LOCKHEED MARTIN

Y/ER-310

ENVIRONMENTAL RESTORATION PROGRAM

Field Sampling and Analysis Plan for the Removal Action at the Former YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee

This document has been approved by the
Y-12 Technical Information Office
for release to the public. Date: 03/25/98

ENERGY SYSTEMS ER

MANAGED BY
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

UCN-17560 (6 8-95)

ENTECH, Inc.

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

Y/ER-310

Field Sampling and Analysis Plan for the Removal Action at the Former YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee

Date Issued—March 1998

Prepared by
ENTECH, Inc.
Oak Ridge, Tennessee
under subcontract 1CK-AENO2V

Prepared for the
U.S. Department of Energy
Office of Environmental Management
under budget and reporting code EW 20

Environmental Management Activities at
OAK RIDGE Y-12 PLANT
Oak Ridge, Tennessee 37831
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

DISCLAIMER

APPROVALS

Field Sampling and Analysis Plan
for Lead Source Removal Action
at the Former YS-860 Firing Ranges,
Oak Ridge Y-12 Plant,
Oak Ridge, Tennessee
(Y/ER-310)

March 1998

Victor L. Turner

Victor Turner, LMES Project Manager

3/23/98

Date

Richard K. Adkisson

Richard K. Adkisson, ENTECH Program Manager

3/23/98

Date

CONTENTS

FIGURES

TABLES

ABBREVIATIONS

ASO	Analytical Services Organization
ESP	Environmental Surveillance Procedure
LMES	Lockheed Martin Energy Systems, Inc.
QA	quality assurance
QC	quality control
SMO	Sample Management Office

EXECUTIVE SUMMARY

The U.S. Department of Energy is conducting environmental restoration activities at the Oak Ridge Y-12 Plant. As part of these efforts, a removal action is planned for the former YS-860 Firing Ranges. The purpose of this removal action is to address lead-contaminated soil and reduce a potential risk to human health and the environment. This site is an operable unit within the Upper East Fork Poplar Creek watershed. Lead source removal action will contribute to early source actions within the watershed. The project will accomplish this through the removal of lead-contaminated soil in the target areas of the two small arms firing ranges.

This field sampling and analysis plan sets forth the scope of sampling and analysis procedures that are required to ensure that soil contamination exceeding the action level of 1400 μg/g has been identified and removed as part of this project.

This field sampling and analysis plan covers the verification/confirmatory sampling that will be conducted during excavation and following regrading activities. Surface soil samples collected during verification and confirmatory sampling will be located along evenly spaced nonrandom authoritative grids. Samples will be collected at each grid node. The grid spacing will be set to provide for a large number of sampling locations to improve representativeness. The grids will be established from numbered transect stakes keyed to the type of sampling (verification or confirmatory) and the location being sampled. To facilitate analysis of a large number of samples, spatial compositing along individual transects will be implemented.

Verification sampling will be performed during excavation of the end berm soil to ensure the removal effectively reduces lead concentrations below the action level (1400 μg/g). After a portion of the berm has been excavated, and it is safe to do so, a visual inspection will be performed by the sampling team before soil sampling. During excavation, if significant evidence of bullets or shot penetrating deeper than the cut face is identified (more than 5 bullets between any two lines of transect), an additional 6-in. of soil will be cut from the berm between those lines of transect. Sequentially numbered transect stakes will be added every 5 ft along the crest of the berm as excavation proceeds. Sequentially numbered grid sampling nodes will be established at 5 ft intervals down the face of the berm from each transect stake to the base of the cut. For the end berm at the west firing range, this will result in a grid of 41 transect stakes by 10 grid nodes (410 sampling locations), and for the east firing range end berm, a grid of 17 transect stakes by 6 grid nodes (102 sampling locations) will be established. Surface soil samples will be collected from the grid nodes along each line of transect and composited to provide a single sample from each transect. This will result in a total of approximately 512 grid node locations being sampled and composited into a total of 58 composite samples.

Confirmatory sampling will be performed over the entire site following regrading of site before revegetation. The confirmatory samples will ensure that any remaining lead contamination in surface soil at the final grade is below the action level. Sequentially numbered transect stakes will be established every 20 ft along an east/west line from the northwest corner of the regraded area to the northeast corner. Sequentially numbered grid sampling nodes will be established at 20 ft intervals from north to south from each transect stake to the edge of the regraded area. This will result in a

grid of approximately 17 transect stakes by 11 grid nodes (187 sampling points) yielding 17 composite samples, and 8 randomly collected discrete soil samples or a total of 25 confirmatory samples will be collected. The results of the confirmatory soil sampling will be used to determine if the removal action objective for the site has been achieved. If lead concentrations in soil above the action level are identified during confirmatory sampling, the need for additional soil sampling and/or soil removal will be reviewed with the site manager and the U.S. Department of Energy.

Verification and confirmatory soil samples collected for analysis will be analyzed by the Sample Management Office–approved Y-12 Plant Analytical Services Organization laboratory using U.S. Environmental Protection Agency SW846 Method 7421 protocol for lead detections. This approach will allow for the quick turnaround of a large number of samples with a high level of precision and accuracy, yielding dependable results.

Specific requirements for sample preparation, sample analysis, and laboratory quality assurance/quality control are presented in the quality assurance project plan (ENTECH, Inc. 1998d). The internal procedures and protocols used by Lockheed Martin Energy Systems, Inc., Sample Management Office–approved laboratories meet the general data quality requirements for this project.

