years' experience in environmental restoration. The RSO will report to the PM. The RSO will be authorized to stop any operation that is unsafe or is in violation of a regulatory requirement. The HPA/RSO will be selected by Kaiser based on experience, advanced education, and industry reputation.

3.2.5 Data Manager (Consultant)

The Data Manager will report to the QAC and will ensure that all required surveys and sampling are performed in accordance with the Final Status Survey Plan and applicable written procedures. Data will be reviewed by the Data Manager to ensure that the requirements stated in the Final Status Survey Plan are implemented as prescribed and that the results of the data collection activities support the objectives of

the survey, or permit a determination that these objectives will be modified. The Data Manager will determine if the data are of the right type, quality, and quantity to demonstrate compliance with the plan objective. The Data Manager shall be qualified by a combination of training, education, and experience relative to final status survey sampling, sampling design and measurement techniques, and data interpretation.

3.3 Remediation Contractor(s)

The remediation contractor(s) will be responsible for excavation and segregation of soils and dross material as well as packaging and transport of wastes. The remediation contractor(s) and consultants need to provide a consistent basis for preparing Safety Work Permits (SWP) and ALARA reviews, ensure procedural compliance, and provide reliable tool and equipment calibration. In addition, the traceability of radiologically-contaminated materials shipped off site for processing or disposal and associated records retention and management will support the waste management effort.

3.3.1 Contractor PM

Kaiser will utilize qualified contractor(s) to implement the DP. The contractor(s) will designate a Contractor PM (CPM) who will be responsible for planning, managing, and coordinating all contractor activities in accordance with written procedures. The CPM will report to the SA and will ensure that remediation activities meet the established H&S (environmental and radiological), environmental 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. The CPM will possess a B.S./B.A. degree in science, engineering, or business and have a minimum of 5 years of health, safety, and environmental management experience. Appropriate work experience (for similar radiation remediation projects) may be substituted for the degree requirement.

3.3.2 Contractor QC Supervisor

The contractor shall designate a QC Supervisor (QCS) who will report to the CPM for administrative activities and QC guidance. The QCS will implement and support the QA program when performing daily management and supervisory functions. 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 QAC. The QCS will possess a B.S./B.A. degree in science, engineering, or business and have a minimum of 3 years' experience in QC-related activities. Appropriate work experience (on similar radiation remediation projects) may be substituted for the degree requirement.

3.3.3 Contractor Lead Health Physics Technician

The QCS shall designate a Lead Health Physics Technician (LHPT) who will provide job coverage and ensure all necessary sampling and scanning are performed in accordance with such plan and written procedures. The LHPT is also responsible for sampling of soil stockpiles, off-site borrow material, and transportation containers, and will perform the preliminary review of survey data and analytical results.

The LHPT will possess a B.S./B.A. degree in science, or engineering, or have equivalent experience and training and a minimum of 3 years' experience as an HPT.

3.3.4 Contractor Site Supervisor

The contractor shall designate a Site Supervisor responsible for ensuring that contractor activities are performed in accordance with the plans, the specifications, work plans, and safety work permits. The Site Supervisor reports to the CPM, or may be identified as the CPM. The Site Supervisor has the authority to stop any activity that may be unsafe or is in violation of a regulatory requirement. The Site Supervisor will have appropriate training and experience.

3.3.5 Contractor H&S Supervisor

The H&S 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. The H&S Supervisor will possess a B.S. degree in science or engineering, have a minimum of 2 years' experience in health physics/industrial hygiene, and have specific training.

3.4 Analytical Laboratory

The selected analytical laboratory will analyze waste characterization and final status survey samples for radiological parameters in addition to providing for the analysis of effluent samples and samples to support radiation protection requirements such as air filter analysis. The selected analytical lab shall be

qualified for waste characterization in accordance with the disposal facility requirements and submit an Statement of Qualifications and Quality Manual to the Kaiser Management Team prior to approval.

3.5 Dosimetry Processor

Dosimetry will be provided and processed by a National Voluntary Laboratory Accreditation Program-Certified vendor.

