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Sampling and Analysis Plan for the Sampling and Site Characterization of Waste Evaporator Facility, Building 3506, at Oak Ridge National Laboratory, Oak Ridge, Tennessee

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ORNL Environmental Restoration Program

Sampling and Analysis Plan for the Sampling and Site Characterization of Waste Evaporator Facility, Building 3506, at Oak Ridge National Laboratory, Oak Ridge, Tennessee

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Prepared by
Energy Systems Office of
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Environmental Monitoring

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APPROVALS

Sampling and Analysis Plan for the Sampling and Site Characterization of Waste Evaporator Facility, Building 3506, at Oak Ridge National Laboratory, Oak Ridge, Tennessee (ORNL/ER-320)

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PREFACE

This *Sampling and Analysis Plan for the Sampling and Site Characterization of Waste Evaporator Facility, Building 3506, at Oak Ridge National Laboratory, Oak Ridge, Tennessee* was prepared to ensure that waste streams generated by demolition of the Waste Evaporator Facility, Building 3506, will undergo the detailed analyses required to meet the Waste Acceptance Criteria for the designated storage/disposal facility. This plan describes the techniques and systems involved in obtaining representative data from Building 3506 based on information from prior site characterization activities, statistical modeling, and available analytical technology. This work was performed under Work Breakdown Structure 1.4.12.6.2.01.12.05, Activity Data Sheet 3701, "Oak Ridge National Laboratory Decontamination and Decommissioning Program."

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ABBREVIATIONS

AnaLIS	Analytical Laboratory Information System,
ASD	Analytical Services Division
ASTM	American Society for Testing and Materials
Bechtel	Bechtel National, Inc.
CLP	Contract Laboratories Program
CoC	chain-of-custody
D&D	decontamination and decommissioning
Energy Systems	Lockheed Martin Energy Systems
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration (Program)
IWMF	Interim Waste Management Facility
LIMS	Laboratory Information Management Systems
OECD	Office of Environmental Compliance and Documentation
ORNL	Oak Ridge National Laboratory
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyls
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act of 1976
SOPs	standard operating procedures
WAC	Waste Acceptance Criteria
WEF	Waste Evaporator Facility
WMP	Waste Management Plan
WSFs	waste storage facilities

EXECUTIVE SUMMARY

This *Sampling and Analysis Plan for the Sampling and Site Characterization of Waste Evaporator Facility, Building 3506, at Oak Ridge National Laboratory, Oak Ridge, Tennessee* has been developed in support of the Waste Evaporator Facility, Building 3506, demolition project. Various waste streams will be generated as a result of demolition activities, and this plan will be used to determine whether these wastes meet the Waste Acceptance Criteria for the designated storage/disposal area.

The objective of the *Sampling and Analysis Plan* is to develop an approach based on information from prior site characterization efforts, statistical modeling, and available technology for the collection of analytical data that will be used to determine the level of any potential contaminants. This plan describes the techniques and systems involved in obtaining representative data from Building 3506 and provides a standard for all activities involved in sample collection, analysis, and data reporting.

This proposed *Sampling and Analysis Plan* will be used to verify the findings of Bechtel National, Inc. and to determine the extent of the Resource Conservation and Recovery Act of 1976 (RCRA) regulated contamination found in Building 3506. This plan will also be used to determine avenues for disposal of demolition debris that will not fit into the below grade portion of the facility.

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

Building 3506, also known as the Waste Evaporator Facility (WEF), is a surplus facility at Oak Ridge National Laboratory (ORNL) slated for decontamination and decommissioning (D&D). The building, located in the ORNL main plant area to the west of the South Tank Farm and near the intersection of Central Avenue and Third Street, includes a single concrete cell and an operating gallery (see Fig. 1). The entire structure down to 1 ft below grade is to be removed. The bulk of the concrete removed is to be placed in the cell area that is below grade and covered. The portion of the structure that is removed and will not fit in the below grade cell area will be disposed of in accordance with the project's Waste Management Plan (WMP).

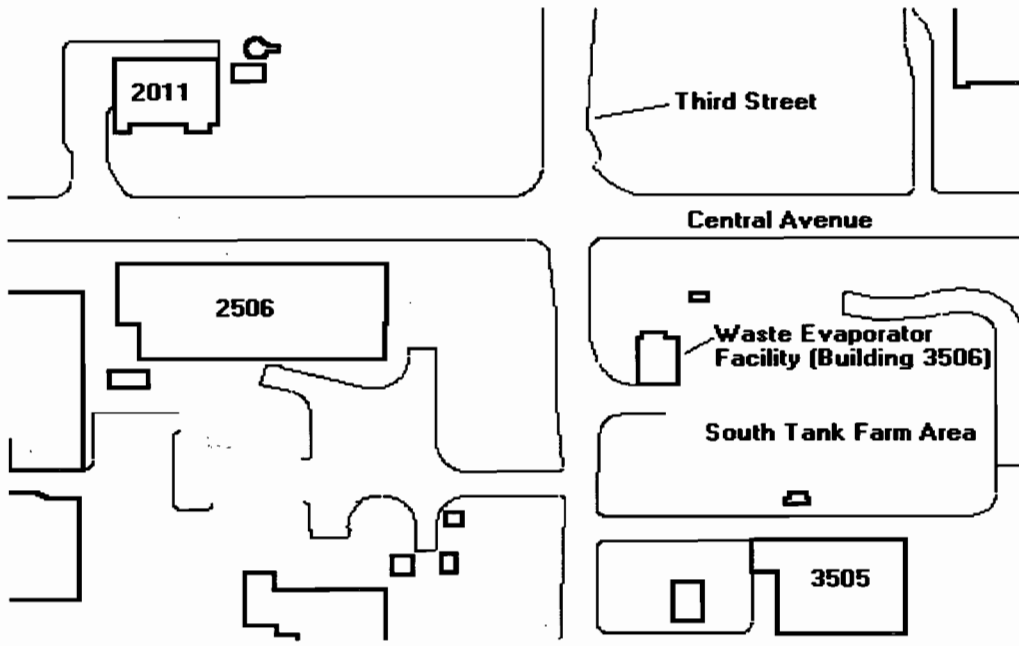

Fig. 1. The Waste Evaporator Facility, Building 3506.

The past use of this building varies and its history is undocumented. Therefore, the use of historical data to determine the extent of contamination is impractical. During the autumn of 1993, site characterization activities were conducted by Bechtel National, Inc. (Bechtel). Two documents, *Site Characterization Plan for Decontamination and Decommissioning of Buildings 3506 and 3515 at Oak Ridge National Laboratory, Oak Ridge, Tennessee,* ORNL/ER/Sub 87-99053/69, (Bechtel 1993) and *Site Characterization Report for Building 3506 at Oak Ridge National Laboratory, Oak Ridge, Tennessee,* ORNL/ER/Sub 87-99053/72, (Bechtel 1994), give detailed descriptions of the site investigation and sampling activities, and summaries of Bechtel's findings. The primary focus of Bechtel's activities was to determine the extent of radiological contamination. See *Site Characterization Report*, Sect. 3.2.(Bechtel 1994).

