UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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February 15, 2001

J. William Vinzant
Regional Environmental Manager
Corporate Environmental Affairs
Kaiser Aluminum and Chemical Corporation
9141 Interline Avenue, Suite 1A
Baton Rouge, Louisiana 70809-1957

SUBJECT: NRC INSPECTION REPORT 040-02377/00-02

Dear Mr. Vinzant:

On December 13, 2000, an NRC inspection was completed at the Kaiser Aluminum facility in Tulsa, Oklahoma. Additionally, on February 13, 2001, a telephonic exit meeting was held to discuss the final result of the inspection. The enclosed report presents the scope and results of that inspection.

The purpose of the inspection was to determine whether decommissioning and remediation activities which began on October 2, 2000, were consistent with the NRC-approved Adjacent Land Remediation Plan for Kaiser Aluminum & Chemical Corporation in Tulsa, Oklahoma. Inspectors found that project activities such as remediation, final status surveys, and site characterization were generally being conducted as described by the Kaiser Aluminum Remediation Plan. However, the inspection identified five deviations from commitments made in the Remediation Plan, and six inspection followup items regarding technical issues associated with the implementation of the Remediation Plan. The five deviations are summarized as follows:

(1) Failure to conduct final status surveys on affected areas as identified and defined in Sections 1.4.1 and 4.3.5.2 of the Remediation Plan.

(2) Failure to have an organization structure that is consistent with Section 2.2.2 of the Remediation Plan.

(3) Failure to demonstrate that the contract laboratory was capable of conducting alpha spectrometry on soil samples consistent with Section 4.2.5 of the Remediation Plan.

(4) Failure to have a process for investigating nonconformances and audit findings consistent with Section 4.6.9 of the Remediation Plan.

(5) Failure to perform alpha spectrometry on soil samples in accordance with procedure 6.1 consistent with Section 2.1.3 of the Remediation Plan.

We request that you respond to the above noted deviations in writing within 30 days of the date on this letter. The deviations and the circumstances surrounding them are described in detail in the enclosed inspection report. You are required to respond to this letter and should follow the instructions specified in the enclosed report when preparing your response. In preparing your response, you should pay particular attention to describing those actions planned or taken to prevent further deviations. The NRC will use your response, in part, to determine whether further action is necessary to ensure compliance with commitments made in the Remediation Plan. For your consideration and convenience, NRC Information Notice 96-28, "SUGGESTED GUIDANCE RELATING TO DEVELOPMENT AND IMPLEMENTATION OF CORRECTIVE ACTION," is enclosed. Information presented in Information Notice 96-28 may be of assistance in developing your responses.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available **electronically** for public inspection in the NRC Public Document Room (PDR) **or** from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/NRC/ADAMS/index.html (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Mr. Louis Carson II at (817) 860-8221 or Dr. Blair Spitzberg at (817) 860-8191.

Sincerely,

/RA/

Dwight D. Chamberlain, Director
Division of Nuclear Materials Safety

Docket No.: 040-02377
License No.: STB-472 (Terminated March 1971)

Enclosures:
1. NRC Inspection Report
   040-02377/00-02
2. NRC Information Notice 96-28

cc w/Enclosure 1:

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket No.:	40-2377
License No.:	STB-472 (terminated March 1971)
Report No.:	40-2377/00-01
Licensee:	Kaiser Aluminum and Chemical Corporation
Facility:	Kaiser Aluminum Adjacent Land Remediation Project
Location:	7311 East 41st Street Tulsa, Oklahoma 74147
Inspection Dates:	October 3 and December 11-13, 2000
Inspector:	Louis C. Carson II, Health Physicist Fuel Cycle and Decommissioning Branch
Accompanied By:	John T. Buckley, Project Manager Division of Waste Management Office of Nuclear Materials Safety and Safeguards
	Judith L. Walker, Health Physicist (Inspector-In-Training) Fuel Cycle and Decommissioning Branch
	Jean-Claude Dehmel, Health Physicist Division of Waste Management Office of Nuclear Materials Safety and Safeguards
Approved By:	D. Blair Spitzberg, PhD., Chief Fuel Cycle and Decommissioning Branch
Attachment:	Supplemental Information

EXECUTIVE SUMMARY

Kaiser Aluminum Speciality Products
NRC Inspection Report 40-2377/00-02

This was a routine inspection of the Kaiser Aluminum Specialty Products facility, formerly operated as the Standard Magnesium Company. This inspection reviewed the site's implementation of the Kaiser Aluminum Adjacent Land Remediation Plan (hereafter referred to as the Remediation Plan) for contaminated soils located outside the property fenceline. The inspectors reviewed the site status, management organization and controls, closeout of remediation surveys and radiation protection.

Site Status and Decommissioning Plan

- Kaiser Aluminum was not conducting certain activities consistent with the NRC-approved Remediation Plan and NRC Draft NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." Specifically, offsite property that Kaiser had identified to the NRC as affected areas within Sections 1.4 and 4.3.5.2 of the Remediation Plan was not being surveyed for final status as affected areas. This inspection finding was a deviation from commitments made in the Remediation Plan and requires a written response to the NRC (Section 1).

Management Organization and Controls

- This portion of the inspection identified four deviations from commitments made in the Remediation Plan in the areas of organization, quality assurance, document control, and procedure adherence. These deviations represent nonconformance with the Kaiser Remediation Plan, should be corrected, and require a written response to the NRC. The deviations are summarized as follows: (Section 2)

    1. Failure to have an organization structure that is consistent with Section 2.2.2 of the Remediation Plan.

    2. Failure to demonstrate that the contract laboratory was capable of conducting alpha spectrometry on soil samples consistent with Section 4.2.5 of the Remediation Plan.

