COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN II)
Northern and Central California, Nevada, and Utah
Contract Number N62474-94-D-7609
Contract Task Order 147

Prepared For

DEPARTMENT OF THE NAVY
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FINAL
F LINE FIELD SAMPLING WORK PLAN
ALAMEDA POINT
ALAMEDA, CALIFORNIA

August 30, 1999

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Subj: TRANSMITTAL OF THE FINAL F LINE FIELD SAMPLING WORK PLAN, ALAMEDA POINT, ALAMEDA, CALIFORNIA

Encl: (1) Final F Line Field Sampling Work Plan, Alameda Point, Alameda, CA, 30 August, 1999

1. Enclosure (1) is the Final F Line Field Sampling Work Plan for Class I areas and is provided for your information. This document describes the contaminated soil sampling work to be done outside the trench areas and is scheduled to start soon.

2. If you have any questions regarding this matter, I can be reached at (650) 244-2549, FAX (650) 244-2774.

ORIGINAL SIGNED BY

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By direction

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ABBREVIATIONS AND ACRONYMS

bgs	Below ground surface
CLEAN	Comprehensive Long-Term Environmental Action Navy
cpm	Counts per minute
CTO	Contract Task Order
DQO	Data quality objective
EPA	U.S. Environmental Protection Agency
IR	Installation restoration
Navy	U.S. Department of the Navy
NRC	U.S. Nuclear Regulatory Commission
NUREG	NRC Guidance
pCi/g	PicoCurie per gram
PRC	PRC Environmental Management, Inc.
QAPP	Quality assurance project plan
Ra-226	Radium-226
TtEMI	Tetra Tech EM Inc.

1.0 INTRODUCTION

On June 22, 1995, Tetra Tech EM Inc. (TtEMI) received Contract Task Order (CTO) No. 147 from the U.S. Department of the Navy (Navy), Naval Facilities Engineering Command, Engineering Field Activity West under Comprehensive Long-Term Environmental Action Navy Contract No. N62474-94-D-7609 (CLEAN II). Task 4 of the statement of work for CTO 147 directed TtEMI to conduct final radiological surveys in support of ongoing removal actions of radiological material at Alameda Point.

At installation restoration (IR) Site 5, radium-226 (Ra-226) was found in storm sewer piping as a result of past use of radium-containing paints in Building 5. The Navy has conducted removal actions at Building 5 to excavate and replace affected piping both inside and outside of the building. At particular locations along the sewer pipeline known as the F Line, the Navy encountered bedding materials that also contained Ra-226. Apparently, the pipeline had leaked at these locations in the past and subsequent repair activities had backfilled the pipeline trench with the excavated material, thereby distributing the radium-affected soil at various depths within the excavation. These locations were designated as Class I areas requiring additional investigation to delineate the extent of the radium-affected soil.

This document describes the methods, techniques, and scope for field work to be performed to provide surveys of residual radioactive contamination at Navy designated Class I areas along the F Line, located outside of Building 5 at Alameda Point. This work plan is a supplement to the final status radiation survey and field sampling work plan for Alameda Point (TtEMI 1998) and to the sampling approach presented in the May 18, 1999, letter from TtEMI to the Navy on the California Department of Toxic Substances Control's proposed survey and sampling approach for IR Sites 5 and 10 (TtEMI 1999).

2.0 PROJECT PURPOSE

The purpose of this work plan is to describe the methodology that will be used to conduct a characterization survey along radiation-affected areas of the F Line, designated by the Navy as Class I, at IR Site 5. The survey will collect data to characterize the extent of Ra-226 contamination in soil adjacent to the pipeline trench areas newly designated as Class I, where additional contamination may exist.

This work plan describes the project scope and technical procedures that TtEMI will use to delineate the extent of Ra-226 contamination at several locations along the F Line.

3.0 BACKGROUND

IR Site 5 consists of Building 5, which was an aircraft rework facility. Radioluminescent paints containing Ra-226 were stored, used, and disposed of in Building 5. Site history suggests that radium-containing paints were disposed into industrial waste sinks and possibly other plumbing fixtures in Building 5, which emptied into the storm sewer system. Further information regarding the radiological history of sites at Alameda Point is contained in the final status work plan (TtEMI 1998).

The F Line is a portion of the Alameda Point storm sewer system being evaluated as part of the radiological removal action being conducted under the oversight of CTO 147. Contaminated soil overburden has been identified along some portions of storm sewer line F, possibly as a result of previous repairs to the storm sewer.