3.6 Personnel Training

An indoctrination and training program to provide staff that are trained and qualified in principles and techniques of jobs assigned such as survey or sampling, aware of the nature and goals of the QA aspects of their respective jobs, and able to demonstrate proficiency. Proficiency is maintained by retraining and/or periodic performance reviews. Individuals who collect samples and/or operate survey instruments or analytical counting systems will be trained accordingly. Training and proficiency will be documented.

4.0 Administration

4.1 Corporate Quality Policy and QA Plan Description

It is Kaiser policy to establish appropriate QA program controls for work related to remediation and final radiological survey activities at the site that may affect the health and safety of the public and personnel at the site, or the quality of final survey data. This QA Plan has been developed to address project personnel responsibilities and activities in support of the Kaiser Thorium Remediation Project. The plans and procedures identified in this QA Plan have been selected to control remediation and final radiological survey and sampling activities. The provisions of this QA Plan also apply to measurements made to determine exposure of persons to radiation and radioactive material as required by the Radiation Health and Safety Plan, Environmental Health and Safety Plan, Environmental Monitoring Plan, or other pertinent procedures.

This plan and related implementing procedures are designed to provide adequate levels of control for these activities. The plan is prepared consistent with the requirements of Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), 10 CFR Parts 20 and 61 and Regulatory Guide 4.15, as applicable. The primary objective of this QA Plan is to provide a procedural framework that will ensure that remediation and final survey activities meet overall project requirements and other safety and regulatory requirements. Kaiser may revise and reissue this plan to be appropriate for current needs. The QA Plan, all implementing procedures, and subsequent revisions are subject to review and approval by the Kaiser PM prior to use.

4.2 QA Objectives for Measurement Data

The data acquired during remediation of the site will have the objective of ensuring that analytical results are representative of the media and conditions measured. For each major measurement parameter, objectives for precision, accuracy, completeness, and comparability will be developed, as appropriate. Unless otherwise specified, final radiological survey data shall be calculated and reported in commonly used units.

The overall QA objective for this project is to develop and implement procedures for field sampling and reporting that will provide data to support the remedial activities for unrestricted release of the site. Specific procedures to be used for sampling, reporting, internal QC, audits, preventative maintenance, and corrective actions are described in other sections of this QA Plan. The purpose of this section is to define

goals for the level of QA accuracy, precision, representativeness, and completeness required during the remediation project. The data quality objectives for the sampling associated with the decommissioning are:

- (1) Obtain and analyze samples to confirm that the site can be released for unrestricted use in accordance with Subpart E, 10 CFR 20.1402, Radiological Criteria for Unrestricted Use.
- (2) Obtain and analyze samples to characterize and profile wastes for disposal.
- (3) Obtain and analyze samples to demonstrate compliance with radiological and industrial safety requirements.

Data quality objectives for accuracy and precision for each measurement parameter will be based on the measurement system employed and method validation studies using replicates, spikes, standards, calibrations, recoveries, etc., and the requirements of this project. The final status survey QA program is described in the Final Status Survey Plan. Quality related issues for other sampling and measurements performed during site remediation such as liquid and airborne radioactivity effluent monitoring, workplace airborne radioactivity, loose contamination, and direction radiation measurements shall be described in specific procedures prepared by contractors and consultants.

5.0 Procedures and Instructions

Contractors shall prepare written instructions and procedures for review and approval by the Kaiser Project Manager and RSO prior to work implementation to control work activities that directly affect the health and safety of workers or the public or the data quality of the final radiological survey. Contractor specific health and safety plans will be reviewed for compliance with the Kaiser Health and Safety Plan, but will not be approved by Kaiser. Work plans involving the potential for exposure to radiation or radioactive material will be approved by the Kaiser PM.

Safety Work Permit Procedures are addressed in KAI-10.

Major changes to written instructions (i.e., changes that alter the intent of the instruction) shall receive the same level of review and approval as was required for the initial issuance of the document. Minor changes to written instructions, such as inconsequential editorial corrections, do not require the same review and approval as the original documents. A determination will be made by the appropriate subject matter expert as to whether a change is major or minor. Kaiser's SA makes the determination for administrative procedures, the RSO for radiation safety, the contractor H&S Supervisor for safety and industrial hygiene, and the QAC for QA procedures. Affected personnel will be made familiar with the written instructions pertaining to the work to be performed.