    3. Failure to have a process for investigating nonconformances and audit findings consistent with Section 4.6.9 of the Remediation Plan

    4. Failure to implement approved procedures consistent with Section 2.1.3 of the Remediation Plan for performing alpha spectrometry on soil samples in accordance with Procedure 6.1, "Final Status Survey Implementation."

- In addition, the inspectors identified two inspection followup items (IFIs) in the area of management organization and controls. The following two IFIs were opened concerning (1) identifying the appropriate number of soil samples requiring alpha spectrometry and the correct number of samples used for determining the Th-230 to (Th-232+Th-228) ratio of 3.5, and (2) reviewing the technical adequacy of procedures (Section 2).

Closeout Inspection Surveys

- Four IFIs were identified regarding errors and inconsistencies in Kaiser's background determination, data presentation, quantitative soil counting at offsite laboratories, onsite qualitative soil counting, instrument calibration, and quality control procedures and practices (Section 3).

Radiation Protection

- Radioactive material was secure and radioactive material signs were conspicuously posted around the site as required by 10 CFR Part 20 (Section 4).

- Appropriate controls were in use to prevent the spread of contamination by personnel (Section 4).

- Kaiser's radiation protection program met commitments contained in the Remediation Plan for the activities being conducted onsite (Section 4).

Report Details

1 Site Status and Decommissioning Inspection Procedure for Fuel Cycle Facilities (88104)

1.1 Background

The Kaiser Aluminum (Kaiser) facility in Tulsa, Oklahoma, formerly called Standard Magnesium, is a formerly Atomic Energy Commission-licensed site. On March 18, 1971, the Atomic Energy Commission terminated Source Material License STB-472 at the request of Kaiser. On November 19, 1993, an NRC inspector found that residual radioactivity at the site existed in excess of background levels. In April 1995, Kaiser completed a soil radiological site characterization report which estimated that 127,685 cubic yards of residual thorium contaminated soil was onsite. In August 1995, the NRC declared that the Kaiser facility presented "no imminent health and safety risk to the public."

Kaiser submitted a Remediation Plan dated August 17, 1998, for NRC review and approval for the cleanup of radioactive material located outside the main site fenceline on property not owned and controlled by the Kaiser Corporation. Kaiser estimated that approximately 6,111 cubic yards of thorium contaminated soil was buried outside the property fenceline on the eastern and southern boundaries of the site.

The NRC approved the "Adjacent Land Remediation Plan for Kaiser Aluminum and Chemical Corporation," on April 4, 2000. On October 2, 2000, Kaiser began the implementation of the Remediation Plan.

1.2 Scope

The purpose of this inspection was to determine if Kaiser had been conducting its activities in accordance with the NRC-approved Remediation Plan which committed, in part, Kaiser to follow the guidance in NRC Draft NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination."

1.3 Observations and Findings

Based on the Kaiser Remediation Plan, the offsite property to be remediated and radiologically surveyed was divided into seven survey units with approximately 174 grid blocks. With the exception of nine small grids, each grid block was approximately 10 x 10 meters (m) (100 square meters (m^2)). At the time of this inspection, Kaiser was starting to remediate Survey Unit 3, and had completed remediation and final status surveys of Survey Units 1 and 2. However, the inspectors noted that Kaiser's working final status survey plan dated October 2, 2000, was divided into seven survey units, but it only addressed 96 grids out of the 174 grids. The inspectors asked Kaiser representatives when they plan to remediate the other grids. Additionally, the inspectors asked about soil sampling and survey procedures for the vertical walls of the deep excavated grids that were used during remediation to determine that all contaminated

soils had been removed. Kaiser representatives stated that sampling and surveying on the vertical walls was not required because adjacent grids were unaffected areas.

Based on discussions with Kaiser during the inspection, the NRC was concerned that Kaiser had an understanding of the survey units and associated grids established for remediation and final status surveys that is inconsistent with NUREG CR-5849. The survey units defined in the Remediation Plan and Kaiser's letter to NRC dated July 8,1999, were inconsistent with the final status survey plan dated June 2000. Discussions with Kaiser representatives on December 12, 2000, indicated that there was disagreement between NRC and Kaiser staff on which grids should be classified as the "affected areas" and "unaffected areas" and which grids require final surveys for these areas.

In Section 1.4 of the Remediation Plan, Kaiser stated that the survey units identified in the Remediation Plan were based on the methodology described in NUREG/CR-5849. Further, the Remediation Plan stated that these seven survey units were used as references for purposes of conducting additional site characterization activities and establishing the sampling and measurement frequency and pattern. Section 1.4.1 of the Remediation Plan indicated that 320 soil core samples were collected from 100 grid blocks for characterization surveys for which 90 core samples were analyzed by gamma spectrometry. Each core was approximately 4 feet in length. The inspectors noted that there were at least 174 grid blocks on the adjacent properties.

Section 4.3.5.2 , "Reference Grid," stated that six survey units that were classified as potentially affected have been gridded on a 10m x 10m grid. Gridding is not required in an unaffected area. Section 1.4, "Adjacent Land Characterization" stated, in part, that the offsite area was surveyed as an affected area in accordance with Draft NUREG/CR-5849. A seventh survey unit consisted of a small area along the south bank Fulton Creek. The offsite survey units were segregated into two areas; these areas were termed as affected areas and unaffected areas. Kaiser's Remediation Plan defined an affected area as areas that have potential thorium contamination based on preliminary radiological surveillance. Areas immediately surrounding or adjacent to locations where thorium slag was buried are included in this classification (affected area) because of the potential for inadvertent spread of thorium slag.