1. INTRODUCTION

The former YS-860 Firing Ranges are located at the eastern end of the Oak Ridge Y-12 Plant outside the primary facility fence line and west of Scarboro Road within the Upper East Fork Poplar Creek watershed in Oak Ridge, Tennessee (Fig. 1). A decision has been made by the U.S. Department of Energy to conduct a removal action of lead-contaminated soils at this site as part of early source actions within the Upper East Fork Poplar Creek watershed. This non-time critical removal action of bullets and lead-contaminated soil from the YS-860 Firing Ranges is being conducted as a Comprehensive Environmental Response, Compensation, and Liability Act of 1980 action. These actions are consistent with the Oak Ridge Reservation Environmental Restoration Program. The removal action will focus on the excavation of bullets and lead-contaminated soil from the shooting range berms, transportation of the material to a permitted treatment facility for disposal, demolition and land filling of a concrete trench and asphalt pathways at the site, and grading and revegetating of the entire site.

2. OBJECTIVE

This report is the field sampling and analysis plan for the removal action at the former YS-860 Firing Ranges. The field sampling and analysis plan addresses environmental sampling for lead after the removal of lead-contaminated soil from the target berm area. The objective of this sampling plan is to obtain sufficient analytical data to confirm that the removal action excavation has successfully reduced lead levels in soil to below the action level of 1400 μg/g.

3. SCOPE

ENTECH, Inc., has developed this sampling plan to accomplish the objective stated in Chap. 2. Verification sampling will be conducted after the removal of soil from the target berms and will confirm that the removal action objectives have been met. After the removal of the concrete trench and the macadam paths, the entire area will be filled and graded with soils from the nontarget berms on the east and west sides of the firing range site and then revegetated. Confirmatory sampling will be conducted after regrading, but before revegetation, to ensure that any remaining lead contamination in surface soil is below the action level (1400 μg/g lead). This field sampling and analysis plan will be implemented in conjunction with the health and safety plan (ENTECH, Inc. 1998c), the waste management plan (ENTECH, Inc. 1998e), the quality assurance project plan (ENTECH, Inc. 1998d), the best management practices plan (ENTECH, Inc. 1998a), the data management implementation plan (ENTECH, Inc. 1998b), and the removal action work plan (DOE 1998) for the YS-860 Firing Ranges.

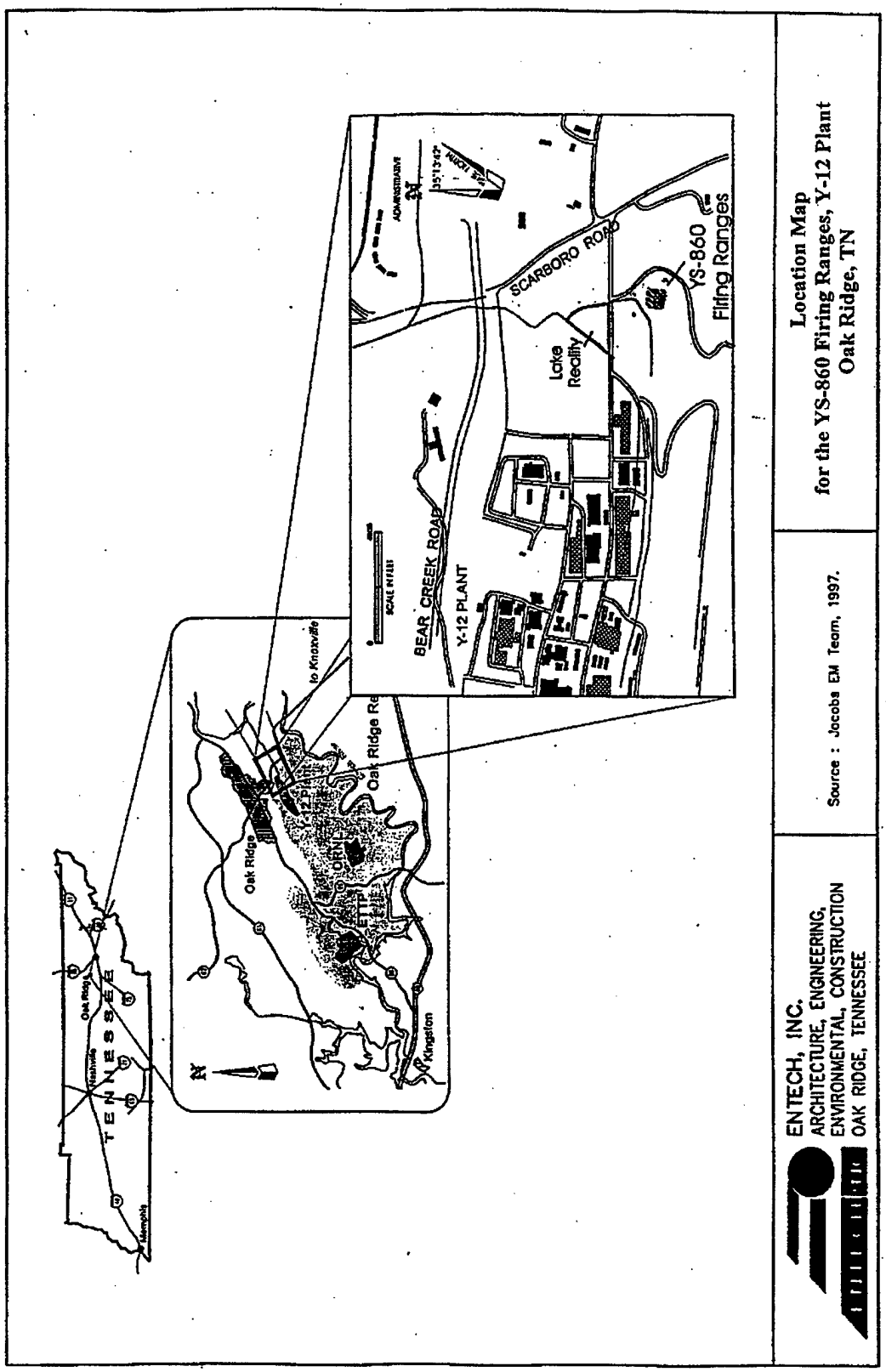


Fig. 1. Location map for the YS-860 Firing Ranges.