CONTAMINANT OF CONCERN

The radioactive contaminant of concern for this survey is Ra-226. Ra-226 is a component of radioluminescent paint, which was commonly used, stored, and disposed of at Alameda Point. More information on Ra-226 is provided in the final status work plan (TtEMI 1998).

4.0 DATA QUALITY OBJECTIVES PROCESS

The data quality objective (DQO) process outlined in Nuclear Regulatory Commission (NRC) guidance NUREG-1505 is incorporated into this work plan (NRC 1997). DQOs are qualitative and quantitative statements developed by data users to specify the quality of data needed from a particular data collection activity to support specific decisions or regulatory actions.

The general DQOs for this project are as follows:

- To collect sufficient data to characterize the extent of near-surface and subsurface contamination at Class I affected areas along the F Line
- To collect sufficient data to characterize the extent of near-surface contamination at Class III nonaffected areas along the F Line
- To collect data of sufficient quality and quantity to assess whether concentrations of Ra-226 are below the release criteria of the action memorandum (5 picoCuries per gram [pCi/g]).

NUREG-1505 outlines seven steps to establish objectives for radiation investigations in accordance with U.S. Environmental Protection Agency (EPA) DQO guidelines (EPA 1994). The seven steps are as follows:

- State the problem
- Identify the decision
- Identify inputs to the decision
- Define the study boundaries
- Develop a decision rule
- Specify limits on decision errors
- Optimize the design for obtaining data

Each step of the process is discussed in the following subsections.

4.1 PROBLEM STATEMENT

Ra-226 is present at Site 5 at concentrations exceeding 5 pCi/g, which was established as the maximum allowable concentration for Site 5 soil in the action memorandum (TtEMI 1999b). Ra-226 was detected at concentrations above 5 pCi/g (net activity above background) in Class I affected areas of the F Line. There is insufficient data to delineate the extent of contamination for these areas. The lack of data prevents the evaluation of these areas for unrestricted use.

4.2 IDENTIFICATION OF DECISIONS TO BE SUPPORTED BY THE SAMPLING

The problem stated in Section 4.1 is addressed in the following specific questions, which the proposed field sampling and analyses are intended to answer:

- What is the extent of Ra-226 contamination outside the F Line trench in Class I affected areas?
- What Ra-226 affected areas meet the release criterion of 5 pCi/g?

Soil sampling and walkover surveys for Ra-226 will identify the extent of potentially affected areas that will require further investigation or remedial action. Sampling will also identify areas where the

release criterion of 5 pCi/g is met and no further action is necessary in accordance with the action memorandum (TtEMI 1999b).

4.3 INPUTS TO THE DECISIONS

To resolve the questions presented in Section 4.2, additional data are needed. An evaluation of the existing F Line scan and sampling data has resulted in the identification of the following data needs:

- For each Class I area, collect a fixed number of soil samples from randomly selected locations within a fixed grid. This sampling approach would be conducted at the following Class I affected grids: F11, F12, F21 (partial), F22, F23 (partial), F36 through F38, and the circular area around manhole 5F (F39 and F40).
- Class III affected grids where the sheet pile scan criteria failed the investigation level of 1,900 net cpm a soil sample will be collected at the depth of the highest scan location (approximately one foot) on the other side of the shoring and screened in the field. Samples will be collected for Class III affected grids F13 (east side) and F24 (west side) in this manner.
- Step-out soil sampling up to a distance of 15 feet on the east side of grids F11 and F12, and the east, west, and south sides of manhole 5F.
- Walkover surveys of exposed soils in Class I and Class III areas out to 20 feet and 10 feet, respectively

4.4 DEFINITION OF THE STUDY BOUNDARY

The study boundary encompasses the Class I areas where contaminated overburden has been encountered during removal of storm sewer piping and areas where Class III surveys have failed. The length of piping from manhole 5F to manhole 6F, including soil 20 feet east and west of the pipe location, defines the boundary for this investigation. Depthwise, the potentially affected area is estimated to slope from the bottom of the trench excavation (included as trench excavation) to the surface at a slope.

4.5 DECISION RULE

The data generated from the field sampling and analyses will be used in combination with existing data to address the questions in Section 4.2. Examples of the decision rules that will be used to resolve these questions area presented below.

- Suspected areas will be eligible for free release if, based on random sampling, all subsurface samples are below 5 pCi/g and surface walkover surveys are below 1,900 counts per minute (cpm) (over concrete or asphalt overburden corresponding to 5 pCi/g), demonstrating the absence of near-surface radioactivity in excess of 5 pCi/g.

- However, if the investigation concentration at a net count rate of 1,206 cpm is exceeded (an action level corresponding to 3.3 pCi/g), a soil sample will be collected below the road covering. Class I areas will be surveyed out to 20 feet and Class III areas to 10 feet, on both sides of the trench.