The inspectors observed in Survey Unit 2 that Grids 44 and 45 had been excavated to at least 9 feet deep. Only a 2m x 2m x 1m section of Grid 47 had been remediated. However, Grid 46 which is next to Grids 45 and 47 was not final status surveyed as an affected area. The NRC inspectors considered Grid 46 as affected because it was located next to grids that had been significantly remediated, but Kaiser staff did not. Additionally, the inspectors identified the need for vertical walls of the excavated grids to be surveyed and sampled to aid in demonstrating that the adjacent grids did not need to be remediated. Kaiser staff disagreed with the inspectors' position in this regard. The inspectors identified similar concerns with Grids 34-38 of Survey Unit 2.

According to Kaiser, contamination estimates on a grid block were generally based on the analytical results from one of four cores. Based on this limited amount of data, Kaiser believes that any grid block with a "clean" core scan should be classified as an

unaffected area. Kaiser's classification of unaffected areas was not in accordance with NUREG/CR-5849, Section 4.2, because some property that Kaiser had identified as affected areas were not being final status surveyed. And as previously noted, the survey units defined in the Remediation Plan were inconsistent with the Final Status Survey Plan. As a result, the inspectors determined that Kaiser was in deviation of Sections 1.4 and 4.3.5.2 of the Remediation Plan (DEV: 40-2377/0002-01).

1.4 Conclusions

Kaiser was not conducting certain activities consistent with the NRC-approved Remediation Plan and NRC Draft NUREG/CR-5849. Specifically, offsite property that Kaiser had identified to the NRC as affected areas within Sections 1.4 and 4.3.5.2 of the Remediation Plan were not being final status surveyed as affected areas.

2 Management Organization and Controls (88005)

2.1 Scope

The inspectors reviewed Kaiser's organization structure and management controls to determine whether functional responsibilities had been established consistent with the Remediation Plan and if controls were in place to ensure site and public safety.

2.2 Observations and Findings

a. Organizational Structure and Staff Duties

The inspectors reviewed the organizational structure in the Remediation Plan. Revision 0 of the Kaiser Remediation Plan, dated August 1998, contained an organizational chart (Figure 2.2-1) and functional description of the key positions (Section 2.2.2). The NRC's initial review of the Remediation Plan in June 1999 concluded that Figure 2.2-1 did not match the organization description provided in Section 2.2.2. Specifically, the QA Coordinator, Site Manager, Radiation Safety Officer (RSO), and Health & Safety Officer were not shown on the organizational chart. In July 1999, Kaiser issued Revision 1 of the Remediation Plan. Kaiser indicated that the organization description provided in Section 2.2.2 had been revised to match Figure 2.2-1. Kaiser had deleted the functional descriptions of the four positions out of the Remediation Plan.

During this inspection, the NRC determined that Kaiser's current organizational structure was inconsistent with the organizational structure as presented in the Remediation Plan. Specifically, the Remediation Plan does not include the following positions: Earth Science Corporation(ESC) Excavation QA/QC Coordinator, Kaiser Site Administrator, Kaiser RSO, and ESC Excavation Health Physics Technician. Additionally, although referenced, Revision 1 of the Remediation Plan did not include Figure 2.2-1 "Project Organizational Chart" and Figure 3.1-1 Organizational Chart for Kaiser Remediation Activities." An unrevised Figure 2.2-1 was later provided to the NRC on January 2, 2001, and Figure 3.1-1 was not.

Kaiser's December 2000 organizational structure was not consistent with Section 2.2.2 of the Remediation Plan which was a deviation (DEV: 40-2377/0002-02).

b. Quality Assurance and Quality Control

(1) Remediation Program Audits and the QA Auditor

The Kaiser site QA program as described in the Remediation Plan dated July 1999, was implemented, in part, by Kaiser's QA Plan, Revision 1, KAI-06 dated August 2000. Section 4.6.9 of the Remediation Plan states, "Comprehensive internal audits, field surveillance/inspections will be done as required to assure that the remediation project activities conducted at the Kaiser site are being performed in accordance with specified technical and quality assurance requirements."

During the inspection on October 4, 2000, the inspectors noted that Kaiser had began remediation activities that were important to the quality of the project. However, Kaiser personnel had not conducted a readiness review of Remediation Plan activities. For example, Kaiser had planned to use the services of Outreach Laboratory for the soil isotopic analysis. Kaiser's contract RSO and the remediation survey technician subsequently conducted an readiness review on contract services on October 18, 2000.

Section 4.2.5 of the Remediation Plan, states, in part, that analytical services for measuring gross radioactivity in samples and for alpha or gamma spectrometry analysis will be performed by a laboratory with demonstrated capability to perform the required analysis. The analysis will be in accordance with documented and approved procedures and the laboratory's approved QA Plan. The inspectors determined that Kaiser had not conducted a readiness review on Outreach Laboratory's capability to perform alpha spectrometry on soil samples. According to Kaiser's RSO, Outreach Laboratory had demonstrated its ability conduct alpha spectrometry on environmental water samples in May 1999. Kaiser's failure to determine that the laboratory had demonstrated capability to conduct alpha spectrometry for soil samples was in deviation from Section 4.2.5 of the Remediation Plan (DEV:40-2377/0002-03).

(2) Audit Findings and Investigations

Kaiser's audits were effective in identifying some weaknesses in its program. For example, the audits found that procedures did not include radiation instrument record reviews. Also, the remediation contractor was not adequately posting temporary fences with radiation warning signs. In an audit conducted by the remediation survey technician, it was noted that typographical and data manipulation errors were found in sample results.

Section 4.6.9 of the Remediation Plan states, in part, that "Each finding of nonconformance with specified quality assurance requirements and observations will be investigated." In addition, Section 12 of the QA Plan "Correction of Non-Compliance," requires that a deficiency or nonconformance that potentially invalidates the quality of measurements subject to the QA Plan or that is an exception to this plan shall be

reported to the QA coordinator, the site administrator, or project manager. Nonconformances shall be investigated and resolved. The investigation report shall identify any substantial undesirable impact caused by the nonconformance, the resolution, and recommended measures to reduce the likelihood or preclude the same or similar nonconformance in the future."