4. SITE BACKGROUND

4.1 OPERATIONAL INFORMATION

The former YS-860 Firing Ranges are located at the eastern end of the Y-12 Plant between Lake Reality and Chestnut Ridge. This area is east of the primary facility fence line and west of Scarboro Road within the Upper East Fork Poplar Creek watershed. This portion of the Oak Ridge Reservation is within Anderson County, Tennessee. The site consists of two firing ranges, a smaller eastern range and a larger western range. The eastern range is a relatively unimproved area with a low end berm approximately 80 ft long. The western range is an improved firing range with a covered shed, asphalt and gravel pathways, side berms, and a large end berm (approximately 200 ft long) with a concrete trench at the base.

The former firing ranges were used for small arms training by the Y-12 Plant security forces. The eastern firing range was in use from 1943 until the mid-1950s. The western range was in use until the mid-1980s. These ranges were both used primarily as pistol ranges; however, shotgun and rifle use at the ranges cannot be excluded. It is not anticipated that any of the firearms potentially used at the ranges would penetrate more than 2 ft.

4.2 PREVIOUS INVESTIGATIONS

In 1996, a site evaluation of the YS-860 Firing Ranges was conducted by Lockheed Martin Energy Systems, Inc. (LMES). The investigation determined that elevated lead levels were present in the firing range target berm soils. The results of the evaluation are documented in the *Y-12 Analytical Services Organization Official Report* (LMES 1996). The results of this sampling event form the basis for the removal action recommendation presented in the *Action Memorandum for Lead Source Removal at the Former YS-860 Firing Ranges, Y-12 Plant, Oak Ridge, Tennessee* (DOE 1997).

The site evaluation consisted of four shallow surface soil samples (0–6 in.), two deeper surface soil samples (0–12 in.), four soil borings (0–24 in.), and one surface water sample. Two surface soil samples (S-1 and S-2) were collected from the face of the end berm in the western range, three surface soil samples (S-4, S-5, and S-10) were collected from near the base of the western range end berm, and one surface soil sample was collected from near the base of the western edge berm of the western range. Three soil borings (SB-6, SB-7, and SB-8) were installed in an east/west line between the western range and a diversion ditch, the nearest topographically downgradient surface water drainage, and one soil boring (SB-9) was installed in the drainage ditch downgradient of the site. The surface water sample (SW-3) was collected from standing water at the base of the western range end berm. Figure 2 illustrates the locations of samples collected during the site evaluation. All of the samples were analyzed for total lead using SW-846 methods, except S-1, which was analyzed using the toxicity characteristic leaching procedure.

Samples S-1 and S-2, from the face of the western range end berm, had the highest levels of lead contamination found at the site, 769 mg/L and 116,000 μg/g, respectively. The results from the remaining eight soil samples ranged from 23 to 255 μg/g, all below the most stringent U.S. Environmental Protection Agency guidance level of 400 μg/g recommended for