6.0 Document Control

An activity that creates or acquires environmental data essential to meeting or assessing whether remediation criteria or health, safety, or environmental protection requirements are met is subject to QC. Documents and records that control, assure, or record quality controlled activities are quality related records. Kaiser will review, approve, control, require revision, if needed, and maintain documents that record, control, or assure quality related safety and environmental data.

A written instruction or procedure that specifies QC for remediation or radiation safety shall be controlled to assure that correct documents are being used. Such documents, including changes thereto, shall be reviewed for adequacy and approved for use by signature of at least one responsible member of the Kaiser PM.

A control copy will be maintained in a project file by the Kaiser SA, and an approved copy will be distributed to the Kaiser PM and project personnel supervising and/or performing work controlled by the document.

QA records related to the Thorium Remediation Project which will fall within the document control program include the following:

- Kaiser site-specific procedures
- Kaiser site-specific plans
- Contractor site-specific procedures
- Contractor site-specific plans
- Nonconformance reports
- Corrective Action reports
- Audit reports
- Final Status Survey Data
- Final Status Survey Report
- Instrument Response Check Data
- Instrument Calibration and Repair Records
- Personnel Radiation Exposure Records
- Effluent and Environmental Monitoring Data
- Radiological Data and Survey Reports
- Training Records
- Safety Work Permits and ALARA Documentation

6.1 Control of Computer Software Configuration and Application

Development of computer models or software is not anticipated under the current scope of work for the Kaiser Thorium Remediation Project. However, available dose assessment/pathway analysis computer models, e.g., RESRAD, will be used to support project activities. It is anticipated that these computer models and codes will be used as originally received, and that no changes, revisions, or modifications will be made to these models or codes (excluding default input values of parameters).

7.0 Identification and Control of Samples

7.1 General

This section describes the identification and control of materials, the quality of which must be maintained for measurements, including geologic cores, field and laboratory samples, and materials. The identification and control measures ensure that geologic and environmental data are traceable to the geologic cores, and field and laboratory samples used to obtain the data. The geologic cores and field and laboratory samples are to be traceable to their date, time, and location of origin.

Storage, handling, and shipping of geologic cores, field and laboratory samples, and materials are described in Chapter 8.0.

Field procedures, sampling procedures, and sampling identification and tracking procedures specify the methods by which samples and cores are to be collected, identified, and controlled.

7.2 Description

7.2.1 Identification and Traceability

Identification of soil cores, samples, and materials is maintained in records traceable to the geologic cores, samples, and materials. The method and location of the identification are specified in a plan or procedure, and are selected so as not to affect the function, quality, or properties of the geologic cores, field and laboratory samples, or materials. As a minimum, the specific plan or procedures delineate the following items:

- (1) The scheme to be used in assigning unique identification numbers to the original and to the parts when the geologic core, field or laboratory sample, or material is split.
- (2) That the identification be controlled and maintained from the time of collection or receipt through shipment, sample split, and subsequent use (i.e., chain-of-custody for off-site analyses).
- (3) That the shelf life of time-sensitive and perishable materials is identified and controlled, as required.

Before geologic core, field or laboratory sample, or materials are used, the identification is checked by the user to ensure that the correct item is used.

7.2.2 Core and Sample Documentation

A standardized field tracking and reporting form, such as a field activity log, chain-of-custody, etc., is employed to establish sample traceability and custody.

7.2.3 Laboratory Sample Control

The analytical laboratory is responsible to act as sample custodian for samples it receives. A sample custodian is authorized to sign for incoming field samples, to obtain documentation of shipments (i.e., bill of lading number), and to verify the date entered into the sample custody records.

Procedures are established at the laboratory for sample handling, storage, and dispersment for analysis.

7.2.4 Control of Archival Samples

In the event archival samples are collected, they are stored and maintained in accordance with applicable procedures.