The inspectors determined that Kaiser had no formal system for processing nonconformances. Resolution of deficiencies identified from internal audits of the program had not been documented and/or tracked. Further, Kaiser had not performed the required investigations needed to address the audit findings. The failure to investigate nonconformances identified by QA audits was identified as a deviation from Section 4.6.9 of the Remediation Plan (DEV:40-2377/0002-04).

c. Document Control

Section 2.0, "Administration," of the Kaiser QA Plan states that all implementing procedures and subsequent revisions are subject to review and approval by the Kaiser project manager prior to use. Section 3.7.1 of the Remediation Plan requires that, "preparation, review, approval, distribution, and revisions of quality assurance, health and safety plans and procedures will be controlled." The inspectors found that Kaiser was controlling the Remediation Plan, but was not controlling other documents or procedures under a formal document control system. With one exception that is discussed just below in this report [(Section 2.2d(1)], the absence of a document control system for procedures had not been problematic to date.

d. Written Procedures

(1) Approved Procedures

Section 2.1.3, "Procedures," of the Kaiser Remediation Plan, states, in part, that decommissioning activities and tasks will be conducted in accordance with written procedures that have been approved by the project manager. Details of the control system that ensures written procedures are prepared, reviewed, revised, approved, and implemented are provided in the Kaiser QA program. Further, Section 3.0 of the QA Plan requires, that "written instructions will be prepared, reviewed, approved, and implemented 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." Finally, Section 4.6.1, of the QA Plan requires that final radiation survey activities on which compliance with release criteria depend will be performed in accordance with technical plans [i.e. Final Status Survey Plan and QA Plan] or procedures.

The inspectors reviewed Kaiser's plans and procedures that were being used during the adjacent land remediation project. Kaiser's instructions for conducting work at the site included procedures that were being used by Kaiser, A&M Engineering & Environmental Services, and Earth Sciences Consultants Incorporated (Earth Sciences). Kaiser's principal contract laboratory, Outreach Laboratory was using their own written procedures for analyzing Kaiser samples. During the inspection in October 2000, the inspector found that Kaiser had not reviewed the applicable Outreach procedures in

accordance with Section 2.1.3 of the Remediation Plan and the QA program. Additionally, Earth Sciences had collected samples for Outreach Laboratory analyses on September 12, 2000, without approved procedures. Earth Sciences also performed daily operational instrument checks on microrem meter No. 73492 and scaler/ratemeter No. 75448 on October 2, 2000, as reported on Form HPM-1-2-1, without having an approved copy of the procedures onsite. Although Earth Sciences was able to demonstrate that the health physics manual, which contains the necessary procedures, was approved for use on October 2, 2000, a copy of the manual was not transmitted to Tulsa, Oklahoma, for use at the site. Instead, Kaiser and Earth Sciences prepared a second copy of the health physics manual at the site. This copy was approved by an unauthorized individual, the remediation survey technician, an Earth Sciences employee. The health physics manual was approved for the QA coordinator and Kaiser project manager without appropriate written authorization. Kaiser personnel indicated that appropriately approved procedures would be made available to site personnel in the future.

(2) Procedural Adherence and Alpha Spectrometry

Procedure 6.1, "Final Status Survey Implementation," Section 5.5.8.2.4 requires, in part, that one out of every five soil samples are analyzed by alpha spectrometry. However, as of December 12, 2000, none of Survey Units 1 or 2 soil samples, which numbered approximately 77, had been analyzed by alpha spectrometry. Failure to conduct alpha spectroscopy on the soil samples as prescribed by Procedure 6.1 was a deviation from Section 2.1.3 of the Remediation Plan which requires that activities will be conducted in accordance with approved procedures (DEV: 40-2377/0002-05).

This matter is of importance because some samples should be analyzed by alpha spectroscopy, in part, to validate the Th-230-to-(Th-232+Th-228) soil contamination ratio of 3.5. This would confirm that data in Appendix A and Section 3.1 of the Remediation Plan is still valid for Th-230 contaminated soil. Kaiser representatives stated that Procedure ESC/HPM-6-1 had included alpha spectroscopy in error. However, the inspectors noted that the following Kaiser documents supported that soil samples will be submitted for alpha spectroscopy: (1) Section 4.2.5 of the Remediation Plan; (2) Sections 2.6 and 3.5.2 of the Final Status Survey Plan, and (3) Section 5.5.8 of Procedure ESC/HPM-6-1.

Finally, a point of clarification was needed regarding the number of samples that were used to derive the Th-230-to-(Th-232+Th-228) ratios. A review of Appendix A to the Remediation Plan revealed inconsistent references to the number of samples used to establish the 3.5 ratio. The text stated that 24 samples were used, while Figure A1 showed 22 sampling locations. The headings of Tables A1 and A2 states 20 samples, while both sets of tabulated data list 24 samples. Kaiser should identify to the NRC which sample numbers (20, 22, or 24) in the Remediation Plan are correct.

These matters concerning the appropriate number of soil samples requiring alpha spectrometry and the correct number of samples used for determining the 3.5 ratio will be considered an Inspection Followup Item (IFI:40-2377/0002-06).

(3) Procedure Review

The inspectors' review of selected procedures revealed that procedural steps or requirements were inconsistent with other project documents and needed to be corrected. The following represents some of the inspectors' findings:

1. Survey Procedure ESC/HPM-3-4, "Exposure Rate Surveys," Step 5.1.3, uses an incomplete arithmetic expression to derive the number of required background samples. The terms within the bracketed expression needs to be squared; refer to Equation 8-22 in NUREG/CR-5849. Also, a scan rate of 1 meter/second was higher than specified in the Final Status Survey Plan and NUREG/CR-5849 which was 0.5 meter/second.