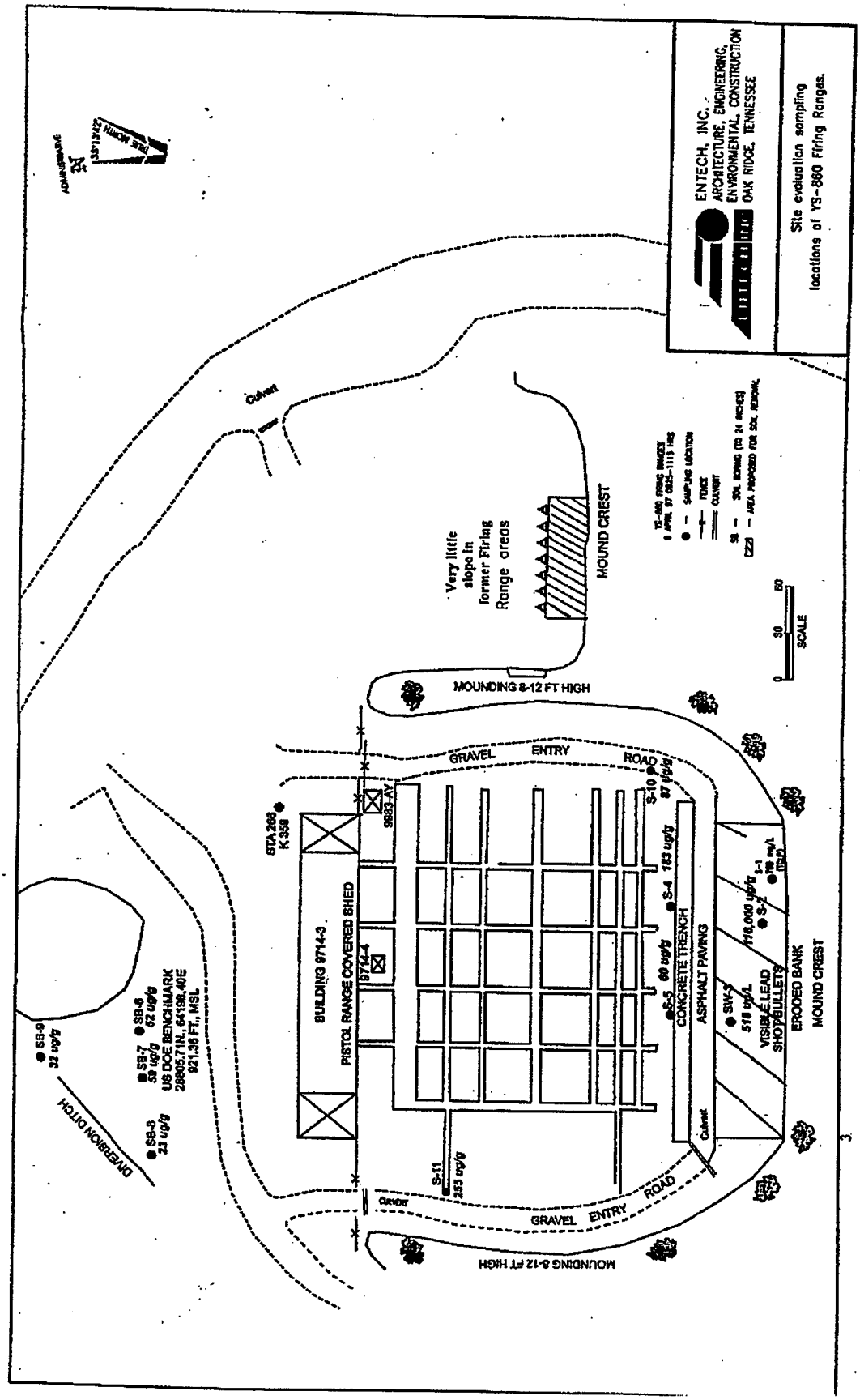


Fig. 2. YS-860 Firing Ranges site evaluation sampling locations.

residential use. The surface water sample, SW-3, from standing water at the base of the western range end berm had a concentration of 0.518 mg/L.

These results demonstrate that most of the lead contamination in soil at the site is restricted to the face of the end berm, as would be expected. Because the transport mechanism for soil and particulate lead is expected to be through erosion of the berm face and fluvial transport along the base of the berms during rain events, these results are consistent with this model. On the basis of these results, removal of the source material from the berm face and soil from the base of the berm (secondary source) should remediate the soil contamination. The presence of lead in surface water at the base of the end berm and the results of the toxicity characteristic leaching procedure analysis indicate that lead is leaching into water at the site. However, lead above background levels has not been detected in surface water or groundwater downgradient of the site during routine monitoring by the Y-12 Environmental Management Division (LMES 1996).

5. LOCATION AND DESCRIPTION OF SITE

Excavation and demolition is planned in general accordance with the *Action Memorandum for Lead Source Removal at the Former YS-860 Firing Ranges, Y-12 Plant, Oak Ridge, Tennessee* (DOE 1997). A strip of soil from each of the two target embankments will be excavated. These areas are estimated to be approximately 200 ft × 45 ft × 15 in. and 80 ft × 25 ft × 15 in. in the west and east firing ranges, respectively (aerial dimensions based on field measurements taken by ENTECH, February 20, 1998, and depth based on measurements taken by Jacobs EM Team during the Engineering Evaluation/Cost Assessment).

6. VERIFICATION/CONFIRMATORY SAMPLING AND ANALYSIS

Verification/confirmatory sampling will be conducted during excavation and following regrading activities to ensure that soil contamination exceeding the action level of 1400 μg/g has been identified and removed as part of this project. Verification sampling will be performed following excavation of the initial 15 in. of soil from the end berms and visual inspection of the cut surface. Confirmatory sampling will be performed following regrading of the site to ensure surface soil lead concentrations are below action levels. Samples collected as part of this project will be analyzed for lead by using a quick turnaround of SW-846 Method 7421 analysis by the Y-12 Plant Analytical Sources Organization's (ASO's) fixed-base laboratory. Table 1 shows the approximate total sampling requirements, including QA/QC, verification, and confirmatory samples, for fixed-base laboratory analysis and Table 2 lists analytical methods, parameters, and project quantitation limits.

Table 1. YS-860 Firing Ranges removal action sampling requirements for lab analysis

Analytic group	Approximate no. of samples[a]	Container	Minimum sample size	Preservative	Holding time[b]
		Verification and Confirmatory Sampling			
Lead	91	(1) 4-oz wide-mouth glass or polybottle	25 g	Cool, 4°C	180 d
		Quality Control Samples			
Lead (water)	4	(1) 500-mL polybottle	300 mL	Cool, 4°C, HNO3 to pH<2	180 d

[a]Includes 83 soil samples to be collected for fixed-base field laboratory analysis of lead and 8 duplicate soil samples to be collected for the fixed-base laboratory analysis of lead.SW-846 method 7421 will be followed. Quality control samples include three sampling equipment rinsate samples and one decontamination source water blank for lead.

[b]Holding times are listed for reference; however, an overnight turnaround is requested for lead in soil.

Table 2. Analytical methods, parameters, and project quantitation limits for YS-860 Firing Ranges Removal Action, Y-12 Plant, Oak Ridge, Tennessee

Parameters	Analytical method	Project quantitation[a] (ppm)
Lead	SW846-7421 (GFAA)	50

[a]These are expected quantitation limits based on a purified matrix. Actual quantitation limit may be higher depending on the nature of the sample matrix. The limit reported on final laboratory reports will take into account the actual sample volume or weight, percent solids (where applicable), and the dilution factor, if any. The quantitation limits for additional analytes to this list may vary depending on the results of laboratory studies.