8.0 Handling, Storage, and Shipping of Samples

8.1 General

This section describes the control of handling, packaging, shipping, preserving, and storing of samples and the cleaning/decontamination of sampling equipment used during waste characterization, sample and survey data collection, testing, and final radiological survey to prevent damage, loss, deterioration, or misidentification.

8.2 Description

Qualified personnel are assigned to carry out handling, preservation, storage, cleaning, packaging, and shipping of environmental samples.

Procedures or instructions shall provide for the handling, storage, packaging, shipping, preservation, and storage of samples and the cleaning/decontamination of sampling equipment. These procedures shall include the following items:

- (1) Identification methods.
- (2) Packaging (including type of container) and handling instructions.
- (3) Specifications for delivery to carrier for transport that comply with applicable NRC and Department of Transportation regulations.
- (4) Interface and custody responsibilities.
- (5) Safety considerations, if appropriate.

The sample handler shall verify that the correct identification has been provided for each sample and take precautions to prevent contamination of the sample during handling, packaging, transportation, and processing.

8.3 Chain-of-Custody

Custody of samples will be tracked from collection through analysis until disposal, so that sample custody is always assigned to a specific person as evidenced by a signed record. Control of samples for on-site analysis shall be described in work plans, instructions, or procedures.

9.0 Control of Measuring and Test Equipment

9.1 General

This section applies to the control of instruments; standards; and measuring, test, and analytical equipment used for measurement, inspection, and monitoring of site remediation, and final radiological survey activities.

A system shall be established to assure that measuring and testing equipment (M&TE) is controlled and calibrated, adjusted, and maintained at prescribed intervals or prior to use. Calibration shall be against certified equipment having known relationships to nationally recognized standards (National Institute of Standards and Technology [NIST] or an industry-recognized organization) to maintain accuracy within specified limits.

9.2 Controls

The responsible user organization shall ensure that the following controls are implemented:

- (1) Each piece of M&TE is uniquely identified (e.g., using the serial number).
- (2) Date calibrated, date calibration is due, and the initials of the person who performed the calibration, or a note identifying the company that performed the calibration are documented as part of calibration records.
- (3) Normal intervals between calibrations for various types of M&TE are established and specified in the appropriate plan or technical procedure. This interval may be adjusted for specific pieces of M&TE based on the required accuracy and the M&TE's history of drifting, precision, purpose, and other characteristics that could affect accuracy or requirements.

The identification number of the equipment used to take each measurement is recorded with the original documentation of the results. The identification number is used to identify the measurements performed since the last calibration when a piece of M&TE was found to be in calibration.

Standards used to calibrate M&TE have the following components:

- (1) Ranges, precision, and accuracy adequate for the measurement requirements of the calibrated M&TE.

- (2) Known valid and documented relationships to nationally recognized standards (NIST or equivalent) or accepted values of natural physical constants; if no nationally recognized standards exist, the acceptability of the calibration standard used is documented.

M&TE that is found out of calibration and with which measurements of record were made while calibration was uncertain shall be documented using the nonconformance reporting process described in Chapter 14.0. The resolution of the nonconformance shall include an evaluation of the validity and acceptability of measurements performed since the last acceptable calibration or operability check and the need for repeating original activity or test using calibrated equipment. The calibration system shall provide for recall of equipment for recalibration and confirm that the required recalibration is performed. Out-of-calibration devices shall be tagged or removed from service.

Records shall be maintained for each piece of calibrated M&TE. These records shall include the following items as applicable:

- (1) Identification of calibrating agency or person.
- (2) Identification of M&TE (name; manufacturer; serial number and, when applicable, the range).
- (3) Date of calibration and next calibration due date.
- (4) Identification of calibration standard.
- (5) Indication of acceptance/rejection.
- (6) Calibration points that were verified.
- (7) Signature, initials, or stamp impression of person performing the calibration.
- (8) Procedure used to calibrate and revision number or effective date (if calibrated by the contractor using the instrument).
- (9) Compensating corrections for environmental effects (when applicable, may be documented in instrument manual).