2. Survey Procedure ESC/HPM-2-1, "Basic Instrument Operation," does not fully specify instrument operating configurations and settings, such as detector window, voltage, response, and use of Pb-shield. Kaiser needs to update the procedure to include these important settings as part of the pre-operational checks.

3. Survey Procedure ESC/HPM-2-5, "Ludlum Model 19 Micro-Rem Meter," should include an operational check requirement to verify the operational status of the survey instrument prior to use. This comment applies to all other instrument procedures as well.

4. Survey Procedure ESC/HPM-2-6, "Ludlum Model 2221 Ratemeter," does not include the full instrument configuration; it only addresses the Ludlum Model 2221 scaler/ratemeter without the detector being currently used. In addition, the procedure needs to include operational configurations and settings as part of the pre-operational checks.

5. Survey Procedure ESC/HPM-3-1, "Gross Gamma Surveys," does not present details describing survey parameters to meet the required remediation objectives. The procedure needs to describe specific parameters such as counting or observation time, scan rates, site specific minimum detectable concentration (MDC) or minimum detectable activity (MDA), response settings, conditions, and prompts requiring the re-derivation of detection limits under site specific conditions.

6. Survey Procedure ESC/HPM-4-1, "Soil Sampling," does not prompt the user that QA/QC samples may have to be collected in addition to those required by a specific task. The procedure needs to refer to the appropriate QA/QC procedure. Additionally, a subsection that addresses relevant release surveys and Department of Transportation shipping requirements for sending samples to the laboratory should be incorporated into the procedure.

7. Procedure ESC/HPM-7-1, "QA/QC Procedures," provides the methods for deriving instrument detection limits. However, the records for the instrumentation currently being used at the site and the site specific MDCs or

MDAs were not available for inspection. Kaiser should provide the completed forms with all related calculations for the suite of instruments currently being used at the site. In addition, Kaiser should provide a copy of the completed "Cross Calibration of Pressurized Ion Chamber and Portable Instruments" report to the NRC.

8. A further review of QA/QC Procedure ESC/HPM-7-1 and the Final Status Survey Plan for each survey unit (Section 3.6) indicated that surfaces (bottom and walls) of the excavations will be fully scanned (i.e., 100 percent of all exposed surface areas). However, the procedure and the Final Status Survey Plan did not describe the requirements for collecting soil samples on walls or sides of the excavations. Section 4.2.4 of NUREG/CR-5849 provides guidance on collecting subsurface samples of soil. Kaiser's procedure needs to address conditions when samples will need to be taken on side walls, (i.e., (i) in addition to the four samples per the 100 m^2 area criterion, (ii) in substitution for one of the four samples taken on the floor of the excavation, (iii) as additional samples (beyond the minimum of four samples already stipulated) mandated by elevated surface gamma scans or ambient radiation exposure rates, or (iv) when mandated by visual conditions (e.g., exposed Th-slag) and anomalous radiation levels).

An Inspection Followup Item (IFI) 40-2377/0002-07 was identified with respect to the above procedure problems to review the technical adequacy of these procedures during a future inspection and after Kaiser has responded to the NRC's observations.

2.3 Conclusions

In summary, the inspectors identified four deviations and two inspection followup items in the area of management organization and controls. The deviations require a written response to the NRC concerning why the deviations from the commitments have occurred and the corrective actions Kaiser plans to implement.

3 Closeout Inspection and Surveys (83890)

3.1 Inspection Scope

The site status and decommissioning activities were reviewed to determine if remediation and final status survey activities were being conducted in accordance with regulatory requirements and the Kaiser Remediation Plan. The plan commits Kaiser to follow the recommendations in NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination." As part of the NRC confirmatory surveys process, 14 soil samples were collected for analysis by the NRC. Five soil samples were collected from Survey Unit 1 and seven from Survey Unit 2. In addition, two background soil samples were collected from the Bishop Kelley High School area. The samples will be analyzed by the NRC for total thorium in soil to determine if the samples met the criteria of the Remediation Plan, NRC Branch Technical Position, and NUREG/CR-5849. Additionally, the inspectors reviewed the licensee's quantitative soil

counting at offsite laboratories, onsite quantitative soil counting, instrument calibration, and quality control procedures and practices.

3.2 Observations and Findings

a. Background Determination

NUREG/CR-5849, Appendix C, Section 4.4, "Background Level Determinations," recommends that exposure rate measurements be performed using a pressurized ion chamber (PIC). However, NUREG/CR-5849, "Instrument Selection and Use," Section 5.3, allows the use of portable sodium iodide (NaI) scintillation detectors if it is cross calibrated to a PIC or for the energy of interest. The inspectors reviewed a Kaiser document entitled "Cross Calibration of Pressurized Ion Chamber and Portable Survey Meters," which was partially based on PIC background measurements that were taken around the Kaiser site in May 1999. According to Kaiser's instrument cross calibration data, five exposure rate background measurements were taken at one offsite location using six different instruments. The PIC and the Ludlum Model 19 measured 9.7 µR/hr and 8 µR/hr, respectively. The Kaiser document stated that 30 [soil] coring samples were collected from the background locations. In October 2000, Kaiser wrote a "Correlation Data Study for the Kaiser Chemical Corporation." Kaiser performed background exposure rate and NaI scan measurements at 20 locations near Bishop Kelley High School in Tulsa, Oklahoma. Additionally, 10 soil samples were collected for background analyses. The inspectors noted that Kaiser was using an average site background of 10 µR/hr instead of the 7 µR/hr measured by NRC inspectors at the same area. The inspectors suggested that if Kaiser was going to use the Bishop Kelley location as the official background location, that PIC correlation data may have to be obtained. A Kaiser representative stated that they were still developing their correlation study.

b. Radiation Survey Results and Data Presentation

The inspectors reviewed selected survey Packages 2A-33A, B, C, and D dated October 19, 2000, and 2F-39, 40 and 41 dated November 2 and 20, 2000. Numerous observations were made by the inspectors based on the quality of final status survey data reviewed. Inspectors were uncertain if data collected was pre-final status survey data for guiding remediation activities or for documenting that remediation efforts were completed before formally initiating final surveys. The inspectors determined that each package needed to clearly state whether the results were for interim use or part of the final status survey package supporting the documentation requirements for a specific grid.