1.2 PRIMARY OBJECTIVE

The objective of the plan is to develop an approach, based on information from prior site characterization activities, statistical modeling, and available analytical technology, for the collection of analytical data that will be used to determine the level of contamination at Building 3506. This information will be used to determine eligibility of demolition waste for K-25's waste storage facilities (WSFs), or an Interim Waste Management Facility (IWMF), and to help project members develop a WMP that will demonstrate waste stream compliance with applicable Waste Acceptance Criteria (WAC).

This *Sampling and Analysis Plan* adequately describes the techniques and systems involved in obtaining representative data from Building 3506. It provides a standard for all activities involved in sample collection, analysis, and data reporting. Proper procedures for the needed sampling, preservation, handling, chain-of-custody (CoC), documentation, and quality assurance/quality control (QA/QC) protocols are addressed. The correct sampling and analytical procedures are presented to ensure only approved methodology is used for analysis of the samples.

The activities stated in this *Sampling and Analysis Plan* will achieve the following objectives:

- Determine the eligibility of demolition waste generated by the Building 3506 D&D project for the WSF and/or IWMF at K-25. *Waste Evaluation Criteria for Storage by the K-25 Site Waste Management Division* (See Appendix A) will be used as the standard for eligibility.

- Determine types of waste and levels of contamination for development of the WMP for the Building 3506 D&D project.

1.3 ORGANIZATION AND RESPONSIBILITIES

Table 1 displayed below presents the organizational roles and responsibilities developed to implement this *Sampling and Analysis Plan* for the Building 3506 D&D project.

Table 1. Organizational roles and responsibilities

Role	Person	Responsibilities
Project Manager	Gerry Mandry	Coordinates project activities. Ensures project stays on schedule and within budget. Notifies appropriate personnel of work schedules. Maintains and controls all project records
Waste Management Coordinator	Jerry Cunningham	Reviews and evaluates data for development of WMP
D&D QA/QC Representative	Bill Palmer	Oversees QA/QC activities for Building 3506 D&D project

Role	Person	Responsibilities
Sampling Project Manager	Michael White	Develops *Sampling and Analysis Plan.* Oversees QA/QC of field sampling activities. Coordinates and schedules sampling activities
ORNL Sample Management Coordinator	Mary Lane Moore	Coordinates transportation of samples from ORNL to K-25
Environmental Management	Denise Reynolds	Reviews *Sampling and Analysis Plan* and project for Energy Systems compliance requirements
ASD Project Coordinator	Jim Davis	Ensures through planning the availability of analytical capability to perform chemical and radiological analysis of samples collected. Ensures that nationally recognized methodology and applicable QA/QC practices are employed. Will ensure off-site labs are procured. Ensures that analytical results are provided within the project time frame
Data Validation Coordinator	TBD	Ensures that the data package is properly reviewed and validated in accordance to standards set forth in the data quality objectives of this plan
Health Physics	TBD	Ensures that all personnel monitoring equipment and frisk stations are operable. Assists sampling personnel in entry and exit of area
Site Health and Safety Officer	Melinda Patton	Responsible for activities related to industrial hygiene and ensures compliance with 29CFR1910 and 1925 requirements during the investigation and collection of samples. Maintains proper use of field instrumentation and reviews field records
Engineering	Bob Jones III Ian Smith	Coordinates activities of D&D contractors during demolition activities
Special Projects Lead Field Technician	Richard Allen	Ensures samples are collected in accordance with *Sampling and Analysis Plan* and required SOPs

TBD *To be determined*

1.4 DATA QUALITY OBJECTIVES

Data quality objectives are assurance that the data is suitable for its intended use. Data generated by this *Sampling and Analysis Plan* are from randomly selected grids that represent individual homogenous areas. The data provided must be an accurate reflection of the extent of any contamination found in Building 3506. Data obtained for this purpose must be scientifically valid and legally defensible. In cases where the data is suspect or of poor quality, its acceptance is left to the technical judgement of the intended user. The definitions of precision, accuracy, completeness, representativeness, and comparability as they apply to this activity are listed below. A summary of the data quality objectives for acceptable precision, accuracy, and completeness is given in Table 2.

1.4.1 Precision

Precision is a measure of mutual agreement among individual measurements of the same property usually under "prescribed similar conditions." Precision is expressed in terms of the relative percent difference. Various measures of precision exist depending on the prescribed similar conditions. The precision estimates presented in Table 2 represent variability of replicate measurements of the same parameters, expressed in terms of relative percent difference. Field duplicates and laboratory duplicates will be used to determine precision for this project.

1.4.2 Accuracy

Accuracy is the degree of agreement of a measurement (or an average of measurements of the same parameter) X, with an accepted reference or true value T. Accuracy is usually expressed as the difference between the two values, X−T, or the difference as a percentage of the reference or true value, 100(X−T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measure of the bias in a system. Accuracy values presented in Table 2 include components of both random error and bias and are expressed as percent recovery of the true or known value. Laboratory spikes and reference materials will be used to determine accuracy for this project.

1.4.3 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be collected under normal conditions. For this program, the completion objective for the sampling is 95 percent and the completion objective for analysis is 95 percent for all valid samples obtained.

1.4.4 Representativeness and Comparability

Representativeness and comparability objectives are not quantifiable. Representativeness is defined as the degree to which data accurately and precisely represent a characteristic of a population, process condition, or an environmental condition. Comparability is defined as expressing the confidence with which one data set can be compared to another. The use of standardized and approved methodology and reporting the results in common units will help ensure comparability.

Table 2. Summary of acceptable precision, accuracy, and completeness

Parameter	Sample type	Precision	Accuracy	Completeness
Metals	Water	10%	90–110%	95%
Mercury	Water	10%	90–110%	95%
PCBs/Pesticides	Water	15%	80–120%	95%
Radiological	Water	20%	80–120%	95%
Total Organic Carbon	Water	10%	90–110%	95%
Volatiles	Solid	20%	70–120%	95%
Semi-volatiles	Solid	20%	70–110%	95%
Promethium-145	Solid	20%	80–120%	95%
Cobalt-60	Solid	20%	80–120%	95%
Gross α, β, and γ scan	Solid	20%	80–120%	95%
Metals	Solid	20%	80–120%	95%
Mercury	Solid	20%	80–120%	95%
PCB/Pesticides	Solid	20%	80–120%	95%
Volatiles	Soil/Sludge	20%	70–120%	95%
Semi-volatiles	Soil/Sludge	20%	70–110%	95%
Promethium-145	Soil/Sludge	20%	80–120%	95%
Cobalt-60	Soil/Sludge	20%	80–120%	95%
Gross α, β, and γ scan	Soil/Sludge	20%	80–120%	95%
Americium-241/243	Soil/Sludge	20%	80–120%	95%
Cesium-137	Soil/Sludge	20%	80–120%	95%
Neptunium-237	Soil/Sludge	20%	80–120%	95%
Plutonium-238/239/240	Soil/Sludge	20%	80–120%	95%
Strontium-89/90	Soil/Sludge	20%	80–120%	95%
Technetium-99	Soil/Sludge	20%	80–120%	95%
Thorium-230/231/232	Soil/Sludge	20%	80–120%	95%
Uranium-234/235/236/238	Soil/Sludge	20%	80–120%	95%
Uranium-Total	Soil/Sludge	20%	80–120%	95%
Metals	Soil/Sludge	20%	80–120%	95%
Mercury	Soil/Sludge	20%	80–120%	95%
PCBs/Pesticides	Soil/Sludge	20%	80–120%	95%

2. DESIGN OF SAMPLE COLLECTION

2.1 APPROACH, LOCATION, AND SAMPLE SIZE

The sampling and analysis performed to determine if demolition materials from Building 3506 meet certain eligibility requirements for waste disposal at K-25 WSFs and/or the IWMF will be conducted using a multiphase approach.