- Soil Geoprobe samples will be screened using a sodium iodide crystal. Scanning of continuous cores will have a sensitivity of 5 pCi/g for a 1-inch-diameter core (based on a 6-second counting interval per 6-inch length of core). This sensitivity will be sufficient for delineating any additional areas of significance. After affected areas are delineated and sample analysis is complete, the area will be evaluated further for release or remedial action.

4.6 LIMITS ON DECISION ERROR

Investigative data from the sampling event may be strongly indicative of site conditions but not absolutely definitive; as a result, decisions based upon the data could potentially be in error. This is known as the decision error. The approach used to collect data endeavors to minimize the potential for error.

The following two types of errors are associated with data collection and may lead to decision error:

- **Sampling error** occurs because it is impossible for a sampling effort to measure conditions at every point of a site or at every point in time. Sampling error occurs when the sample is not representative of the true conditions of the environment at a site. Sampling error is minimized because both surface areas and cores will be completely scanned using portable detectors.

- **Measurement error** occurs because of the random and systematic errors associated with sample collection, handling, preparation, and analysis. Measurement error is minimized by close adherence to sampling procedures and the quality assurance project plan (QAPP) (PRC Environmental Management, Inc. [PRC] 1996) and this work plan.

4.7 OPTIMIZATION OF DATA COLLECTION DESIGN

The data collection design is considered to be optimized because it has been negotiated with regulatory agency staff. The step-out pattern approach used for delineation of contamination is optimal because it utilizes continuous core scanning combined with an on-site mobile laboratory for identifying

appropriate sample locations and depths and when the release criteria has been satisfied for sample location decision-making.

5.0 SAMPLE LOCATIONS

The field locations included within the scope of this work include areas on either side of the 5F to 6F storm sewer piping that were identified for additional surveys in Section 4.3. The soil investigation activities for each area are as follows:

- At Class I areas, three randomly located samples will be taken for analysis on each side of the trench, as delineated by the present locations of sheet piling used to shore the open trench. Sample locations will be identified by using random coordinate selection in horizontal "x" (along the trench, south, parallel to the pipe, 0 to 10 feet) and lateral "y" (toward Building 5, east and west, perpendicular to the pipe, 0 to 20 feet) coordinates. The maximum depth "z" coordinate (0 to 15 feet below ground surface [bgs]) for sampling will be based on a slope extending from 2 feet below the bottom of the excavation (13 feet plus 2 feet for a maximum of 15 feet bgs) to the surface. Presently, F Line grids F11, F12, F21 (partial), F22, F23 (partial) and F36 through F38 are considered Class I.

- A circular area around manhole 5F (Grid F39 and F40) will be investigated using a 5 foot step-out. The horizontal, lateral, and depthwise extent of this source will be evaluated by the use of continuously cored samples collected using a Geoprobe. The first set of cores will be 5 feet away from the 5F manhole and cored to a depth of 15 feet bgs. Subsequent boring locations will advance laterally from the trench at intervals to be determined in the field after the first set of borings are screened.

- Soils at grids F11 and F12 are suspected of being affected from a source external to the trench. The horizontal, lateral, and depthwise extent of this source will be evaluated by the use of continuously cored samples collected using a Geoprobe. The first set of cores will be 4 feet apart and cored to a depth of 20 feet bgs along F11 and F12. Sample boring locations will be approximately 1 foot from the former trench sidewall as delineated by the sheet pile. Subsequent boring locations will advance laterally from the trench at 4-foot intervals until a nonaffected area is reached. These core samples will define the lateral and vertical extent of the suspected source of Ra-226 contamination present at the F12 grid.

- One sample boring at Class III grids F13 (east side) and F24 (west side) will be collected one foot away from the sheet pile and screened in the field. The boring will be cored to a depth of 15 feet bgs.

- A surface walkover survey will be conducted using a 2-inch scintillation detector horizontally from the east and west trench walls, in grids designated as Class III.

Currently, 47 samples are planned to be taken in Class I and Class III areas along the F Line. The Microsoft Excel™ randomly calculated coordinates are listed in Table 1.

6.0 SAMPLE METHODOLOGY

At Class I areas, three soil samples will be collected from each side of the trench at locations and depths randomly selected within the area judged to be affected. Samples will be collected using a Geoprobe. Sufficient soil will be collected to fill a 1-liter Marinelli container. The sample will be field blended, and a 0.5-liter aliquot will be submitted to the on-site laboratory for analysis by gamma spectroscopy. Up to 10 percent of the samples will be sent to an off-site laboratory for confirmation analysis. Samples will be analyzed using the 186 kiloelectron volt emission from Ra-226.