Some of Kaiser's sample data logs did not consistently include radiation survey units such as gross and net counts per minute (cpm) and corrected background levels in microRoentgen/hour (µR/hr). The data did not consistently reflect whether radiation levels and exposure rates were specifically associated with samples located in areas other than the survey grid. Based on a reviews of Packages 2A-33A, B, C, and D, the following exemplifies some of the inspectors' observations:

- Data presenting surface scans and exposure rates at 1-meter did not always include the appropriate information for the survey instrumentation used to obtain the results. Survey forms needed to include full details on the survey instrumentation used, including make, model and serial numbers of both survey meter and detector, detection units (disintegrations per minute per 100 centimeters squared (dpm/100, cpm, or µR/hr)).

- The inspectors noted that data presented in spreadsheets implied a correlation between surface scans and ambient 1-meter results. The spreadsheets needed to include footnotes providing the necessary details to ensure the proper interpretation of the results. Similarly, the spreadsheets should indicate the locations of background measurements, onsite or offsite and include the details on specific area. The micro-R-meter data presented in survey forms expressed 1-meter ambient exposure rates as average scans rather than ambient levels at specific grid points. The survey results needed to be corrected to indicate "ambient 1-meter results" and not "average scan results." Kaiser should note whether the results are "gross" or "net" exposure rates above background.

- Kaiser surface scan results needed to include maximum readings in addition to averages and surface areas covered when surveying partial grid blocks. Such information was needed for the purpose of assessing soil concentrations and surface scans against the 100 m^2 area or "hot-spot" criteria in NUREG/CR-5849.

- The instrument calibration date (current or due) and special configuration, such as details on shielded probe design features and specifications needed to be included on the survey forms. The inspectors determined that Table 1 to Kaiser's Final Status Survey Plan needed to be updated for specific radiation detection instruments used by Kaiser.

- It was not clear from the data reported in some survey packages whether any of the lower reported radiation levels (cpm or µR/hr) were within the detector sensitivity or MDA levels for each specific instrument and survey conditions. The inspector recommended that Kaiser qualify the soil sample results with the MDAs (as footnotes) in each survey package attachment. The survey packages needed to present survey results in conformance with Appendix D to NUREG/CR-5849. The survey packages that were reviewed did not include soil concentration results with uncertainty levels and MDAs at the 95 percent confidence level.

With regard to the above observations in Sections 3.2(a) and (b), more detailed information regarding survey results and data presentation will be needed in order to demonstrate compliance with site cleanup criteria. The above matters will be considered as an inspection followup item to be reviewed during a future inspection (IFI: 40-2377/0002-08).

c. Soil Concentrations Versus Radiation Surveys

The final status survey results for survey grids Nos. 39, 40 and 41 dated November 20 and 21, 2000, indicated internal inconsistencies in relating Th-232 soil concentrations, gross gamma surface scans, and 1-meter ambient radiation exposure rates. A comparison of these parameters indicated varying relationships, implying that results may be influenced by extraneous factors, such as shine, different detector-to-surface configuration, varying instrument response or calibration, or alternate survey methods. Table 1 below in this report represents some inconsistencies in survey data obtained by Kaiser.

Table 1 - Soil Concentration vs Gross Radiation Scan and Ambient Radiation Levels

Entry No.	Grid No. 2F-	Gross Thorium Concentration (pCi/g)	Gross Surface Scan (cpm)	Ambient Gross (μR/hr)
1	39A	0.947	6,211	22
2	40A	0.741	9,108	40
3	40B	0.827	7,509	32
4	40C	0.794	7,211	25
5	41A	3.04	13,021	490
6	41B	0.710	11,798	180
7	41C	0.791	9,846	85
8	41D	0.986	21,069	790
9	41E	1.37	8,476	240
10	41F	2.76	5,670	85
11	41G	0.778	5,213	45

Data: Based on survey package dated 11/20/00 and 11/21/00.

The data indicated that for nearly equal soil concentrations, the corresponding radiation levels (surface scans and 1-meter ambient readings) were widely different. For example, entries No. 2 and 6 of Table 1, revealed inconsistent radiation levels for nearly equal soil concentrations. Data entries No. 5 and 6 revealed another type of inconsistency regarding radiation levels not being proportional to soil concentrations. If there are valid reasons for such divergent relationships, it needs to be fully documented and justified. This information will be evaluated and interpreted by the NRC in demonstrating compliance with site cleanup criteria. These matters will be considered an inspection followup item for review during a future inspection (IFI: 40-2377/0002-09).

d. Remediation Survey Instrument Review

The inspectors reviewed a calibration record dated September 5, 2000, for a Ludlum Model 2221 and Model 44-10 NaI detector. The record indicated an instrument response was different than stated by the manufacturer and published in NUREG-1507, "Minimum Detectable Concentration with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions." For example, the calibration record gives a response factor of 95 cpm per µR/hr while NUREG-1507 (Table 6.4) gives values ranging from 760 to 900 cpm per µR/hr, depending on the radionuclide of interest. The efficiency (19.7 percent for Ra-226) given in the calibration record appeared to be overstating the response of the detector as compared to that presented or derived using the method of NUREG-1507 (less than 8 percent, Pages 6-20 and 6-21). The calibration records needed to describe the actual configuration of the instrument and detector, if different than the manufacturer's specifications. Another review of calibration records dated August 31, 2000, for the Ludlum Model 19 micro-R-meter with a NaI detector indicated that the instrument response was calibrated at 200 µR/hr. The calibration records should be corrected because it characterized this exposure rate as "background" on inappropriate scale of operation. In addition, the battery conditions were expressed in terms of exposure rate readings ("46 µR/hr") as opposed to conditions, such as "OK" or "replaced."

