

Base Realignment and Closure
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CONTRACT NO. N62473-06-D-2201
CTO No. 0015

FINAL
ADDENDUM 2
TO THE
FINAL SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
December 7, 2007

INSTALLATION RESTORATION SITES 1, 2, AND 32
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-07-0748.A2



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12/04/07

Date

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NAVFAC SW Quality Assurance Officer

12/15/2007

Date

FINAL
SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN AND QUALITY ASSURANCE
PROJECT PLAN)
DATED 02 MARCH 2007

IS APPENDIX B OF THE FINAL TIME-CRITICAL REMOVAL
ACTION WORK PLAN, IR SITE 1, 2, AND 32

DATED 02 MARCH 2007

THIS RECORD IS ENTERED IN THE DATABASE AND FILED
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1.0 INTRODUCTION

This Addendum 2 to the Final Sampling and Analysis Plan (SAP) included as Appendix B in the *Final Time-Critical Removal Action Work Plan, Document Control Number: ECSD-RACIV-07-0748*, (TtEC, 2007) has been prepared by Tetra Tech EC, Inc. (TtEC) under the Naval Facilities Engineering Command, Southwest (NAVFAC SW) Remedial Action Contract (RAC) IV No. N62473-06-D-2201, Contract Task Order (CTO) No. 0015. This Addendum 2 addresses a change in scope for removal of radiological impacted material and confirmation sampling procedures and analytical requirements.

The original scope of this project included removal of previously identified radiological anomalies and subsequent post-excavation (or confirmation) sampling of these excavated areas. The confirmation samples were to be analyzed for radium 226 (^{226}Ra), and the results were to be compared to the remedial action objective (RAO). If the results were above RAO, then additional excavation would be conducted and another confirmation sample would be collected. This process would continue until ^{226}Ra was less than the RAO or until groundwater was encountered (approximately 8 feet below ground surface).

The original scope assumed that the radiological anomalies represented discrete areas based on previous investigation data. However, during the course of excavation and field radiological survey activities for this project, it was discovered that the radiological anomaly areas are not discrete and encompass larger portions of the site and that gravel material (not just soil) is present which may be contributing to the higher detections of radiological material. These higher detections may be attributed to naturally occurring radiological isotopes instead of point sources/anomalies. Therefore, discussions with Radiological Affairs Support Office (RASO) and the Department of the Navy (DON) have prompted a revised approach to the excavation and confirmation sampling and analysis of these radiological impacted areas.

The revised process will include a phased approach to the excavation and sampling of the material. The excavation of the gravel material will proceed in accordance with Figure 1-1 and the soil excavation in accordance with Figure 1-2. Revised sampling guidance for these two types of material is described in Figure 1-3. (These figures also provide the rationale for the revised data quality objectives for this project.) Confirmation samples collected will be analyzed for ^{226}Ra and other gamma and alpha isotopes (as listed in Table 7-1). The results from the analyses will be used in the assessment of whether the material has naturally occurring radiological components or not.

In addition to the revised approach described above, re-establishment of the background value for ^{226}Ra as well as establishment of a background value for the other gamma and alpha isotopes

are described in this Addendum 2. (Previous background values were established by TtEC but only for ²²⁶Ra.)

This Addendum 2 will be used in conjunction with the original SAP (Document Control Number ECSD-RACIV-07-0748) and will be distributed to the recipients listed in Table 1-1. In addition, the sign-off sheet in Table 1-2 will be signed by project personnel involved with the field effort described in this Addendum 2.

This Addendum 2 will be used for the field activities described herein, and all sections from the original SAP not specifically changed in this Addendum 2 will remain in effect for the field effort described herein. The following list shows the sections, tables, and figures of the SAP that are being added or modified in this Addendum 2:

- Section 1.1
- Table 1-1 (added table)
- Table 1-2 (added table)
- Section 3.2 (revised)
- Section 3.3 (revised)
- Table 3-1 (added table)
- Section 5.5 (added section)
- Section 5.6 (added section)
- Table 5-1 (added table)
- Section 6.3.5 (added section)
- Section 6.3.6 (added section)
- Section 7.2 (revised section)
- Section 7.3 (revised section)
- Table 7-1 (added table)
- Table 7-5 (added table)
- Figures 1-1, 1-2, and 1-3 (added figures)

TABLE 1-1

**DISTRIBUTION LIST
(UFP-QAPP Worksheet #3)**

This document will be distributed to the following project participants listed below once all approval signatures have been received.