6.1 SAMPLING LOCATIONS AND METHODS

6.1.1 Sampling Locations and Identification

Surface soil samples collected during verification and confirmatory sampling will be located along evenly spaced grids. The grids will be established from numbered transect stakes keyed to the type of sampling (verification or confirmatory) and the location being sampled. The location of the end or corner stakes for each sampling grid will be surveyed and the coordinates established using the Y-12 Plant grid. Transect stakes and grid sampling nodes will be located using a fiberglass measuring tape and recorded using a sample identifier keyed to the sample location. Sample identifiers will consist of an 11 digit alphanumeric code assigned in the field. The data management implementation plan (ENTECH, Inc. 1998b) provides a complete description for assignment of sample identifiers.

6.1.2 Sampling Methods

Methods used during soil sampling will be based on LMES Environmental Surveillance Procedures (ESPs). LMES ESPs planned for use during this project are presented in the quality assurance project plan (ENTECH, Inc. 1998d). ESP-103 (formerly ESP-1100) forms the basis of the

sampling design for this project. The planned sampling is based on a nonrandom authoritative grid because the general location of the affected media is well established (the range end berms). As a result of the random nature of the distribution of lead within a shooting range end berm and the localization of the lead contamination (bullets) within the soil matrix, samples will be collected at each grid node. The grid spacing will be set to provide for a large number of sampling locations to improve representativeness. To facilitate analysis of a large number of samples, spatial compositing along individual transects will be implemented. Because lead is the only analyte of concern at the site, U.S. Environmental Protection Agency SW-846 Method 7421 protocol with high precision and accuracy will be used while providing for rapid overnight turnaround of a large number of samples.

Samples will be collected using manual methods described in ESP-303-1 with clean sampling equipment. A stainless-steel spade, scoop, or bucket auger will be used to collect an approximately 8-oz sample aliquot from each grid node. The sample will be collected to a depth of approximately 2-in. bgs and placed directly into a clean sample container or into a bowl for compositing. Spatial composites will be collected along transects by placing the composite sample aliquots into a clean stainless-steel bowl and thoroughly mixing with a clean stainless-steel spoon. An approximately 8-oz aliquot will be taken from the mixture and placed directly into a sample container. When composite samples are being collected, the sampling device will not require decontamination between sampling locations for the same composite sample.

Sample containers used for collection of verification and confirmatory samples in the field will be precleaned 8-oz clear glass jars. The sample identifier, sample date, sample time, and sampler initials will be placed on self-adhesive labels attached to the container or written directly on the container. The container will be closed, sealed with custody tape, and placed in a rigid container for transport to the Y-12 Plant ASO laboratory. Sample custody will be documented on a field chain-of-custody form following ESP-501. Following analysis, any unused sample volume will be disposed of on-site as near the point of generation as possible unless the action level is exceeded. Unused sample material exceeding the action level will be included with material shipped to the disposal facility. Sampling equipment decontamination will be performed following ESP-801 (formerly ESP-900) procedures for stainless-steel or metal sampling equipment as discussed in the quality assurance project plan.

6.1.3 Quality Assurance/Quality Control Sampling

Quality assurance/quality control (QA/QC) sampling per ESP-102 will include collection of field duplicates, field blanks, and equipment rinsates. Field duplicate samples will be collected at an approximate rate of 10% of field samples by collecting two aliquots from a composited sample volume. A single potable water source field blank will be collected during the first week of field activities. Equipment rinsates will be collected from clean sampling equipment at a rate of one per week in which sampling is taking place. Table 3 summarizes the QA/QC sampling to be performed during the project.

Sample custody, sample handling, and analysis of field duplicate samples will be performed in the same manner as the other samples. Sample custody for the remaining QA/QC samples to be submitted for fixed-base laboratory analysis will be performed using laboratory chain-of-custody forms per ESP-501. Soil matrix QA/QC samples do not require preservation, but water matrix samples require preservation with nitric acid to a pH <2. The fixed-base laboratory samples will be packaged for shipment to an LMES Sample Management Office (SMO)–approved Y-12 Plant ASO laboratory following requirements of ESP-505.

Table 3. Quality assurance/quality control samples

Sample type	Media	Number of samples
Field duplicates	Soil	8
Field blanks	Water	1
Equipment rinsates	Water	3

6.2 VERIFICATION SAMPLING

Verification sampling will be performed during excavation of end berm soil to ensure that the removal effectively reduces lead concentrations below the action level. A grid will be established from the end of the berm where excavation begins by placing the first transect stake (#00) at the crest of the berm adjacent to the beginning of the cut. Sequentially numbered transect stakes will be added every 5 ft along the crest of the berm as excavation proceeds. Sequentially numbered grid sampling nodes will be established at 5 ft intervals down the face of the berm from each transect stake to the base of the cut. For the end berm at the west firing range, this will result in a grid of 41 transect stakes by 10 grid nodes (410 sampling locations); for the east firing range end berm, a grid of 17 transect stakes by 6 grid nodes (102 sampling locations) will be established. Table 4 summarizes the samples to be collected during verification sampling. Verification sampling will be accomplished in two steps, a visual inspection followed by soil sampling.