2.1.1 Phase I Approach—Area VI

Phase I will be the sampling and analysis of the water that has collected in the cell floor. Sampling technicians from the Office of Environmental Compliance and Documentation (OECD) Lockheed Martin Energy Systems (Energy Systems) ORNL will be available to sample the water upon removal of the steel plates that cover the cell area. The D&D contractor will remove the steel plates. Analytical results of the water are needed before the water is removed. To generate a sample that will be representative of the water after removal, a composite will be constructed from three subsamples for all analysis except polychlorinated biphenyls (PCBs). Collection of a PCB sample should not include transfer from one container to another in this matrix; therefore, a separate PCB sample will be taken from each subsample location and the results will be averaged. The number of subsamples was determined by using guidance from *The Environmental Survey Manual.* Appendix E. "Field Sampling Protocols and Guidance" (DOE 1987) (See Appendix B). Table 3 gives the total area and number of subsamples to be taken. The total area was divided into 60 grids of approximately equal area. Three of these grids were selected using a random generation computer program. Appendix C shows the locations of each subsample for this area.

2.1.2 Phase II Approach—Area V

Phase II will be the sampling and analysis of the sludge that is found in the cell floor. After the removal of the water in the cell floor, the D&D contractor will clean the cell floor by removing the sludge that has settled there through the years. This sludge will be collected in a drum and labeled for disposal. Samples will be collected from the drum after the sludge has been collected from the cell floor. It is estimated that all the sludge will fit in one drum. One sample and a field duplicate will be collected from this drum. An additional sample will be collected from each drum generated if more than one drum is needed to contain the sludge.

2.1.3 Phase III Approach—Area I

Phase III will be the sampling and analysis of the concrete that is to be dismantled during the D&D activity. The first step in the dismantling of the concrete is to create "starter holes". Samples will be collected from the cores generated from the creation of these "starter holes". The D&D contractor will drill these holes. OECD sampling technicians will be present to receive the cores generated by this drilling. The number of cores to be used as samples was determined by using guidance from *The Environmental Survey Manual.* Appendix E. "Field Sampling Protocols and Guidance" (DOE 1987) (See Appendix B). Table 3 gives the total area and number of subsamples to be taken. The total area was divided into 80 grids of approximately equal area. Four of these grids were selected using a random generation computer program. Appendix C shows the locations of each sample for this area. Samples will actually be taken from the core generated from the starter hole closest to the grid location found in Appendix C. OECD sampling technicians will instruct the

D&D contractor as to which cores will be needed for sampling. Analysis should be completed and results reviewed before the dismantling of the concrete continues. If the concrete is shown to be contaminated, any amount that will not fit in the below grade portion of the building may be containerized and sampled during Phase IV.

2.1.4 Phase IV Approach—Areas II, III, IV, VII, and VIII

Phase IV will be the sampling and analysis of all other materials generated as construction debris and placed in waste containers. Table 3 shows the estimated numbers of containers that will be generated for each separate area. Approximately 10 B-25 boxes of concrete will be generated if the concrete is shown to be contaminated in Phase III. One sample from each randomly selected container will be collected. A field duplicate will be collected for every 10 containers in each area with one drum being a minimum. For example, if only one drum is generated for an area, a field duplicate will be collected from that drum. If twenty-two drums are generated for an area, two drums will be selected by the lead technician to collect field duplicates. Sampling will occur within one week after generation of containers.

Table 3. Description of homogeneous areas for sampling

Area name	Area/number of containers	Number of samples	Number of duplicates
I—Poured Concrete Area (PCA)	145 m^2	4	1
II—Masonry/Block Area (MBA)	5/B-25 boxes	3	1
III—Wood Frame Area (WFA)	2/B-25 boxes	1	1
IV—Soil Under Gallery (SUG)	9/B-25 boxes	4	1
V—Cell Floor Sludge (CFS)	1 drum	1	1
VI—Water in Cell Floor (WCF)	21 m^2	1 Composite 3 Subsamples	1
VII—Scabbled Concrete (SCB)	1 drum	1	1
VIII—Light Fixtures (LTF)	1 drum	1	1

2.1.5 Phase I and II Grid Selection

Two areas were divided into grids for random selection of sampling sites. Table 4 shows which areas were divided into grids, the number of samples that will be taken from the total number of grids (i.e., samples/grid) and the number of each grid where sampling is to take place (random numbers selected). Refer to Appendix C for diagrams of gridded areas.

Table 4. Numbers randomly selected for each area

Area	Samples/grid	Random numbers selected
I	4/80	35, 52, 66, 71
VI	3/60	12, 32, 59

2.2 SAMPLE COLLECTION

The sampling for this project will adhere to the SOPs that are in place to assure good quality control. Table 5 below lists the procedures that cover the sampling event.

Table 5. Sampling event procedures

Method number	Subject
DOE/EH-0053	*Environmental Survey Manual. Appendix E.* (DOE 1987).
ESP-900	Decontamination
ESP-301	Sludge
ESP-303	Soil Sampling
ESP-308	Waste Sampling
SOP-ESP-003.111	Sampling of Soil and/or Sediment
SOP-ESP-003.002	Chain of Custody
SOP-ESP-003.014	Sampling Document Control
ORNL/ER-225	*QAP for ORNL ER Program*

2.2.1 Phase I Sample Collection—Area VI

Phase I sampling will be done using either a peristaltic pump or a stainless steel dipper for all parameters except PCBs. PCBs should be collected directly into their sample container for this matrix. The PCB sample container should be lowered into the cell using a string, or it should be attached to the end of a dipper. One PCB sample will be collected from each subsample site. The lead sampling technician will choose one site to collect a PCB field duplicate. For each of the other analytes, approximately 1100 ml should be collected from each subsample location. It is not necessary to decontaminate the dipper or peristaltic pump between subsample locations. Each subsample should be placed in a large glass or stainless steel container to be gently and completely mixed. A composite sample and field duplicate should be collected from this mixture. Any remaining water after the collection of the sample and duplicate will be returned to the cell floor area.

2.2.2 Phase II Sample Collection—Area V

Phase II sampling will represent a vertical composite of the container. Samples will be collected using either a COLIWASA (glass) or a trier-type (stainless steel) sampler. An equipment blank should be taken if the sampling equipment has been used in previous sampling activities and decontaminated. This is to be done by spraying organic-free deionized water over the equipment and collecting the water for sampling.