Calibration test data shall be traceable to each item of equipment calibrated. Calibration frequencies shall be specified in the instrument calibration procedure or instrument file.

9.3 Reference Standards

Reference standards shall be used to:

- calibrate and determine the efficiency of instruments;
- calibrate the energy response of an instrument having an energy dependent detector; and
- calibrate mass or volume, as appropriate.

Each reference standard shall be properly identified, including concentration where applicable, and stored in a designated location. Files containing documentation for standards shall be maintained.

The person who prepares a reference standard, or receives it, if acquired from a supplier outside Kaiser, should:

- affix or verify the identity of the reference standard on its container or holder;
- record information linking traceability to NIST or certifying supplier, as applicable;
- record date of preparation and concentration; and
- record the name of the preparer.

A log or record of this information will be retained by Kaiser.

9.4 Instrument Calibration

9.4.1 Purpose

The purpose of calibrating a measurement system is to determine and/or set the accuracy and precision of the system within a range of interest and capability. Instruments shall be calibrated for the type of material or energy expected to be detected. Equipment shall be calibrated and operational practices applied that ensure that instruments in use remain within prescribed calibration limits. The HPA/RSO is responsible to ensure that procedures for radiation instrument calibration are developed, maintained, and implemented. The Data Manager or H&S Supervisor, for instruments under their control, are responsible to ensure that calibration procedures for other instruments important to safety are developed, maintained, and implemented. Each contractor is responsible for ensuring that its instruments important to safety or remediation specifications are calibrated.

The lower limit of detection (LLD) or minimum detectable concentration should be determined in accordance with industry standards or regulatory guidance (when practical) for each instrument and type of measurement for which it is used. When practical, an instrument will be used in such a manner that its LLD is substantially below the administrative action level or regulatory limit associated with the measurement(s) being made.

9.4.2 Conditions Requiring Calibration

The conditions under which instrument calibration is performed vary with the instrument type, its stability, the conditions and frequency of its use, and the importance of the measurement made. Every instrument is calibrated before its initial use. In addition, an instrument is recalibrated when:

- (1) It cannot be set within acceptance limits by normal operational adjustment during functional testing.
- (2) It remains outside acceptance limits when analyzing reference standards.
- (3) It displays evidence of damage or wear that would affect its calibration or operation.
- (4) Repairs, maintenance, or other physical alterations made to it are likely to change the calibration beyond the acceptable limits. (Replacement of batteries or other parts to restore operability without affecting calibration can be made without recalibration of the instrument.)
- (5) It is adjusted or used for conditions other than those for which it was designed or calibrated.
- (6) Periodically as recommended by the manufacturer at intervals not exceeding 12 months.

9.4.3 Elements of Calibration

Instrument calibration will include the following elements as applicable:

- (1) The instrument is to be in proper working condition prior to calibration.
- (2) The calibration standard yields conditions of a quantity and quality similar to that which the instrument will be used to measure, when applicable.
- (3) Calibration shall be performed with reference standard sources of the highest traceability practical and a carrier medium simulating that which is encountered during instrument use.
- (4) When necessary, compensation in calibration or conversion factors are determined and/or applied when calibration conditions do not correlate with actual use.
- (5) A calibration label is affixed to each instrument, identifying the calibration date, the next required calibration date, and the initials of the person performing the calibration. When applicable, calibration labels may also contain efficiency or background measurements obtained during calibration.
- (6) Calibration may be performed by correlation with another calibrated instrument when it is the best reasonable method.
- (7) Instrument calibrations shall be documented on appropriate forms/records.

9.5 Operability Checks

Operability checks shall be made between calibrations to demonstrate that instruments are in working condition and that the parameter(s) measured is/are within an acceptable range. A pass/fail limit shall be established for operability checks for each type of instrument. If an instrument fails an operational check, it shall be removed from service until the deficiency is resolved.

9.5.1 Frequency of Operability Checks

If an instrument is used infrequently, it shall be checked and/or inspected before use. If it is used often or continuously, the RSO, Data Manager, H&S Supervisor, or Project Manager, as appropriate, shall specify a frequency for operability checks, accounting for the frequency of use and stability of the instrument. After an instrument has been shipped, an operability check will be performed before it is used.