The Navy will also perform a 100 percent gamma scan survey on all soils within the area that may become exposed during the storm sewer removal action activities. This will include scanning any locations adjacent to the trench prior to backfilling.

In addition, walkover surveys will be conducted in all Class I areas out to 20 feet, and in Class III areas to 10 feet from the trench boundary.

In areas where the extent of contamination is being delineated, continuous cores will be scanned using a 2-inch scintillation detector in a shielded configuration (in order to increase sensitivity) for evidence of increased Ra-226 concentrations. Samples will be selected from core areas exhibiting increased detector response. Approximately 17 inches of 1-inch-diameter core or 9 inches of 2-inch-diameter core will be selected from the location of highest response for analysis by an on-site spectrometry system. Scan sensitivity will be at least 5 pCi/g.

7.0 EVALUATION OF DATA AND DEVELOPING RECOMMENDATIONS

The data collected from this sampling event will be reviewed to determine the extent of Ra-226 contamination in Class I affected areas adjacent the F Line at IR Site 5, if present, or whether Class I affected areas meet the acceptable cleanup criterion of 5 pCi/g established for the F Line removal action. Based on the derivation of acceptable cleanup criteria for locations outside the trench area, and consultation with regulatory agency staff, Navy and Navy Radiological Affairs Support Office personnel will make recommendations for unrestricted release of subject areas.

The sampling data will be compiled into a technical memorandum. The sampling data, derived natural radiation background concentrations, and characterization data for future remediation will be included in the technical memorandum. The data will be accompanied by text describing the sampling,

description of results, and conclusions drawn from the data. The technical memorandum will include maps, data tables, summary figures, and necessary equations and calculations.

8.0 QUALITY ASSURANCE

Quality assurance components for this project are detailed within the "Final Site Status Confirmation Assurance Project Plan Addendum, Alameda Point, Alameda California" (TtEMI 1999c), final status work plan (TtEMI 1999a), and the CLEAN II quality control management plan (PRC 1995).

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TABLE 1

RANDOMLY GENERATED SAMPLE LOCATION COORDINATES

F-Line Grid	X-Coordinate Horizontal South (feet)	Y-Coordinate Vertical East/West (feet)	Z-Coordinate Depth (feet)
F11-E	9	17	2
F11-E	2	6	10
F11-E	3	8	9
F11-W	0	6	11
F11-W	1	1	15
F11-W	8	1	14
F12-E	2	2	13
F12-E	7	9	8
F12-E	0	4	12
F12-W	9	14	4
F12-W	8	16	3
F12-W	3	11	7
F21-E (partial)	10	13	5
F21-W (partial)	8	10	8
F22-E[a]	8	8	9
F22-W[a]	7	15	4
F23-E (partial)	1	6	10
F23-W (partial)	3	5	12
F36-E	4	6	11
F36-E	6	3	12
F36-E	4	4	12
F36-W	5	17	2
F36-W	9	18	1
F36-W	2	18	2
F37-E	5	14	4
F37-E	6	14	5
F37-E	6	11	6
F37-W	2	13	5
F37-W	8	1	14
F37-W	6	17	2

TABLE 1 (Continued)

RANDOMLY GENERATED SAMPLE LOCATION COORDINATES

F-Line Grid	X-Coordinate Horizontal South (feet)	Y-Coordinate Vertical East/West (feet)	Z-Coordinate Depth (feet)
F38-E	4	10	7
F38-E	8	20	1
F38-E	7	2	14
F38-W	1	1	15
F38-W	1	15	4
F38-W	0	2	14
Step-Out F11/F12 - East side[b]			
F10.5	0	1	20
F11.25	0	1	20
F12	0	1	20
F12.75	0	1	20
F13.5[b]	0	1	20
Step-Out Manhole 5F[b, d]			
F39-E	From Manhole	5	15
F39-SE	From Manhole	5	15
F39-S	From Manhole	5	15
F39-SW	From Manhole	5	15
F39-W	From Manhole	5	15
Other Sampling[b, c]			
F24-W	5	1	15

Notes:

a Class I grid F22 passed the sheet pile scan. Thus, the three random samples will be collected over a larger area. The area extends from F21.5 to F23.5 on both sides of the trench.

b Sampling is not random

c Class III grid where sheet pile scan failed. The F13.5 eastside grid sample will also be part of the F11/12 step-out. This is a more conservative approach than proposed to the regulatory agencies (TtEMI 1999a)

d Sampling of the highest location where sheet pile scans failed in Class I grids will be satisfied by the F11/12 step-out sampling.