The consistency of the sludge will determine the type of sampler to be used. The sample will be placed in a container (glass, stainless steel, or aluminum foiled lined) and gently mixed using a stainless implement. Enough volume of sample should be obtained to collect the sample and a field duplicate. After mixing, the sample will then be transferred to appropriate sample containers. Any remaining sludge after the collection of the sample and duplicate will be returned to the drum

2.2.3 Phase III Sample Collection—Area I

Phase III sampling will represent a horizontal composite of the concrete wall. The actual coring will be done by the D&D contractor with the OECD sampling technicians present. An equipment blank of the coring equipment that will come in contact with the wall will be taken by OECD sampling technicians before drilling begins. This is to be done by spraying organic-free DI water over the equipment and collecting the water for sample. This same equipment will be decontaminated before each core is drilled for collection of samples. Decontamination should follow ESP-900. A decontamination rinsate will be collected from at least one decontamination event. The core will be placed on aluminum foil. Portions of the outer one-third, inner one-third, and middle one-third of the core will be broken into small pieces and powdered if possible. A stainless steel chisel and hammer will be used for this process. These will also be decontaminated between each sample or a new precleaned chisel and hammer will be used. The small pieces and powder will be collected in a large container (glass, stainless steel, or aluminum foiled lined) and mixed for the sample. The mixing container will be replaced with a new clean container or decontaminated between samples. After mixing, the sample will then be transferred to appropriate sample containers. One core will be selected by the lead sampling technician to collect a field duplicate. Any remaining concrete will be given to the D&D contractor to place in the below grade portion of the building.

2.2.4 Phase IV Sample Collection—Areas II, III, IV, VII, and VIII

Phase IV sampling will depend upon the material to be sampled. Sampling equipment will be decontaminated between each container or replaced with new precleaned equipment. At least two sampling events (sampling of a specific container) should be selected to collect an equipment blank and decontamination rinsate. The lead technician will select these two events. Sampling containers of soil (Area IV—SUG) and scabbled concrete (Area VII—SCB) will represent a vertical composite of the container. Samples will be collected using a trier-type (stainless steel) sampler. The sample will be placed in a container (glass, stainless steel, or aluminum foiled lined) and gently mixed using a stainless steel implement. Enough volume of sample should be obtained to collect the sample and a field duplicate for the scabbled concrete container and one of the soil containers. After mixing, the sample will then be transferred to appropriate sample containers. Any remaining mixture from the collection of the sample and duplicate will be returned to the container from which it originated.

Materials from containers that contain wood frame debris, masonry/block debris, and light fixtures will be segregated manually. The top portion of the container will be segregated into the

different materials that make up that container's contents. These materials will be placed on plastic sheeting. Pieces of each material will be broken into smaller pieces and put in a mixing container. Only stainless steel implements will be used to break materials into smaller pieces. Enough volume of sample should be obtained to collect the sample and a field duplicate for the wood frame containers, one of the masonry/block containers, and one from the light fixture container. After mixing, the sample will then be transferred to appropriate sample containers. Any remaining mixture after the collection of the sample and duplicate will be returned to the container from which it originated.

During Phase IV sampling, composites will also be made from subsamples taken from every container in specific areas. Composites will be made from all the containers in Areas II, III, and IV. For example, Area II is estimated to have five B-25 boxes. Subsamples will be taken from each of the five boxes and mixed together to make an Area II composite. This composite sample is in addition to the individual samples taken from each container (see Table 6 in Chap. 3).

The project engineer will provide drums that will remain on site for the collection of sampling and decontamination waste and will be responsible for their disposal.

3. SAMPLE DOCUMENTATION

3.1 SAMPLING PROCEDURES

The sampling for this project will adhere to the SOPs that are in place to assure good quality control. Table 5 in Sect. 2.2 lists the procedures that cover the sampling event.

3.2 SAMPLE IDENTIFICATION

Samples will be identified using the basic format ABCXX-YY-ZL.

3.2.1 Area Codes

"ABC" signifies the area from which the sample was taken. Codes for the areas are as follows:

- Area I—PCA
- Area II—MBA
- Area III—WFA
- Area IV—SUG
- Area V—CFS
- Area VI—WCF
- Area VII—SCB
- Area VIII—LTF

3.2.2 Sample Location Codes

"XX" signifies the grid or container number from which the sample was taken. If the sample is a composite of several grids or containers then "XX" will equal 00. "XX" may also signify the type of equipment that has been used for sampling and therefore decontaminated. Codes for the equipment are as follows:

- Concrete drill—CD
- Trier-type sampler—TT
- Mixing dish—MD
- COLIWASA—CO
- Chisel—CH
- Hammer—HM
- Stainless steel spoon—SS

If any other sampling equipment is used and needs an equipment blank or decontamination rinsate collected, the sampling technicians will record the two letter code they have chosen for that item in the field log book.

3.2.3 Sample Type Codes

"YY" signifies the sample type. Codes for each sample type are listed below:

- Grab sample—GR
- Composite sample—CM
- Trip blank—TB
- Equipment blank—EB
- Decontamination rinsate—DR
- Field duplicate—FD

3.2.4 Analytical Laboratory Group Codes

"Z" signifies the number of samples taken from that sample location where "1" is the original sample and "2" is a field duplicate. "L" signifies the laboratory group that will receive the sample. Codes for each laboratory are listed below:

- Organics Laboratory—A
- Inorganics Laboratory—B
- Radiological Laboratory—C

Table 6 (presented at the end of Chap. 3) lists the samples for each phase of the project and gives sample identifications. This table includes what is anticipated during this project. Other samples may be added in the field if it is deemed necessary by the lead sampling technician, project manager, or project engineer. Still other samples may be eliminated from this table due to cost constraints and/or compositing of samples.

3.3 SAMPLE LABELS

According to SOP-ESP-003.014, field sampling technicians will fill out labels on each container before collection to minimize handling errors. Label information will include the following:

- Initials of collector
- Sample number or identification
- Location sample was taken from
- Sampling time and date
- Preservation method
- Requested analysis

Labels are to be filled out with permanent ink markers. Preprinted labels may also be used.

3.4 FIELD LOG NOTES

Based on guidance from SOP-ESP-003.002 and SOP-ESP-003.014, during sampling events, notes will be kept in a field log book describing the environmental conditions present. An example of the information that will be recorded is found Appendix D. Any deviations from this plan will

also be recorded in the field log book or laboratory notes. When sampling is done from containers, the sampling technicians will record a description of the contents of each container in the field log book. The description of the contents should include the following:

- Physical appearance of contents
- Approximate "% Full" of container
- Any unusual odors or unexpected materials
- Any field measurements if taken

3.5 CHAIN-OF-CUSTODY

Chain-of-Custody (CoC) will be kept on ALL samples. This record is filled out during the sampling event and accompanies every sample from the time it is taken until the sample is relinquished to the laboratory. This form contains at a minimum the following information:

- Sample number or identification
- Signature of collector
- Date and time of collection
- Identification of sample site
- Sample location
- Sample Description
- Number of containers
- Date and time of possession
- Signature of person involved in CoC

A sample is in custody if it meets the following criteria:

- It is in your possession;
- It is in your view, after being in your possession; or
- The sample is in a locked, secure place safe from tampering.

Samples taken under CoC for this project will follow the specific guidance provided in SOP-ESP-003.002.

3.6 SAMPLING AND DECONTAMINATION INFORMATION

In concurrence with ESP 301, 303, 308, 900 and SOP-ESP-003.111, a sample will be taken from each grid or container. The sample from each location designated as a grab sample in the sample identification will actually be a mixture of several subsamples taken in the one location. The grid or container will be marked. Five subsamples will be taken from at least three different locations from within the grid or container and from varying depths. The subsamples will be mixed together and samples will be collected from this mixed batch. Mixing will take place in glass, stainless steel, or aluminum covered pans. New clean pans will be used in between grids, or pans will be decontaminated. Aluminum coverings will be discarded and replaced.

In Area VI, one true grab sample of water will be collected from the center of each grid.