Table 4. Summary of verification samples

Location and sample type	Number of grid node locations sampled	Number of samples submitted for analysis
West Range/composite	410	41
East Range/composite	102	17

6.2.1 Visual Inspection

A visual inspection of the cut berm face will be performed by the sampling team before soil sampling. The inspection will take place as the sampling grid nodes are laid out from the transect stakes. The sampling team will thoroughly inspect the entire cut berm face between every line of transect for bullets, shot, or lead streaks, and note their findings (positive or negative) with reference to the transect number and grid node(s) in their field logbooks. The sampling team may use brooms or rakes, as necessary, to facilitate the visual inspection. If significant evidence of bullets or shot penetrating deeper than the cut face is identified (more than 5 bullets between any two lines of transect), then an additional 6-in. of soil will be cut from the berm between those lines of transect.

6.2.2 Soil Sampling

Surface soil samples will be collected from the grid nodes along each line of transect and composited to provide a single sample from each transect. The samples will be collected as described above to a depth of 2-in. below the surface of the cut. Any bullets or shot encountered in the sample material will be noted as part of the visual inspection and removed from the sample before analysis.

The results of the verification soil sampling will be used to determine if and where any additional soil will be removed from the berm face to reduce the soil lead content below the action level. If additional soil is removed, a second round of verification soil sampling will be performed in the area of the additional berm cut.

6.3 CONFIRMATORY SAMPLING

Confirmatory sampling will be performed over the entire site following regrading of the site but before revegetation. The confirmatory samples will ensure that any remaining lead contamination in surface soil at the final grade is below the action level. Sequentially numbered transect stakes will be established every 20 ft along an east/west line from the northwest corner of the regraded area (#00) to the northeast corner. Sequentially numbered grid sampling nodes will be established at 20 ft intervals from north to south from each transect stake to the edge of the regraded area. This will result in a grid of approximately 17 transect stakes by 11 grid nodes (187 sampling points). Table 5 summarizes the samples to be collected during confirmatory sampling.

Table 5. Summary of confirmatory samples

Location and sample type	Number of grid node locations sampled	Number of samples submitted for analysis
Entire site/composite	187	17
Entire site/discrete	8	8

Surface soil samples will be collected from the grid nodes along each line of transect and composited to provide a single sample from each transect. The samples will be collected as described previously to a depth of 2-in. below the regraded surface. Any bullets or shot encountered in the sample material will be noted and removed from the sample before analysis. Additionally, 8 discrete soil samples will be collected from randomly selected grid nodes. All samples will be sent to the Y-12 Plant's fixed-base laboratory for analysis of lead by SW-846 Method 7421 protocol. These samples will be collected to a depth of 6-in. bgs using a clean stainless-steel hand auger.

The results of the confirmatory soil sampling will be used to determine if the remedial action objective for the site has been achieved. If lead concentrations in soil above the action level are identified during confirmatory sampling, the need for additional soil sampling and/or soil removal will be reviewed with LMES and the U.S. Department of Energy.

6.4 ANALYTICAL METHODS

Verification and confirmatory soil samples collected for analysis will be analyzed by the SMO-approved Y-12 Plant ASO laboratory using SW-846 Method 7421 protocol for lead detections. This approach will allow for the quick turnaround of a large number of samples with a high level of precision and accuracy, yielding competent, dependable results.

Specific requirements for sample preparation, sample analysis, and laboratory QA/QC are presented in the quality assurance project plan. The internal procedures and protocols used by LMES SMO-approved laboratories meet the general data quality requirements for this project.

7. SAMPLING AND FIELD PROCEDURES

Documented and controlled procedures will be used to perform field activities affecting quality. The procedures listed in Table 6 (or approved equivalent) will be used during the field sampling activities. Health and safety requirements and procedures to protect the personnel involved in the field activities are set forth in the health and safety plan (ENTECH, Inc. 1998c). Unless otherwise indicated, the implementing organizations are responsible for verbatim compliance to the procedures. Copies of the project-specific procedures will be available to project personnel in a separate YS-860 Firing Ranges Removal Action Project-Specific Procedures manual.

Table 6. Project-specific procedures.

Field procedure description	Document number or reference	Implementing organization
Field Quality Control	ESP-102, Rev. 1	ENTECH
Statistical Sampling Design	ESP-103, Rev. 0	ENTECH
Collection of Soil Samples	ESP-303-1, Rev. 1	ENTECH
Sample Chain-of-Custody	ESP-501, Rev. 2	ENTECH
Field Logbook and Field Forms	ESP-503, Rev. 0	ENTECH
Field Monitoring Equipment Calibration	ESP-504, Rev. 0	ENTECH
Decontamination	ESP-801, Rev. 0[a] ESP-802, Rev. 0 ESP-803, Rev. 0	ENTECH
Sample Packing and Shipping	ESP-505, Rev. 1	ENTECH
Waste Management	ESP-105, Rev. 0	ENTECH
Land Surveying		ENTECH

[a]ENTECH plans to use these procedures with modifications. Modifications are described in the following project-specific work aids described in Chap. 7.

7.1 PROJECT-SPECIFIC WORK AID FOR FIELD QUALITY CONTROL PROCEDURE ESP-102, REV.1

Protocols provided in procedure number ESP-102, Rev.1, will be followed for defining the field quality control sampling requirements of this project. Specific QA/QC samples to be collected include field duplicates, field blanks, and equipment rinsates.

Field duplicates samples will be collected at a rate of approximately 10% of soil samples by collecting two aliquots from a composited sample volume. The two aliquots will be collected simultaneously to minimize any bias in the composited sample volume. Field duplicate sample results will be used to evaluate the precision and accuracy of the sampling and analytical processes.