The inspectors' review of daily instrument operational check sheets (Form HPM-1-2-1) indicated that wrong instrument serial numbers are being recorded, (e.g., Serial. No. 73492 versus 104630) for the Model 19 micro-R-meter on completed HPM-1-2-1 forms dated since October 2, 2000.

The inspectors recommended that the calibration and instrument check errors in the records noted above be corrected, accordingly. This matter will be considered as an inspection followup item for review during a future inspection (IFI: 40-2377/0002-10).

e. QA/QC of Outreach Laboratory Results

The inspectors conducted reviews of Outreach Laboratory reports. Some reports had missing information such as confidence limits and systematic errors. There was a statement equating the HASL 300 procedure to EPA Method 901.1 for gamma spectroscopy analysis which did not seem appropriate, because the statement was without an explanation confirming the equivalence of the HASL 300 procedure. Soil concentration results presented must be reported as "pCi/g-dry." However, the laboratory report, Kaiser's audit findings, and the inspectors findings did not support that samples were being dried. The laboratory was not providing the results for other gamma emitters present in soils and materials sampled and analyzed, including U-238 series decay products and K-40. The basis for sampling backfill soil (e.g., number of samples per cubic yards of soil) and laboratory results for other gamma emitters present in soils, including U-238 series decay products and K-40 were not presented in support of sampling activities associated with soil samples No. CF-001, CF-002 and CF-1-1. The radiological pedigree of the backfill should be demonstrated by Kaiser. Providing additional radioisotopic information as attachments to each laboratory result would be beneficial. Since the gamma spectroscopy records maintains a database of the

previous analyses, the laboratory should be able to provide the full results from sample spectrum files without having to re-analyze the samples.

The inspectors' review of two laboratory reports (Nos. 20001103 and 20000976) indicated that some samples had been spiked with thorium (e.g., 001-PD-EP-A, 54.1±1.15 pCi/g and 002-PD-EP-A, 64.5±1.48 pCi/g). However, it was not clear from the documentation reviewed if these results were being evaluated by Kaiser's staff as part of its QA/QC program. Kaiser should provide QA/QC documentation of the evaluation of all spiked results.

Outreach Laboratory uses gamma spectrometry to count Kaiser's soil samples based on measurements of Ac-228 as the indicator of Th-232 and Th-228. A review of laboratory report No. 20001092 indicated an Ac-228 QC duplicate result (QC Report section, Page 3 of 3) had a relative difference of ±44 percent, which was much higher than other similar QC results. Kaiser needed to confirm the validity of this result with the laboratory and provide documentation of the assessment and disposition of all listed results in light of this difference. Laboratory report No. 20000878 presented results of samples used for correlation purposes. The QC results section (Page 3 of 3) did not provide any data for Ac-228. Kaiser needed to contact the laboratory and determine why the QC Ac-228 result was missing and provide documentation of the assessment. In addition, Kaiser should confirm that all future correlation samples will be required to have Ac-228 results as part of the Outreach Laboratory generated QC-suite of radionuclides.

The inspectors' cursory check of selected survey reports indicated that Kaiser's records needed to be QA/QC verified. Some entries were found to be in error or missing, including survey dates and radionuclide concentration results. For example, erroneous soil concentrations (0.669 picocuries/gram (pCi/g) versus 0.699 pCi/g) for grid No. 15-FS-1B-59-B dated October 12, 2000. A wrong sample date was entered from log grid No. 040-FS-2B-35-D-1 dated November 19 instead of November 9. There was a missing soil concentration result for grid No. 47-FS-2E-47-B dated November 15, 2000. The inspectors recommended that the errors noted above be reviewed and corrected, accordingly.

In summary, the inspectors' reviews of Outreach Laboratory results identified several technical concerns with the quality of data and Kaiser's reviews of QA/QC analyses. These matters will be considered as an inspection followup item to be reviewed during a future inspection (IFI: 40-2377/0002-11).

3.3 Conclusions

Four IFIs were identified regarding errors and inconsistencies in Kaiser's background determination, data presentation, quantitative soil counting at offsite laboratories, onsite qualitative soil counting, instrument calibration, and quality control procedures and practices. These IFIs will be reviewed during a future inspection.

4 Radiation Protection (83822)

4.1 Scope

Section 1.2 of the Remediation Plan states, in part, that although Kaiser is not a holder of an NRC license for the possession and use of thorium, remediation activities and the related survey and sampling methods must conform to the regulations and guidance set forth in the following documents to the extent that they would be applicable including the Code of Federal Regulations, Title 10.

The inspectors examined the radiation protection program for consistency with the requirements of 10 CFR Part 20 and the Remediation Plan.