Note: **It may be difficult to collect a water sample without collecting stirred sludge or debris. Samples should be filtered before water is analyzed.**

Samples collected from the light ballasts should be from oil found within the ballast itself. If the ballast is dry, hexane soaked gauze should be used to wipe the inside of the ballast to collect samples.

Scabbled material and other containerized materials will be collected from the container and composited to make one sample and a duplicate.

Various equipment will be used for collection of samples. Where ever possible stainless steel or glass sampling equipment will be used. A description of sampling equipment will be recorded in a field log book. An equipment blank will be collected from the most difficult pieces of sampling equipment to decontaminate prior to start of the sampling event. The last decontamination rinsate will be collected to verify decontamination effectiveness. Table 5 in Sect. 2.2 lists the procedures that cover the sampling event.

Table 6. Summary of samples to be collected

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
Trip Blanks, Equipment Blanks, and Decontamination Rinsates					
WEF01-TB-1A	WATER	EPA SW-846[a]	8260	ALL ANALYTES	
WEF02-TB-1A	WATER	EPA SW-846	8260	ALL ANALYTES	
WEF03-TB-1A	WATER	EPA SW-846	8260	ALL ANALYTES	
PCACS-EB-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
PCACS-EB-1B	WATER	EPA SW-846	6010	ALL ANALYTES	
PCACS-EB-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
PCACS-EB-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy[b]	0.5 pCi/l
PCACS-DR-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
PCACS-DR-1B	WATER	EPA SW-846	6010	ALL ANALYTES	
PCACS-DR-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
PCACS-DR-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
PCACH-EB-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
PCACH-EB-1B	WATER	EPA SW-846	6010	ALL ANALYTES	
PCACH-EB-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
PCACH -EB-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
PCACH-DR-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
PCACH-DR-1B	WATER	EPA SW-846	6010	ALL ANALYTES	
PCACH-DR-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
PCACH-DR-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
PCAHM-EB-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
PCAHM-EB-1B	WATER	EPA SW-846	6010	ALL ANALYTES	
PCAHM-EB-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
PCAHM-EB-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
PCAHM-DR-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
PCAHM-DR-1B	WATER	EPA SW-846	6010	ALL ANALYTES	

[a]EPA SW-846. EPA (U.S. Environmental Protection Agency). 1992 (July). *Test Methods for Evaluating Solid Waste.* PB94-170313.

[b]The Gamma Spectroscopy quantitation limit will be set against the Co-60 MDA-6.0 pCi/l based on a 900 ml sample counted for 1000 minutes. Pa-237m, TH-234, Co-60, and CS-137 are among the gamma emitting radionuclides of interest.

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
PCAHM-DR-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
PCAHM-DR-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
SUGTT-EB-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
SUGTT-EB-1B	WATER	EPA SW-846	6010	ALL ANALYTES	
SUGTT-EB-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
SUGTT-EB-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
SUGTT-DR-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
SUGTT-DR-1B	WATER	EPA SW-846	6010	ALL ANALYTES	
SUGTT-DR-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
SUGTT-DR-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
MBACH-EB-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
MBACH-EB-1B	WATER	EPA SW-846	6010	ALL ANALYTES	
MBACH-EB-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
MBACH-EB-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
MBACH-DR-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
MBACH-DR-1B	WATER	EPA SW-846	6010	ALL ANALYTES	
MBACH-DR-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
MBACH-DR-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
MBAHM-EB-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
MBAHM-EB-1B	WATER	EPA SW-846	6010	ALL ANALYTES	SEE Appendix A
MBAHM-EB-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
MBAHM-EB-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
MBAHM-DR-1A	WATER	EPA SW-846	9060	Total Organic Carbons	1.0 mg/l
MBAHM-DR-1B	WATER	EPA SW-846	6010	ALL ANALYTES	SEE Appendix A
MBAHM-DR-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
MBAHM-DR-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
Phase I Samples - Area VI Water in Cell Floor (WCF)					
WCF00-CM-1B	WATER	EPA SW-846	7470	Mercury[c]	0.2 ug/l
WCF00-CM-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
WCF00-CM-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
WCF00-FD-2B	WATER	EPA SW-846	7470	Mercury	0.2 ug/l
WCF00-FD-2C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
WCF12-GR-1A	WATER	EPA SW-846	8080PCB	ALL ANALYTES[d]	0.4 ug/l
WCF32-GR-1A	WATER	EPA SW-846	8080PCB	ALL ANALYTES	0.4 ug/l
WCF59-GR-1A	WATER	EPA SW-846	8080PCB	ALL ANALYTES	0.4 ug/l
WCFxx-FD-1A	WATER	EPA SW-846	8080PCB	ALL ANALYTES	0.4 ug/l
Phase II Samples - Area V Cell Floor Sludge (CFS)					
CFS01-CM-1A	SLUDGE	EPA SW-846	8080PCB	ALL ANALYTES	0.4 ug/l
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	SR-89/90	Strontium-89/90	0.5 pCi/g
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
CFS01-CM-1B	SLUDGE	TCLP	1311NV	TCLP Prep	N.A.
CFS01-CM-1B	SLUDGE	TCLP	6010	ALL ANALYTES	
CFS01-CM-1B	SLUDGE	TCLP	7470	Mercury	0.02 mg/l
CFS01-CM-1B	SLUDGE	ASTM	D2216	Moisture	PER METHOD
CFS01-CM-1B	SLUDGE	ASTM	D3286-85	Heat Content	PER METHOD
CFS01-CM-1B	SLUDGE	ASTM	D482-7	% Ash	PER METHOD
CFS01-CM-1B	SLUDGE	ASTM	D854	Bulk Density	PER METHOD
CFS01-CM-1B	SLUDGE	ASTM	D422	Particle Size	PER METHOD
CFS01-CM-1B	SLUDGE	EPA SW-846	1010	Flash Point/Ignitability	PER METHOD

[c]This is the only method requiring lower than normal quantitation limits.

[d]Due to the unlikely detection of Aroclor 1221, the project is willing to accept quantitation limits for PCB Aroclor 1221 in water at 0.4 ug/l instead of the previously requested 0.2 ug/l.

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
CFS01-CM-1B	SLUDGE	EPA SW-846	1110	Corrosivity	PER METHOD
CFS01-CM-1B	SLUDGE	EPA SW-846	9010	Reactive Cyanide	PER METHOD
CFS01-CM-1B	SLUDGE	EPA SW-846	9030	Reactive Sulfide	PER METHOD
CFS01-CM-1B	SLUDGE	EPA SW-846	9095	Paint Filter Liquids	PER METHOD
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	NP-237	Neptunium-237	0.3 pCi/g
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	AM-241/243	Americium-241/243	0.3 pCi/g
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	PU-238/239/240	Plutonium-238/239/240	0.3 pCi/g
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	TH-228/230/231	Thorium-228/230/231/232	0.5 pCi/g
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	U-234/235/236	Uranium-234/235/236/238	0.5 pCi/g
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	TOTAL ACT	Total Activity[e]	10 pCi/g
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	% U-235	% Uranium-235[f]	
CFS01-CM-1C	SLUDGE	RADIOLOGICAL	U-TOTAL	Total Uranium[f]	0.6 pCi/g
CFS01-FD-2A	SLUDGE	EPA SW-846	8080PCB	ALL ANALYTES	0.4 ug/l
CFS01-FD-2C	SLUDGE	RADIOLOGICAL	SR-89/90	Strontium-89/90	0.5 pCi/g
CFS01-FD-2B	SLUDGE	EPA SW-846	9030	Reactive Sulfide	PER METHOD
Phase III Samples - Area I Poured Concrete Area (PCA)					
PCA35-GR-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
PCA35-GR-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
PCA35-GR-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
PCA35-GR-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
PCA35-GR-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g

[e]Total activity is the alpha/beta/gamma energies measured as a whole by a Liquid Scintillation Counter.