SAP Recipients	Title	Organization	Telephone Number	E-mail Address
Mr. Derek Robinson	Remedial Project Manager	NAVFAC SW	(619) 532-0951	derek.j.robinson1@navy.mil
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Mr. Gregory Grace	ROICC	NAVFAC SW	(510) 749-5940	gregory.grace@navy.mil
Kent Weingardt, P.E.	Project Manager	Tetra Tech EC, Inc.	(619) 471-3532	kent.weingardt@tteci.com
Mr. Gregory Joyce	QC Program Manager	Tetra Tech EC, Inc.	(360) 598-8117	greg.joyce@tteci.com

Abbreviations and Acronyms:

- EPA – U.S. Environmental Protection Agency
- NAVFAC SW – Naval Facilities Engineering Command, Southwest
- QAO – Quality Assurance Officer
- QC – quality control
- RASO – Radiological Affairs Support Office
- ROICC – Resident Officer in Charge of Construction
- RPM – Remedial Project Manager
- UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans
- USFWS – United States Fish and Wildlife Service

TABLE 1-2

**PROJECT PERSONNEL SIGN-OFF SHEET
(UFP-QAPP Worksheet #4)**

I have read and understood this Addendum SAP and will perform the task as described in the Addendum SAP.

Project Personnel	Organization	Title	Signature	Date Addendum Read
Kent Weingardt, P.E.	TtEC	Project Manager		
Mr. Greg Joyce	TtEC	Program QC Manager		
Ms. Lisa Bienkowski	TtEC	Program Chemist		11/20/07
Ms. Sabina Sudoko	TtEC	Project Chemist		
Vincent Richards, P.G.	TtEC	Sample Technician		

Notes:

SAP – Sampling and Analysis Plan

TtEC – Tetra Tech EC Inc.

UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

3.0 PROJECT OVERVIEW

3.2 SCOPE

Additional text.

The scope for this project has been revised to include a phased approach to the excavation of material and subsequent sampling, which is illustrated in Figures 1-1, 1-2, and 1-3.

3.3 DATA QUALITY OBJECTIVES

Additional text.

The DQOs for this Addendum 2 are presented in Table 3-1.

TABLE 3-1

SUMMARY OF DATA QUALITY OBJECTIVES

State the Problem	Identify the Goals of the Study	Identify Information Inputs	Define the Boundaries of the Study	Develop the Analytic Approach	Specify Performance or Acceptance Criteria	Develop the Plan for Obtaining Data
STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
<p>Previous investigations at IR Sites 1, 2 and 32 identified radiological anomalies during field surveys. These anomalies were assumed to be discrete areas. However, during the course of excavation and field radiological survey activities for this project, it was discovered that the radiological anomaly areas were not discrete and encompass larger portions of the site and that gravel material (not just soil) is present which may be contributing to the higher detections of radiological material. These higher detections may be attributed to naturally occurring radiological isotopes instead of point sources/anomalies.</p> <p>Subsequently, discussions with Radiological Affairs Support Office and the Department of the Navy have prompted a revised approach to the excavation and confirmation sampling and analysis of these radiological impacted areas in order to remediate these impacted areas.</p>	<p>Does the evaluation of the results from the confirmation samples indicate naturally occurring radiological material (as defined in Section 5.5 of this Addendum 2)?</p>	<p>An average background concentration of ²²⁶Ra and other gamma and alpha isotopes will be determined as part of this Addendum 2.</p> <p>Confirmation samples will be collected as described in Step 7.</p> <p>All samples will be analyzed for ²²⁶Ra and other gamma and alpha isotopes (as listed in Table 7-1 of this Addendum 2).</p>	<p>The boundaries of the radioactive anomalies will be established as described in Figures 1-1 and 1-2.</p>	<p>If the evaluation of the results concludes that radioactive material is naturally occurring (as defined in Section 5.5 of this Addendum 2), then a post-remediation survey will be conducted and the area backfilled. Otherwise, the DON will be contacted for further action.</p>	<p>Field crews will review this Addendum 2 before collection of samples and sign-off on Table 1-2.</p>	<p>Figure 1-3 describes the confirmation sampling guidance for this Addendum 2.</p>

Abbreviations and Acronyms:
 DON – Department of the Navy
 IR – Installation Restoration
²²⁶Ra – radium-226

5.0 SAMPLING STRATEGY

5.5 CONFIRMATION SAMPLING (REVISED APPROACH)

Additional section. (Section 5.4 was added in Addendum 1 to the original SAP).