9.5.2 Source Checks

Sources used to check the operability of portable instruments need not be NIST traceable, but must be reproducible. The RSO shall determine the frequency with which check sources are to be verified against a reference standard, or by direct measurement or replaced.

Each day that a counting system and instrument are used, the response will be checked using an appropriate source before initial use. Additional response checks may be necessary depending on the counting system used. In addition:

- For field instrumentation, source check acceptance criteria (e.g., $\pm 2 \sigma$ for direct [integrated] measurements and ± 20 percent for rate measurements) will be established.
- For field instruments of increased complexity (e.g., single-channel analyzers), additional checks such as energy calibration and efficiency checks will be performed and documented.
- All source check results will be documented.
- Failed source checks will be repeated. Consecutive failure will result in additional testing of the counting system in accordance with the applicable procedure and ultimately removing the counting system from service.
- The LHPT (Contractor) will notify the PM (Contractor) of an instrument failure and corrective actions that were taken by the end of the work shift.

- The HPT (Consultant) will notify the Data Manager of any instrument failure or performance check deficiencies and corrective actions that were taken as soon as practicable and by the end of the work shift in which the deficiency is identified.
- The corrective actions taken by the LHPT or HPT may include battery replacement, cable replacement, detector replacement, resetting of the detector voltage or threshold to calibrated presets if the voltage or threshold changed due to instrument handling.
- Out-of-calibration or malfunctioning equipment shall be tagged out-of-service.
- The Data Manager will immediately notify the QAC who will conduct an investigation which typically involves the use of a properly operating instrument to repeat the measurements previously performed with the "failed" instrument to evaluate whether any of the previous measurements acquired since the last successful response check is useable.
- Survey data acquired prior to an instrument failing a source check will be reviewed by the Data Manager to determine the validity of the data. This review will be documented.
- Data quality evaluation will be performed by the Data Manager using the Data Quality Objective (DQO) and Data Quality Assurance (DQA) process and directives in MARSSIM. Potential deficiencies in data quality shall be corrected prior to use of the data.
- Instrument failures in the field will be followed by an investigation by the Data Manager of suspect data. Investigations will be documented.

9.5.3 Background Checks

A background check is performed with each instrument at least once each day it is used to verify that the ambient background radiation level is within the expected range and that the instrument has not become contaminated. When its background reading exceeds the acceptance limits, an instrument is not used to perform measurements of record.

9.5.4 Other Operability Checks

Operational procedures or the instrument log shall identify methods and frequency for background, check source, and/or any additional standard measurements for laboratory counting systems and other instruments.

9.5.5 Records

A written record of an operability, background, or battery check are not required except when specified in the instrument procedure.

9.6 Maintenance

When an instrument requires regular maintenance or inspection to ensure its operability, a maintenance or inspection schedule shall be established. The next maintenance or inspection due date shall be indicated on the instrument, if it is practical to do so. Responsibility for regularly scheduled equipment maintenance or inspection shall be assigned, and a maintenance file or log maintained. The maintenance or log file shall include, at a minimum:

- the nature of the maintenance/inspection,
- the person performing the maintenance/inspection,
- the date, and
- the due date of the next inspection/maintenance.

If maintenance or repair is performed that may change the calibration, the instrument shall be tagged out of service until it is calibrated. For instruments that have a battery check function, the battery should be checked at least each day before the instrument is used. An instrument must pass the battery check to be considered operable. Procedures or records of battery checks or changes are not required.

10.0 Laboratory Analytical QC

For each type of laboratory analysis requested, a specification for the following (at a minimum) will be made: required analysis and/or analytical methodology, the required minimum detectable concentration value for each radionuclide, any result presentation requirements, sample disposition, and turnaround time required to support the project. In addition, for all analytical laboratories (vendors) used, at a minimum, the following QA/QC principles will be applied: proper maintenance, storage, and archiving of samples after transfer to the laboratory will be practiced; and an internal QA program will be in place.