[f]The units for %U-235 will be expressed in percent; however, total U quantitative limit will be 0.6 pCi/g.

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
PCA35-GR-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
PCA35-GR-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
PCA35-GR-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
PCA35-GR-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
PCA35-GR-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
PCA52-GR-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
PCA52-GR-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
PCA52-GR-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
PCA52-GR-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
PCA52-GR-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
PCA52-GR-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
PCA52-GR-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
PCA52-GR-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
PCA52-GR-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
PCA52-GR-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
PCA66-GR-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
PCA66-GR-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
PCA66-GR-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
PCA66-GR-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
PCA66-GR-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
PCA66-GR-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
PCA66-GR-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
PCA66-GR-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
PCA66-GR-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
PCA66-GR-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
PCA66-FD-2B	SOLID	EPA SW-846	6010	ALL ANALYTES	
PCA66-FD-2A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
PCA66-FD-2C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
PCA71-GR-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
PCA71-GR-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
PCA71-GR-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
PCA71-GR-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
PCA71-GR-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
PCA71-GR-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
PCA71-GR-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
PCA71-GR-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
PCA71-GR-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
PCA71-GR-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
Phase IV Samples - Areas II (MBA), III (WFA), IV (SUG), VII (SCB) and VIII (LTF)					
MBA01-CM-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
MBA01-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
MBA01-CM-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
MBA01-CM-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
MBA01-CM-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
MBA01-CM-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
MBA01-CM-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
MBA01-CM-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
MBA01-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
MBA01-CM-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
MBAxx-FD-2B	SOLID	EPA SW-846	6010	ALL ANALYTES	
MBAxx-FD-2A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
MBAxx-FD-2C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
MBA02-CM-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
MBA02-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
MBA02-CM-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
MBA02-CM-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
MBA02-CM-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
MBA02-CM-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
MBA02-CM-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
MBA02-CM-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
MBA02-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
MBA02-CM-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
MBA03-CM-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
MBA03-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
MBA03-CM-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
MBA03-CM-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
MBA03-CM-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
MBA03-CM-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
MBA03-CM-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
MBA03-CM-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
MBA03-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
MBA03-CM-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
MBA04-CM-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
MBA04-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
MBA04-CM-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
MBA04-CM-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
MBA04-CM-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
MBA04-CM-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
MBA04-CM-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
MBA04-CM-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
MBA04-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
MBA04-CM-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
MBA05-CM-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
MBA05-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
MBA05-CM-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
MBA05-CM-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
MBA05-CM-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
MBA05-CM-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
MBA05-CM-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
MBA05-CM-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
MBA05-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
MBA05-CM-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
MBA00-CM-1B	SOLID	ASTM	D2216	Moisture	PER METHOD
MBA00-CM-1B	SOLID	ASTM	D3286-85	Heat Content	PER METHOD
MBA00-CM-1B	SOLID	ASTM	D482-7	% Ash	PER METHOD
MBA00-CM-1B	SOLID	ASTM	D854	Bulk Density	PER METHOD
MBA00-CM-1B	SOLID	EPA SW-846	1010	Flash Point/Ignitability	PER METHOD
MBA00-CM-1B	SOLID	EPA SW-846	1110	Corrosivity	PER METHOD
MBA00-CM-1B	SOLID	EPA SW-846	9010	Reactive Cyanide	PER METHOD
MBA00-CM-1B	SOLID	EPA SW-846	9030	Reactive Sulfide	PER METHOD
MBA00-CM-1B	SOLID	EPA SW-846	9045	pH	PER METHOD
MBA00-CM-1B	SOLID	EPA SW-846	9095	Paint Filter Liquids	PER METHOD
MBA00-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
MBA00-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
MBA00-CM-1C	SOLID	RADIOLOGICAL	NP-237	Neptunium-237	0.3 pCi/g
MBA00-CM-1C	SOLID	RADIOLOGICAL	AM-241/243	Americium-241/243	0.3 pCi/g
MBA00-CM-1C	SOLID	RADIOLOGICAL	PU-238/239/240	Plutonium-238/239/240	0.3 pCi/g
MBA00-CM-1C	SOLID	RADIOLOGICAL	TH-228/230/231	Thorium-228/230/231/232	0.5 pCi/g
MBA00-CM-1C	SOLID	RADIOLOGICAL	U-234/235/236	Uranium-234/235/236/238	0.5 pCi/g
MBA00-CM-1C	SOLID	RADIOLOGICAL	TOTAL ACT	Total Activity	10 pCi/g

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
MBA00-CM-1C	SOLID	RADIOLOGICAL	% U-235	% Uranium-235	
MBA00-CM-1C	SOLID	RADIOLOGICAL	U-TOTAL	Total Uranium	0.6 pCi/g
WFA01-CM-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
WFA01-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
WFA01-CM-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
WFA01-CM-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
WFA01-CM-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
WFA01-CM-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
WFA01-CM-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
WFA01-CM-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
WFA01-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
WFA01-CM-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
WFAxx-FD-2B	SOLID	EPA SW-846	6010	ALL ANALYTES	
WFAxx-FD-2A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
WFAxx-FD-2C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
WFA02-CM-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
WFA02-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
WFA02-CM-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
WFA02-CM-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
WFA02-CM-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
WFA02-CM-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
WFA02-CM-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
WFA02-CM-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
WFA02-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
WFA02-CM-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
WFA00-CM-1B	SOLID	ASTM	D2216	Moisture	PER METHOD
WFA00-CM-1B	SOLID	ASTM	D3286-85	Heat Content	PER METHOD
WFA00-CM-1B	SOLID	ASTM	D482-7	% Ash	PER METHOD

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
WFA00-CM-1B	SOLID	ASTM	D854	Bulk Density	PER METHOD
WFA00-CM-1B	SOLID	EPA SW-846	1010	Flash Point/Ignitability	PER METHOD
WFA00-CM-1B	SOLID	EPA SW-846	1110	Corrosivity	PER METHOD
WFA00-CM-1B	SOLID	EPA SW-846	9010	Reactive Cyanide	PER METHOD
WFA00-CM-1B	SOLID	EPA SW-846	9030	Reactive Sulfide	PER METHOD
WFA00-CM-1B	SOLID	EPA SW-846	9045	pH	PER METHOD
WFA00-CM-1B	SOLID	EPA SW-846	9095	Paint Filter Liquids	PER METHOD
WFA00-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
WFA00-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
WFA00-CM-1C	SOLID	RADIOLOGICAL	NP-237	Neptunium-237	0.3 pCi/g
WFA00-CM-1C	SOLID	RADIOLOGICAL	AM-241/243	Americium-241/243	0.3 pCi/g
WFA00-CM-1C	SOLID	RADIOLOGICAL	PU-238/239/240	Plutonium-238/239/240	0.3 pCi/g
WFA00-CM-1C	SOLID	RADIOLOGICAL	TH-228/230/231	Thorium-228/230/231/232	0.5 pCi/g
WFA00-CM-1C	SOLID	RADIOLOGICAL	U-234/235/236	Uranium-234/235/236/238	0.5 pCi/g
WFA00-CM-1C	SOLID	RADIOLOGICAL	TOTAL ACT	Total Activity	10 pCi/g
WFA00-CM-1C	SOLID	RADIOLOGICAL	% U-235	% Uranium-235	
WFA00-CM-1C	SOLID	RADIOLOGICAL	U-TOTAL	Total Uranium	0.6 pCi/g
SUG01-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG01-CM-1A	SOIL	EPA SW-846	8080	ALL ANALYTES	
SUG01-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG01-CM-1A	SOIL	EPA SW-846	8270	ALL ANALYTES	
SUG01-CM-1B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUG01-CM-1C	SOIL	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
SUG01-CM-1B	SOIL	TCLP	1311NV	TCLP Prep	N.A.