The revised sampling guidance is illustrated in Figure 1-3. Samples that are collected will be analyzed for ^{226}Ra and other gamma and alpha isotopes as listed in Table 7-1. These results will be used to assess if the material sampled contains naturally occurring radioactivity. Naturally occurring radioactive material is defined in Title 17 of the California Code of Regulation as "Any naturally-occurring radioactive material in concentrations which occur naturally." The approach is to evaluate the concentration of the naturally occurring radionuclides to verify the radionuclides are present in concentrations that occur naturally. The natural radionuclides in the environment that the sampling effort is focusing on is the primordial radionuclide potassium-40 and the primordial radioactive series headed by uranium-238, uranium-235, and thorium-232. If not subjected to physical or chemical separation, the members of a series attain a state of radioactive equilibrium, wherein the rate of decay of each nuclide is very nearly equal to that of the nuclide that heads the series. Therefore, the ratios between the nuclide that heads the series and the series members will be evaluated to determine if a member is present in disequilibrium to the series.

Table 5-1 lists the sampling locations/IDs, sample depths, sample analyses, and sampling procedures for the confirmation samples.

5.6 BACKGROUND REFERENCE AREA SAMPLING

Additional section.

Background samples will be collected from the nine locations for each of the three reference background areas as depicted in Figure 5-1 of the Work Plan (TtEC, 2007). A soil sample will be collected from zero to 6 inches at each location, with a field duplicate collected at location #9 in each area. The soil samples will be analyzed for ^{226}Ra and other gamma and alpha isotopes as listed in Table 7-1. These results will be used to establish an average background concentration for each isotope.

Table 5-1 lists the sampling locations/IDs, sample depths, sample analyses, and sampling procedures for the background reference area samples.

TABLE 5-1

**SAMPLING LOCATIONS/IDS, SAMPLE DEPTHS, SAMPLE ANALYSES, AND SAMPLING PROCEDURES
(UFP-QAPP Worksheet #18)**

Sampling Location	Matrix	Depth (inches)	Analytical Group	Sampling Section Reference
IRX-Y-Za ^a	Confirmation Gravel/Soil	0-6	Gamma and alpha isotopes (as listed in Table 7-1)	SAP Section 6.3.5
IRX-Y-Zb ^a	Confirmation Gravel/Soil	6-12	Gamma and alpha isotopes (as listed in Table 7-1)	SAP Section 6.3.5
BRA1-1 ^b through BRA1-10 ^b	Background Reference Area Soil	0-6	Gamma and alpha isotopes (as listed in Table 7-1)	SAP Section 6.3.6
BRA2-1 ^b through BRA2-10 ^b	Background Reference Area Soil	0-6	Gamma and alpha isotopes (as listed in Table 7-1)	SAP Section 6.3.6
BRA3-1 ^b through BRA3-10 ^b	Background Reference Area Soil	0-6	Gamma and alpha isotopes (as listed in Table 7-1)	SAP Section 6.3.6

Notes:

^a The number of confirmation sample locations will be determined in the field based on excavation activities described in Figures 1-1 and 1-2 and on the sampling guidance described in Figure 1-3. Locations will be labeled as follows: "IRX" where X is the IR site number; "Y", which is a radiological sequencing number; and "Za" where "Z" is the sequential number for that radiological location, "a" is the 0- to 0.5-foot sample, and "b" is the 0.5- to 1-foot sample.

^b Background reference area samples will be collected from 3 areas, with 10 samples at each location. Sample locations will be labeled sequential for each area as "BRAX-Y" where "X" is area 1, 2, or 3 and "Y" is sample location 1 through 10.

Abbreviations and Acronyms:

BRA – background reference area
 IR – Installation Restoration
 SAP – Sampling and Analysis Plan
 UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

6.0 SAMPLING PROCEDURES

6.3 SAMPLING PROCEDURES

6.3.5 Confirmation Sampling Procedures (Revised Approach)

Additional section.