Analytical QCs assess the accuracy and precision of measurements and determine the effectiveness of measurement methods. They apply to stationary instruments (bench counters) used to measure concentrations in samples, e.g., air samples, smears, water, soils, etc. They do not apply to portable survey instruments.

All collected samples will be received and analyzed by qualified individuals using approved and documented laboratory analytical procedures in accordance with the final status survey plan and the selected laboratories QA plan. The analytical data will be reviewed by a qualified individual to identify interferences or other artifacts not identified by the analytical protocol.

Laboratory chain-of-custody procedures will be observed for all samples analyzed. The laboratory will participate in a QC cross check program.

Analysis of QC standards and samples determines the precision and accuracy of a measurement method and confirms the ability to produce measurements of acceptable quality. Analysis of reference standards determines accuracy. Analysis of blank(s) or background: 1) detects and measures contamination of the instrument or analytical samples; and 2) determines appropriate background for subtraction.

11.0 Contracted Measurements

In the event an independent contractor performs measurements which, if performed by Kaiser, would have been subject to the scope of this plan (Chapter 1.0), then the contractor shall be subject to the QA Plan or to an contractor QA plan.

12.0 QA Records

Records will be maintained to confirm that actions essential to meeting quality objectives were performed. Nonconformance reports, corrective action reports, audit reports, records, log books, or forms used to document field activities (plans, technical procedures, survey results, analytical data, and survey data) will be retained and managed as quality records. Data of records subject to this plan will be recorded in an orderly and verifiable way. Written instructions will designate documents that must be retained as quality records and maintained on site. QA records will be stored in a lockable fire proof cabinet at the Tulsa facility.

13.0 Audits, Surveillance, and Managerial Controls

13.1 Maintenance of QA Plan

Quality assessments shall be performed to provide added assurance that quality related activities meet applicable requirements. This QA Plan shall be the basis for quality assessments and for necessary response actions. Quality assessments will evaluate whether technical and regulatory requirements are met as well as procedural conformance. Changes in QA policy and procedures shall be documented in a timely fashion. Active contractors and affected personnel performing remediation work shall be given timely notification of changes to the QA Plan to keep them apprised of the current requirements.

Final site surveys will be performed in a manner that ensures results are accurate and sources of uncertainty are identified and controlled. Radiological surveys and sampling will be planned using the DQO Process. The DQO Process assures that the right type, quantity, and quality of data used in decision making is appropriate for the intended application. An overview of QA and QC activities to be implemented during surveying and sampling are contained in Chapter 14.0 of the Decommissioning Plan. Details of the final status survey QA/QC are presented in the Final Status Survey Plan and implementing procedures.

During the course of remediation activities, a DQA will be conducted to verify and validate the survey data and assessment of the quality of the data. Data verification is used to ensure that the requirements stated in the planning documents are implemented as prescribed. Data validation is used to ensure that the results of the data collection activities support the objectives of the survey or sampling. The DQA provides the assessment needed to determine that the planning objectives are achieved.

13.2 Quality Assessments

The QAC or his/her designee shall determine:

- assessment method(s),
- assessment schedule, and
- the planning and implementation process.

Quality assessments will be performed in accordance with written procedures and will examine the programmatic and technical elements of the QA program. A complete program review will be conducted at least annually. Assessment methods will include a combination of the following:

- readiness review,
- data quality evaluation,
- surveillance or performance evaluation,
- management review,
- technical review, and
- periodic audit.

The Kaiser PM will decide:

- responsibilities, authorities, participants, and roles of persons performing quality assessments,
- how the organization will respond to the need for changes,
- how, when, and by whom actions will be taken in response to assessment findings and recommendations, and
- whether the response has been effective.