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
SUG01-CM-1B	SOIL	TCLP	6010	ALL ANALYTES	
SUG01-CM-1B	SOIL	TCLP	7470	Mercury	0.02 mg/l
SUGxx-FD-2B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUGxx-FD-2A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUGxx-FD-2C	SOIL	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
SUG02-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG02-CM-1A	SOIL	EPA SW-846	8080	ALL ANALYTES	
SUG02-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG02-CM-1A	SOIL	EPA SW-846	8270	ALL ANALYTES	
SUG02-CM-1B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUG02-CM-1C	SOIL	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
SUG02-CM-1B	SOIL	TCLP	1311NV	TCLP Prep	N.A.
SUG02-CM-1B	SOIL	TCLP	6010	ALL ANALYTES	
SUG02-CM-1B	SOIL	TCLP	7470	Mercury	0.02 mg/l
SUG03-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG03-CM-1A	SOIL	EPA SW-846	8080	ALL ANALYTES	
SUG03-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG03-CM-1A	SOIL	EPA SW-846	8270	ALL ANALYTES	
SUG03-CM-1B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUG03-CM-1C	SOIL	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
SUG03-CM-1B	SOIL	TCLP	1311NV	TCLP Prep	N.A.
SUG03-CM-1B	SOIL	TCLP	6010	ALL ANALYTES	
SUG03-CM-1B	SOIL	TCLP	7470	Mercury	0.02 mg/l
SUG04-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG04-CM-1A	SOIL	EPA SW-846	8080	ALL ANALYTES	
SUG04-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG04-CM-1A	SOIL	EPA SW-846	8270	ALL ANALYTES	
SUG04-CM-1B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUG04-CM-1C	SOIL	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
SUG04-CM-1B	SOIL	TCLP	1311NV	TCLP Prep	N.A.
SUG04-CM-1B	SOIL	TCLP	6010	ALL ANALYTES	
SUG04-CM-1B	SOIL	TCLP	7470	Mercury	0.02 mg/l
SUG05-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG05-CM-1A	SOIL	EPA SW-846	8080	ALL ANALYTES	
SUG05-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG05-CM-1A	SOIL	EPA SW-846	8270	ALL ANALYTES	
SUG05-CM-1B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUG05-CM-1C	SOIL	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
SUG05-CM-1B	SOIL	TCLP	1311NV	TCLP Prep	N.A.
SUG05-CM-1B	SOIL	TCLP	6010	ALL ANALYTES	
SUG05-CM-1B	SOIL	TCLP	7470	Mercury	0.02 mg/l
SUG06-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG06-CM-1A	SOIL	EPA SW-846	8080	ALL ANALYTES	
SUG06-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG06-CM-1A	SOIL	EPA SW-846	8270	ALL ANALYTES	
SUG06-CM-1B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUG06-CM-1C	SOIL	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
SUG06-CM-1B	SOIL	TCLP	1311NV	TCLP Prep	N.A.
SUG06-CM-1B	SOIL	TCLP	6010	ALL ANALYTES	
SUG06-CM-1B	SOIL	TCLP	7470	Mercury	0.02 mg/l
SUG07-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG07-CM-1A	SOIL	EPA SW-846	8080	ALL ANALYTES	
SUG07-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG07-CM-1A	SOIL	EPA SW-846	8270	ALL ANALYTES	
SUG07-CM-1B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUG07-CM-1C	SOIL	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
SUG07-CM-1B	SOIL	TCLP	1311NV	TCLP Prep	N.A.
SUG07-CM-1B	SOIL	TCLP	6010	ALL ANALYTES	

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
SUG07-CM-1B	SOIL	TCLP	7470	Mercury	0.02 mg/l
SUG08-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG08-CM-1A	SOIL	EPA SW-846	8080	ALL ANALYTES	
SUG08-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG08-CM-1A	SOIL	EPA SW-846	8270	ALL ANALYTES	
SUG08-CM-1B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUG08-CM-1C	SOIL	RADIOLOGICAL	TC-99	Technetium-99	20 pCi/g
SUG08-CM-1B	SOIL	TCLP	1311NV	TCLP Prep	N.A.
SUG08-CM-1B	SOIL	TCLP	6010	ALL ANALYTES	
SUG08-CM-1B	SOIL	TCLP	7470	Mercury	0.02 mg/l
SUG09-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG09-CM-1A	SOIL	EPA SW-846	8080	ALL ANALYTES	
SUG09-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG09-CM-1A	SOIL	EPA SW-846	8270	ALL ANALYTES	
SUG09-CM-1B	SOIL	EPA SW-846	6010	ALL ANALYTES	
SUG09-CM-1C	SOIL	RADIOLOGICAL	TC-99	Technetium-99	20 pCi/g
SUG09-CM-1B	SOIL	TCLP	1311NV	TCLP Prep	N.A.
SUG09-CM-1B	SOIL	TCLP	6010	ALL ANALYTES	
SUG09-CM-1B	SOIL	TCLP	7470	Mercury	0.02 mg/l
SUG00-CM-1B	SOIL	ASTM	D2216	Moisture	PER METHOD
SUG00-CM-1B	SOIL	ASTM	D3286-85	Heat Content	PER METHOD
SUG00-CM-1B	SOIL	ASTM	D482-7	% Ash	PER METHOD
SUG00-CM-1B	SOIL	ASTM	D854	Bulk Density	PER METHOD
SUG00-CM-1B	SOIL	EPA SW-846	1010	Flash Point/Ignitability	PER METHOD
SUG00-CM-1B	SOIL	EPA SW-846	1110	Corrosivity	PER METHOD