The following describes procedures for collecting confirmation samples:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each location.
2. Using a disposable plastic scoop, hand auger, shovel, or equivalent, remove approximately 1 inch of the material prior to sampling at the desired depth.
3. Use the same scoop, hand auger, shovel, or equivalent to collect the material into containers until the containers are full.
4. Label each container and place clear packing tape over the label to secure it.
5. Custody seal and package samples in accordance with Section 6.6 of the original SAP.
6. Fill out field documentation, including field logbooks and COCs, during sample collection in accordance with Section 4.0 of the original SAP.
7. Decontaminate non-disposable sampling equipment in accordance with Section 6.4 of the original SAP.

6.3.6 Background Reference Area Sampling Procedures

Additional section.

The procedures for the collection of background reference area samples will be the same as the confirmation samples indicated above in Section 6.3.5.

7.0 ANALYTICAL DATA QUALITY OBJECTIVES

7.2 DATA QUALITY INDICATORS

Additional text.

Table 7-1 lists the gamma and alpha isotopes to be analyzed for the samples described in this Addendum 2.

7.3 FIELD QUALITY OBJECTIVES

Additional text.

Table 7-5 has also been added to include the field QC sample frequency for the samples collected as described in this Addendum 2.

7.3.1 Field Duplicates

Additional text.

A field duplicate will be collected from each of the background reference areas at location #9 as depicted in Figure 5-1 of the Work Plan (TtEC, 2007).

TABLE 7-1

REFERENCE LIMITS FOR SOIL SAMPLES
(UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Cleanup Level for Samples	Project Quantitation Limit	Analytical MDLs	Analytical Method QLs	Units
Gamma spectroscopy/EPA Method 901.1M or equivalent	Americium-241	86954-36-1	NE ^a	b	b	b	pCi/g
	Cobalt-60	10198-40-0	NE ^a	b	b	b	pCi/g
	Cesium-137	10045-97-3	NE ^a	b	b	b	pCi/g
	Europium-152	14683-23-9	NE ^a	b	b	b	pCi/g
	Europium-154	15585-10-1	NE ^a	b	b	b	pCi/g
	Potassium-40	13966-00-2	NE ^a	b	b	b	pCi/g
	Radium-226	13982-63-3	NE ^a	0.5 ^b	0.25 ^b	0.5 ^b	pCi/g
	Radium-228	15262-20-1	NE ^a	b	b	b	pCi/g
	Thorium-232	7440-29-1	NE ^a	b	b	b	pCi/g
Alpha spectroscopy/DOE HASL-300 or equivalent	Thorium-228	14274-82-9	NE ^a	b	b	b	pCi/g
	Thorium-230	14269-63-7	NE ^a	b	b	b	pCi/g
	Uranium-233/234	13968-55-3	NE ^a	b	b	b	pCi/g
	Uranium-235	15117-96-1	NE ^a	b	b	b	pCi/g
	Uranium-238	7440-61-1	NE ^a	b	b	b	pCi/g

TABLE 7-1

REFERENCE LIMITS FOR SOIL SAMPLES
(UFP-QAPP Worksheet #15)

Notes:

^a The results will be evaluated against criteria described in Section 5.5 of this Addendum 2 to determine whether results indicate naturally occurring radioactive material.

^b Project quantitation limits (and method detection limits) for radiological analyses are calculated per sample per analysis. They are selected based on background, sample size, and count time. For all isotopes listed, except for Radium-226, the laboratory will determine these limits since there are no cleanup levels for these isotopes. However, the quantitation (and method detection) limits for Radium-226 were established in the original SAP as 0.5 and 0.25 pCi./g, respectively due to the removal action objective of 1 pCi/g plus background. Therefore, the laboratory will continue to report Radium-226 at these limits by increasing the sample size or count time for the analyses as required.

Abbreviations and Acronyms:

CAS – Chemical Abstract Service

EPA – U.S. Environmental Protection Agency

MDL – method detection limit

NE – not established

pCi/g – picocuries per gram

QL – quantitation limit

UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

TABLE 7-5

FIELD QUALITY CONTROL SAMPLE SUMMARY
(UFP-QAPP Worksheet #20)