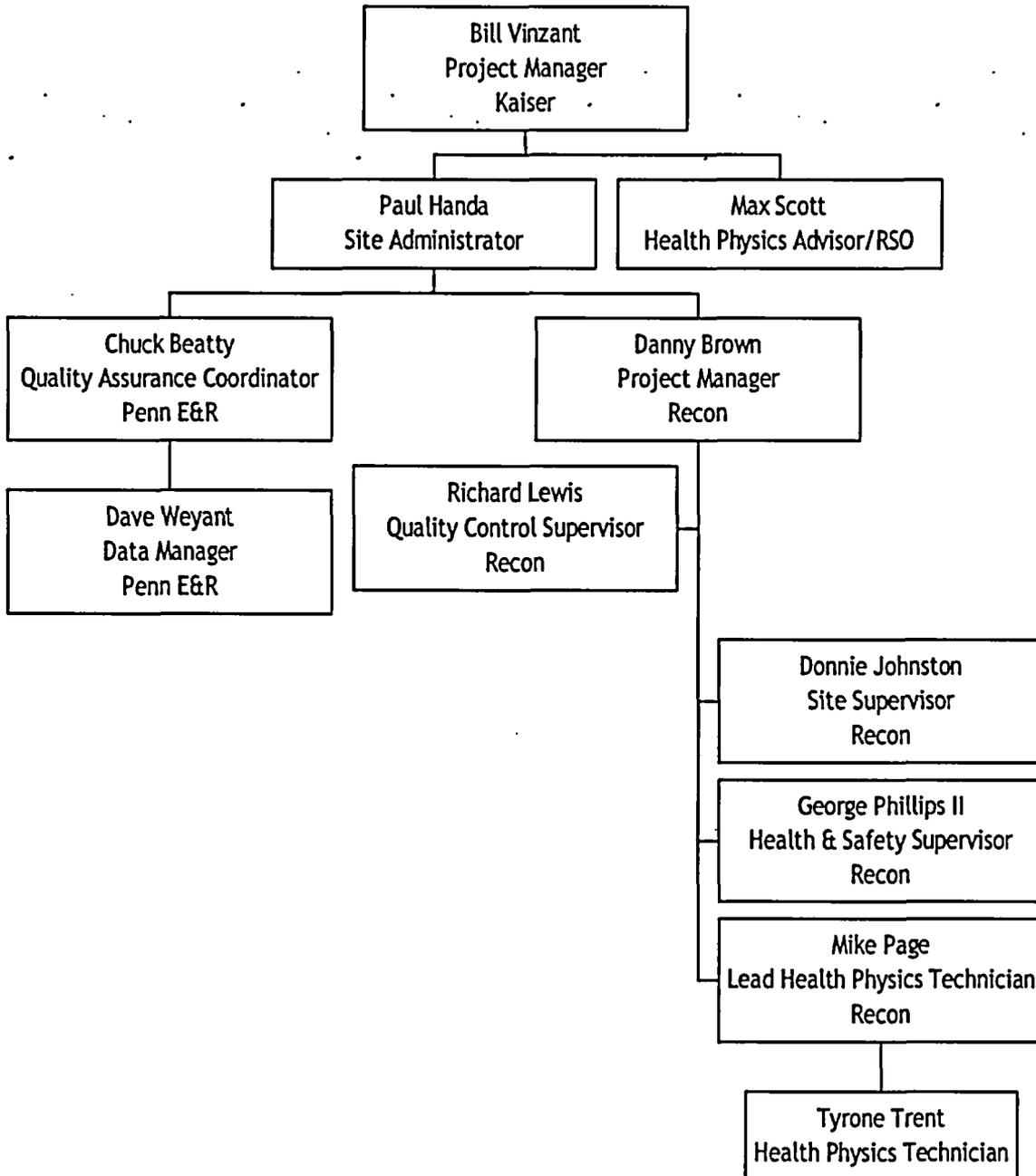
Persons conducting quality assessments shall have access to managers, documents, and records to:

- identify quality-related problems,
- make recommendations to resolve quality-related problems,
- confirm implementation and effectiveness of corrective responses, and
- report a deficiency or nonconformance to the PM in accordance with Chapter 12.0.

14.0 Correction of Nonconformance

Corrective action will be taken in accordance with Kaiser Procedure KAI-11, (Procedure to Audit, Investigate and Rectify Items of Nonconformance).

Kaiser Tulsa Thorium Decommissioning



June, 2004 - Names subject to change