A single potable water source field blank will be collected during the first week of remediation field activities. The sample will be collected directly into appropriate prepreserved sample containers from the on-site water supply spigot or hydrant. This sample will be used to ensure that source waters used for decontamination and QA/QC sampling do not contain unacceptable levels of lead. If the designated potable water source does contain excess lead, the sampling equipment decontamination process will be revised to eliminate or minimize the affect of this finding.

Equipment rinsates will be collected from clean sampling equipment at a rate of one per week in which sampling is taking place. The equipment rinsate sample will be collected by pouring deionized water over and through decontaminated sampling equipment, and decanting the rinsate directly into appropriate prepreserved sampling containers. The equipment rinsate samples will be used to demonstrate the effectiveness of the sampling equipment decontamination process.

Trip blanks will not be used during this project except for waste acceptance criteria sampling because volatile organic compounds are not suspected to be present at the site. Temperature blanks will be included in coolers shipped for fixed-base laboratory analysis.

7.2 PROJECT-SPECIFIC WORK AID FOR SAMPLING DESIGN PROCEDURE ESP-103, REV. 0

Protocols provided in procedure number ESP-103, Rev. 0, will be followed for the design and implementation of the verification and confirmatory sampling. The verification sampling is based on a nonrandom authoritative grid because the general location of the affected media is well established (the range end berms). Because of the random nature of the distribution of lead within a shooting range end berm and the localization of the lead contamination (bullets) within the soil matrix, samples will be collected at each grid node. The grid spacing will be set to provide for a large number of sampling locations to improve representativeness. Surface soil samples will be collected using a stainless-steel spade, trowel, or hand auger at the grid nodes to a depth of 2 in. bgs.

Confirmatory sampling is based on both nonrandom and random grid sampling. A grid will be established over the area of regraded soil, and shallow (2-in. bgs) samples will be collected at each grid node (nonrandom sampling). Additionally, 8 grid nodes from the same grid will be selected using a random number table to assign the grid coordinates. Surface soil samples will be collected using a hand auger at the randomly selected nodes to a depth of 6-in. bgs.

7.3 PROJECT-SPECIFIC WORK AID FOR COLLECTION OF SOIL SAMPLES PROCEDURE ESP-303-1, REV. 1

Collection of shallow surface soil samples (2-in. bgs) will be accomplished using a clean stainless-steel spade, scoop, or spoon following ESP-303-1, Rev. 1. The sample will be collected from the cut or regraded surface to a depth of approximately 2-in. bgs. The sample excavation shall be symmetrical to the extent possible to avoid vertical bias of the sample volume. The soil aliquot will be collected directly into a clean stainless-steel bowl for compositing. The aliquot collected should be approximately 8-oz in volume, and care should be taken to ensure that all aliquots within a given composite sample are the same volume. The sampling device or a clean sample container can be used to measure the sample aliquot at each sampling location.

Collection of discrete surface soil samples (6-in. bgs) will be accomplished using a clean hand-driven stainless-steel bucket auger (preferably 2-in. inside diameter) in accordance with ESP-303-1. The auger will be advanced at the selected grid node to 6-in. bgs and the entire sample volume transferred directly to a sample container with a clean stainless-steel spoon or, if necessary because of the volume, to a clean bowl for homogenization and subsampling. Any excess sample volume will be replaced into the auger boring. The use of plastic sheeting will not be necessary because of the depth of sampling.

7.4 PROJECT-SPECIFIC WORK AID FOR SAMPLE PACKING AND SHIPPING PROCEDURES OF ESP-505, REV. 1

Protocols provided in ESP-505 will be followed for samples to be transported to the Y-12 Plant ASO fixed-base laboratory for analysis.

7.5 PROJECT-SPECIFIC WORK AID FOR DECONTAMINATION PROCEDURES OF ESP-801, REV. 0; ESP-802, REV. 0; AND ESP-803, REV. 0

Sampling equipment decontamination will be performed following ESP-801 (formerly ESP-900) procedures for stainless-steel or metal sampling equipment with the exceptions indicated below. The cleaning will be performed in the field in 5-gal buckets before starting and following collection of each composite sample. Cleaning solutions used during equipment decontamination, with the exception of the solvent rinsate, will be disposed of on-site. The solvent rinsate will be collected and containerized for off-site disposal. The revised cleaning procedure will consist of the following steps:

1. Thoroughly scrub and wash the equipment in a solution of potable water and an environmentally benign laboratory detergent (e.g., Liquinox).

2. Rinse the equipment with potable water.

3. Rinse the equipment with deionized water.

4. Rinse the equipment with laboratory-grade isopropyl alcohol.

5. Allow to air dry for as long as practical (a minimum of 15 min).

6. If the equipment is to be stored for more than 24 hours before use, it will be wrapped in foil or clean plastic.

7.6 PROJECT-SPECIFIC WORK AID FOR LAND SURVEYING

Land surveying will be performed to provide location information for verification and confirmatory sampling grid corner and/or end stakes. Other transect stake and grid node locations will be determined by direct measurement with a fiberglass tape by the ENTECH personnel and recorded in the field logbook with a unique station identifier keyed to the location. These

measurements along with the land surveying coordinates will be used to produce scale sampling location maps in the Y-12 Plant Administrative Grid.

Surveying will be accomplished by the Y-12 Environmental Restoration Program personnel unless otherwise dictated.