Matrix	Analytical Group	Analytical and Preparation SAP Reference	No. of Primary Sampling Locations	No. of Field Duplicates	No. of MS/MSDs	No. of Field Blanks	No. of Equipment Rinsates	No. of Trip Blanks	Total No. of Samples to Laboratory
Confirmation Samples									
Gravel/Soil	Gamma isotopes (as listed in Table 7-1)	Section 5.5	TBD ^a	N/A	N/A	1 (if non-disposable equipment is used)	1 per day per non-disposable equipment	N/A	TBD ^a
Gravel/Soil	Alpha isotopes (as listed in Table 7-1)	Section 5.5	TBD ^a	N/A	N/A	1 (if non-disposable equipment is used)	1 per day per non-disposable equipment	N/A	TBD ^a
Background Reference Area Samples									
Soil	Gamma isotopes (as listed in Table 7-1)	Section 5.6	9	1	N/A	1 (if non-disposable equipment is used)	1 per day per non-disposable equipment	N/A	9 plus QC samples
Soil	Alpha isotopes (as listed in Table 7-1)	Section 5.6	9	1	N/A	1 (if non-disposable equipment is used)	1 per day per non-disposable equipment	N/A	9 plus QC samples

Notes:

^a Total number of sample locations will be determined in the field as described in Figures 1-1, 1-2, and 1-3.

Abbreviations and Acronyms:

MS/MSD – matrix spike/matrix spike duplicate

N/A – not applicable

QC – quality control

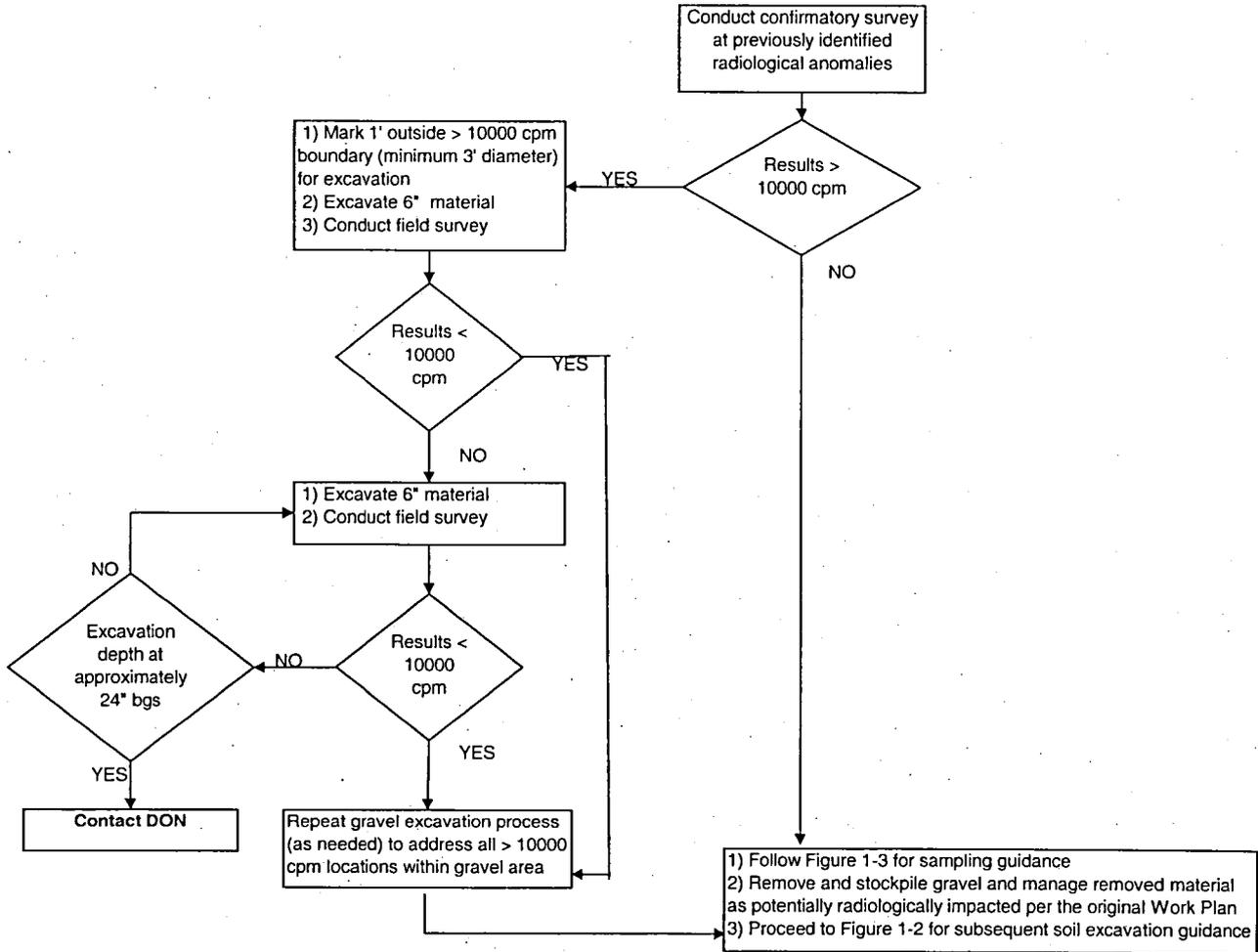
SAP – Sampling and Analysis Plan

TBD – to be determined

UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plan

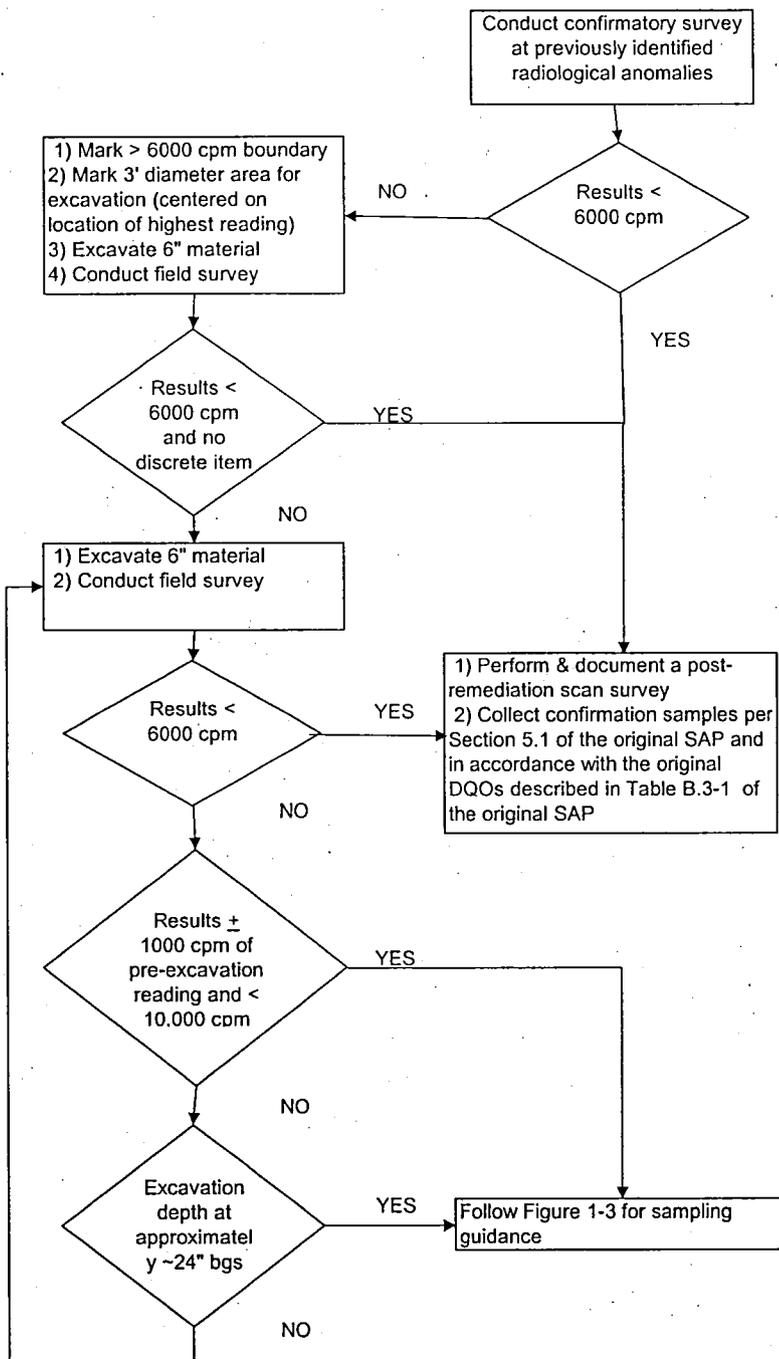
FIGURES

Figure 1-1
Gravel Excavation Guidance



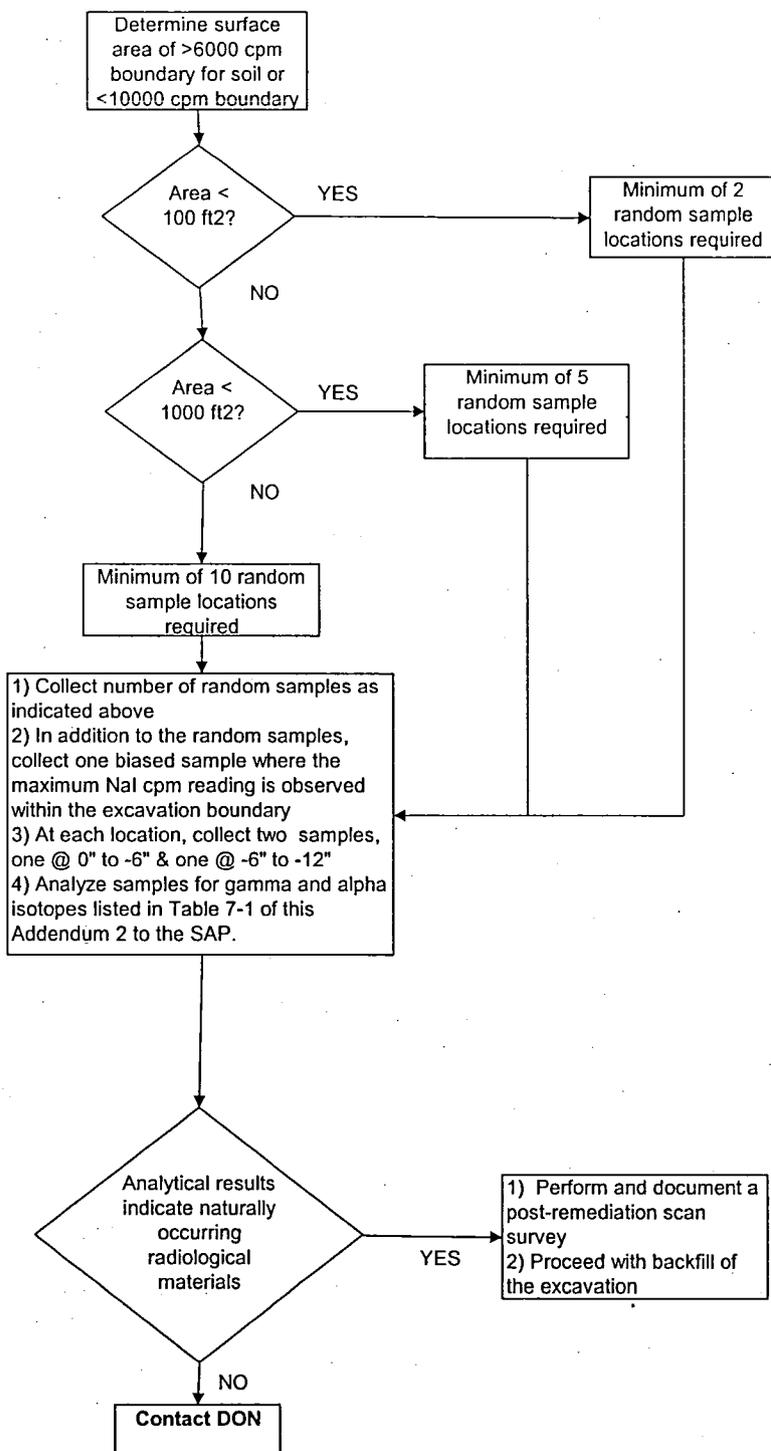
Notes: Segregation and removal of discrete items will proceed as identified in the original Work Plan. Also per the original Work Plan, removal of an additional 1" of material in all directions from discrete item location(s) will be performed. This additional material will be handled and disposed of as radiologically impacted.
10000 cpm = level for gravel measured with 2x2 NaI.
bgs = below ground surface

Figure 1-2
Soil Excavation Guidance



Notes: Segregation and removal of discrete items will proceed as identified in the original Work Plan. Also per the original Work Plan, removal of an additional 1' of material in all directions from discrete item location(s) will be performed. This additional material will be handled and disposed of as radiologically impacted.
6000 cpm = investigative level for soil measured with 2x2 NaI
bgs = below ground surface

Figure 1-3
Sampling Guidance



Notes: Segregation and removal of discrete items will proceed as identified in the original Work Plan. Also per the original Work Plan, removal of an additional 1' of material in all directions from discrete item location(s) will be performed. This additional material will be handled and disposed of as radiologically impacted.
6000 cpm = investigative level for soil measured with 2x2 NaI
10000 cpm = level for gravel measured with 2x2 NaI.
bgs = below ground surface



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A. N. Bolt, Program Manager

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