4.2 Observations and findings

a. Site Tours

The inspectors conducted site tours and made observations regarding radioactive material signs, potential for exposure to workers, and the potential loss of radioactive material control. The inspectors toured grids within Survey Unit 2. The inspectors observed that radioactive material signs were conspicuously posted around the site as required by 10 CFR 20.1902, and the Kaiser property fenceline was in adequate condition. Inspectors found Kaiser's posting of radioactivity signs around the fenceline to be appropriate.

b. Exposure Rate Surveys

Inspectors surveyed the site with a Ludlum Model 19 microRoentgen meter (Serial No. 15544, calibration due date, November 29, 2001). The ambient background radiation away from the Kaiser site measured 7 µR/hr. Radiation exposure rates on adjacent properties along the eastern fenceline, the southern fence, and on the south side of 41st Street measured consistent with past NRC survey results. During the inspection, inspectors surveyed near grids within Survey Unit 2. Exposure rates measured 35-40 µR/hr near Grids 42-45. The inspectors determined that exposure rate measurements taken were consistent with past NRC survey results.

c. Site Work with Radioactive Material

Remediation activities had begun at the site, however, during the inspection, inclement weather limited site activities. Kaiser maintained access control to the radioactive materials area. Prior to entry into the radioactive material area, each person was issued protective boots to reduce the potential spread of contamination. Prior to exiting the radioactive material area, each person was required to wash their protective boots at an equipment decontamination zone. The inspectors noted that the potential for personnel spreading contamination was limited given the current site status and the controls implemented.

The inspectors reviewed survey records for equipment release for unrestricted use. No equipment was released offsite in excess of the criteria set by the Remediation Plan. However, the site did utilize a dump truck within the radioactive material area that had surface contamination. Kaiser's health physics technician stated that the vehicle would not be released until it had been decontaminated. Instrument calibration records showed that instruments used for personnel and equipment contamination surveys were being calibrated at the appropriate frequencies. Also, source check logs were reviewed which revealed that daily checks were being performed before use of instruments.

Kaiser had issued all persons who entered the controlled area a thermoluminescent dosimeter (TLD). In reviewing the TLD results, inspectors found that no worker had received any measurable external dose in 1999 and so far during 2000 the highest measurable dose was 23 millirem. Kaiser's dosimetry vendor processed the TLDs on a monthly basis. The inspectors noted that Kaiser had not established an internal dose program, but was developing procedures for collecting personnel air samples. The potential for airborne radioactivity was limited given the site status in 1999 and currently in 2000. The inspectors noted that all personnel involved in Kaiser's remediation work had received appropriate radiological training in 1999 and 2000.

4.3 Conclusion

Radioactive material signs were conspicuously posted around the site as required by 10 CFR 20.1902. The Kaiser property fenceline was in adequate condition to reasonably assure radioactive material security as required by 10 CFR 20.1802. Appropriate controls were in use to prevent the spread of contamination by personnel. Kaiser's radiation protection program was appropriate for the activities being conducted onsite.

5 Exit Meeting Summary

An exit meeting was conducted on December 13, 2000, at the Kaiser facility in Tulsa, Oklahoma. Additionally, on February 13, 2001, a telephonic exit meeting was held to discuss the final results of the inspection. During these meetings, the inspectors reviewed the scope and findings of the inspection. The participants did not identify any information provided to or reviewed by the inspectors as proprietary.

ATTACHMENT

PARTIAL LIST OF PERSONS CONTACTED

Kaiser Corporation

P. Handa, Site Project Manager and Administrator
W. Vinzant, Corporate Project and Safety, Health, and Environmental Manager

Contractor Personnel

T. Ertugrul, Site Supervisor, A&M Engineering
A. Lombardo, Earth Sciences Consultants
P. Schultze, Radiation Safety Officer/Geologist, A&M Engineering
M. Scott, Health Physicist, ADA Consultants
M. Tourdot, Earth Sciences Consultants

INSPECTION PROCEDURES USED

IP 83822	Radiation Protection
IP 83890	Closeout Inspection and Surveys
IP 88005	Management Organization and Controls
IP 88104	Decommissioning Inspection Procedure for Fuel Facilities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

40-2377/0002-01	DEV	Failure to remediate affected areas as identified and defined in Section 1.4.1 of the Remediation Plan.
40-2377/0002-02	DEV	Failure to have an organization structure that is consistent with Section 2.2.2 of the Remediation Plan.
40-2377/0002-03	DEV	Failure to audit the contractor laboratory's ability to conduct alpha spectrometry on soil samples consistent with Section 4.2.5 of the Remediation Plan
40-2377/0002-04	DEV	Failure to have a process for investigating nonconformances and audit findings consistent with Section 4.6.9 of the Remediation Plan
40-2377/0002-05	DEV	Failure to perform alpha spectrometry on soil samples in accordance with procedure 6.1 consistent with Section 2.1.3 of the Remediation Plan.
40-2377/0002-06	IFI	Clarify the appropriate number of soil samples that require alpha spectrometry, and identify the correct number of samples used for determining the 3.5 ratio
40-2377/0002-07	IFI	Review the technical adequacy of procedures after Kaiser has evaluated the NRC's findings.
40-2377/0002-08	IFI	More detailed information is needed on survey results and data presentation in order to demonstrate compliance with site cleanup criteria.
40-2377/0002-09	IFI	Review reasons for inconsistencies in soil vs. radiation scan data.
40-2377/0002-10	IFI	Review calibration and instrument check records for errors.
40-2377/0002-11	IFI	Reviews of Outreach Laboratory results revealed several technical concerns with the quality of data and Kaiser's reviews of QA/QC analyses.

Closed

None

Discussed

None

LIST OF ACRONYMS

CFR	Code of Federal Regulations
cpm	counts per minute
dpm	disintegrations per minute
MDA	minimum detectable activity
MDC	minimum detectable concentration
µCi/ml	microcuries/milliliter
µR/hr	microRoentgen/hour
NaI	sodium iodide
PIC	pressurized ion chamber
QA	quality assurance
QC	quality control
pCi/g	picocuries/gram
TLD	thermoluminescent dosimeter