8. SAMPLE DOCUMENTATION AND CUSTODY PROCEDURES

8.1 CHAIN-OF-CUSTODY

Sample custody shall be performed in accordance with procedure ESP-501, Rev. 2, "Sample Chain of Custody." Sample and project identifiers, sample media, type, preservative, date, time, and signature of sample custodians will be included on standard preprinted chain-of-custody forms. Laboratory chain-of-custody forms will be used for fixed-base laboratory samples. Following analysis, original or original carbon copies of the chain-of-custody forms will be returned to ENTECH.

8.2 SAMPLE CUSTODY SEALS

At the time of collection, the samples will have a seal placed across the container opening in accordance with ESP-501, Rev. 2. The sample seal ensures the integrity of the sample, protects the custody, and provides the following information:

- name or initials of person collecting the sample and
- date.

8.3 SAMPLE CONTAINER LABELS

Each sample container will be labeled with a self-adhesive label in accordance with ESP-501, Rev. 2, or have the equivalent information written in indelible ink directly on the container at the time of sample collection. Sampler team members will fill out the labels on each container before collection to minimize handling errors. Labels will be permanently attached to the sample container and discarded with the container when analysis is complete. Sample identification numbers will be derived as indicated in Sect. 2.2.2 of the data management implementation plan (ENTECH, Inc. 1998b), as repeated in the following paragraphs.

Label information will include the following information:

- name of collector,
- sample number (e.g, VW05C00-06), and
- sampling time and date (e.g., 1400, 01February1998).

Sample identifiers consist of an 11 digit alphanumeric code assigned in the field. The sample identifier will consist of the following elements:

A B XX C YYYYY D

Where

A	Type of Sampling - "V" for verification or "C" for confirmatory
B	Location Designator - "E" for east range, "W" for west range, or "F" for entire site (following final grading)
XX	Transect Number - a sequential number beginning with 00
C	Station Type - "D" for discrete sample or "C" for composite sample
	YYYYY Station Number - for discrete samples a sequential grid node number beginning with 00000 at the transect stake, or for composite samples the range of grid nodes in the composite separated by a hyphen (e.g., 00-08)
D	Sample Type - "S" for field screening, "D" for duplicate, "B" for field blank, "R" for equipment rinsate, or "L" for fixed-base laboratory verification sample

8.4 FIELD NOTEBOOKS

Field activities will be recorded in field notebooks in accordance with ESP-503, Rev. 0. Field notebooks will be bound with consecutively numbered pages. All pertinent information necessary to interpret the field sampling and fixed-base laboratory analytical data will be recorded in field notebooks. The entries should also provide a chronological record of the team's activities, enabling reconstruction of the field activities at a later date. The following minimum entries should be included in the field sampling notebooks:

- date and time of collection,
- name(s) of sample collector(s),
- number of samples taken,
- type of sample container,
- sample identifier,
- observations during sampling (unusual waste stream conditions; color, density, thickness, texture of sample),
- description of sampling equipment,
- sample location,
- site activities,
- volume of soil/debris removed, and
- bill of lading/waste container/shipping document identification numbers.

9. PERMITS

An Excavation/Penetration Permit number Y980028 has been obtained for conducting the YS-860 Firing Ranges sampling and excavation activities. A Health and Safety Work Permit will be obtained before any sampling or excavation activities.

10. REFERENCES

DOE (U.S. Department of Energy) 1997. *Action Memorandum for Lead Source Removal at the Former YS-860 Firing Ranges, Y-12 Plant, Oak Ridge, Tennessee,* DOE/OR/02-1622&D1.

DOE (U.S. Department of Energy) 1998. *Removal Action Work Plan for the YS-860 Firing Ranges, Oak Ridge Y-12 plant, Oak Ridge, Tennessee,* DOE/OR/01-1709&D1, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tenn.

LMES (Lockheed Martin Energy Systems, Inc.) 1996. *Y-12 Analytical Services Organization Official Report, Oak Ridge, Tennessee.*

ENTECH, Inc. 1998a. *Best Management Practices Plan for the YS-860 Firing Range Removal Action, Oak Ridge, Tennessee*, Y/ER-312, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tenn.

ENTECH, Inc. 1998b. *Data Management Implementation Plan for the YS-860 Firing Range Removal Action, Oak Ridge, Tennessee*, Y/ER-311, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tenn.

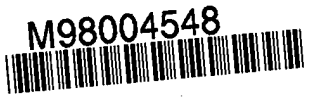
ENTECH, Inc. 1998c. *Health and Safety Plan for the YS-860 Firing Range Removal Action, Oak Ridge, Tennessee*, Y/ER-313, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tenn.

ENTECH, Inc. 1998d. *Quality Assurance Project Plan for the YS-860 Firing Range Removal Action, Oak Ridge, Tennessee*, Y/ER-314, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tenn.

ENTECH, Inc. 1998e. *Waste Management Plan for the YS-860 Firing Range Removal Action, Oak Ridge, Tennessee*, Y/ER-315, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tenn.

DISTRIBUTION

1. C. S. Haase
2. J. F. Hensely
3. P. T. Owen
4. L. B. Raulston
5. V. L. Turner
6. File—EMEF DMC—RC
7. R. Adkisson, ENTECH, Inc., 560 Oak Ridge Turnpike, Suite 2, Oak Ridge, TN 37830
8. M. Allen, Bechtel Jacobs Company LLC, 151 Lafayette Dr., Oak Ridge, TN 37830



Report Number (14) Y/ER--310

Publ. Date (11) 199803

Sponsor Code (18) ~~DOE~~ DOE/EM; DOE/ DP, XF

UC Category (19) UC-1000; UC-702, DOE/ER

DOE