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
SUG00-CM-1B	SOIL	EPA SW-846	9010	Reactive Cyanide	PER METHOD
SUG00-CM-1B	SOIL	EPA SW-846	9030	Reactive Sulfide	PER METHOD
SUG00-CM-1B	SOIL	EPA SW-846	9045	pH	PER METHOD
SUG00-CM-1B	SOIL	EPA SW-846	9095	Paint Filter Liquids	PER METHOD
SUG00-CM-1A	SOIL	EPA SW-846	8080PCB	ALL ANALYTES	
SUG00-CM-1A	SOIL	EPA SW-846	8260	ALL ANALYTES	
SUG00-CM-1C	SOIL	RADIOLOGICAL	NP-237	Neptunium-237	0.3 pCi/g
SUG00-CM-1C	SOIL	RADIOLOGICAL	AM-241/243	Americium-241/243	0.3 pCi/g
SUG00-CM-1C	SOIL	RADIOLOGICAL	PU-238/239/240	Plutonium-238/239/240	0.3 pCi/g
SUG00-CM-1C	SOIL	RADIOLOGICAL	TH-228/230/231	Thorium-228/230/231/232	0.5 pCi/g
SUG00-CM-1C	SOIL	RADIOLOGICAL	U-234/235/236	Uranium-234/235/236/238	0.5 pCi/g
SUG00-CM-1C	SOIL	RADIOLOGICAL	TOTAL ACT	Total Activity	10 pCi/g
SUG00-CM-1C	SOIL	RADIOLOGICAL	% U-235	% Uranium-235	
SUG00-CM-1C	SOIL	RADIOLOGICAL	U-TOTAL	Total Uranium	0.6 pCi/g
SCB01-CM-1B	SOLID	EPA SW-846	6010	ALL ANALYTES	
SCB01-CM-1A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	
SCB01-CM-1C	SOLID	RADIOLOGICAL	Sr-89/90	Strontium-89/90	0.5 pCi/g
SCB01-CM-1C	SOLID	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/g
SCB01-CM-1C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
SCB01-CM-1C	SOLID	RADIOLOGICAL	Tc-99	Technetium-99	20 pCi/g
SCB01-CM-1B	SOLID	EPA SW-846	7470	Mercury	0.02 mg/g
SCB01-CM-1A	SOLID	EPA SW-846	8080	ALL ANALYTES	
SCB01-CM-1A	SOLID	EPA SW-846	8260	ALL ANALYTES	
SCB01-CM-1A	SOLID	EPA SW-846	8270	ALL ANALYTES	
SCB01-FD-2B	SOLID	EPA SW-846	6010	ALL ANALYTES	
SCB01-FD-2A	SOLID	EPA SW-846	8080PCB	ALL ANALYTES	

Table 6. (continued)

Sample ID	Matrix type	Proponent of method	Method number	Analyte	Quantitation limits
SCB01-FD-2C	SOLID	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/g
LTF01-CM-1A	WATER	EPA SW-846	8080PCB	ALL ANALYTES	0.4 ug/l
LTF01-CM-1B	WATER	EPA SW-846	7470	Mercury	0.02 mg/l
LTF01-CM-1C	WATER	RADIOLOGICAL	GAMMA SPEC	Gamma Spectroscopy	0.5 pCi/l
LTF01-CM-1C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l
LTF01-FD-2A	WATER	EPA SW-846	8080PCB	ALL ANALYTES	0.4 ug/l
LTF01-FD-2B	WATER	EPA SW-846	7470	Mercury	0.02 mg/g
LTF01-FD-2C	WATER	RADIOLOGICAL	GROSS ALPHA	Gross Alpha/Beta	15.0 pCi/l

4. SAMPLE PRESERVATION AND HANDLING

Absolute sample preservation is not possible. The preferred technique for assurance of sample integrity is a fast analysis of the sample. After this, the best that can be achieved is to retard the chemical and biological processes that are responsible for sample degradation. Samples collected during the course of this project will not require any means of preservation. Samples will be maintained in coolers and analysis will be conducted within a short period of time. Sample containers will consist of either glass or plastic containers. Sample containers are certified precleaned containers. Guidance regarding container type and sample preservation is taken from ESP-701 and ORNL/ER-225.

5. FIELD AND LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

5.1 FIELD QA/QC PROGRAMS

The Special Projects Sampling Program follows the basic QA/QC principles set forth in the Environmental Surveillance Procedures and in the EPA's *Standard Operating Procedures and Quality Assurance Manual.* Under this project, guidance will also be taken from the ER program *Quality Assurance Plan* (ORNL/ER-225). The assurance of the quality of the field sampling for this program will be maintained by the use of duplicate samples. One duplicate sample will be collected from each homogeneous area. Each composite sample will also have a duplicate collected. The laboratory responsible for the analysis will subject a minimum of five percent of all samples to spiking for the purpose of quality control. These results will serve as tools to evaluate the quality of data being furnished by the laboratory. One equipment blank for each selected sampling equipment will be collected prior to sampling. The final rinse from the last decontamination activity for each selected sampling equipment will also be collected. The rinsate sample will be collected in accordance with ESP-900. A trip blank per cooler per day that contains volatile organic samples will also be submitted for analysis. The sample crew will record any exceptions to the sampling plan in their field notebooks including the use of alternate equipment (nonglass or stainless steel), sampling problems, or unusual sampling conditions.

5.2 LABORATORY QA/QC PROGRAMS

The Analytical Services Division (ASD) at K-25 has implemented a QA/QC program that is defined in document ASO-QAP-0001 Rev. 0, *Analytical Services Organization Quality Assurance Plan.* This document details all QA/QC programs that are active in the laboratory. Any laboratory handling these samples is required to have similar documentation of their control programs. Acceptable control programs would be designed to operate under the U.S. Environmental Protection Agency (EPA) Contract Laboratories Program (CLP) format.

The goal of the QA/QC program is to monitor all programs and ensure that all data generated are suitable for their intended use. The QA/QC activities will be under the direction of a Quality Control Manager who reports directly to the Quality, Facilities and Operations Department Head, or other independent quality assurance organizations, and has the responsibility of monitoring the QA/QC programs of all laboratory sections.

All data generated on controls and samples shall be maintained on a central laboratory computer using Analytical Laboratory Information System (AnaLIS), or other Laboratory Information Management Systems (LIMS) type system. All data storage, archival, and review will be in accordance with DOE 5633.3. Quality assurance data generated by the laboratory will be made available to the principle program manager upon request.

6. CORRECTIVE ACTIONS

6.1 PERFORMANCE/SYSTEM AUDITS

Throughout the duration of this project, if the quality of the data indicates that performance goals of this plan are not being met because of failure of control systems, procedures, or management, corrective actions will be necessary. In most instances of failure to meet the required performance, the individual performing the testing or conducting the process is in the best position to recognize the failure and the need to initiate appropriate corrective actions.

While no specific audits are planned for the project activity, general audits, surveys, and surveillance of operations and systems may reveal the need for specific corrective actions that are not recognizable at the hands-on level. These findings will be evaluated by the QC manager of the group responsible for performance of work described in this plan for impact on the plan. If the QC manager determines that action is necessary, a response will be prepared listing the steps to be taken and estimating the completion dates and forwarded to the project manager.

6.2 CORRECTIVE ACTION REPORTS

When the need for corrective actions has been identified, the QC manager for the organization with responsibility for the performance of work described in this plan will initiate and track corrective actions within the affected group. The appropriate manager is responsible for instituting corrective actions and ensuring the actions are sufficient to correct the nonconformance.

The QC manager for the organization responsible for the performance of the work described in this plan is responsible for reporting any nonconformance and associated corrective actions relating to this plan to management. Nonconformance and corrective actions will be recorded by written reports and will become part of the records of the organization taking such actions.

7. ANALYSIS

Table 6 in Chap. 3 lists the analyses that are to be performed for each type of sample. When available and appropriate for the sample matrix, EPA SW-846 (EPA 1992) methods will be used. When not available, other nationally recognized methods such as DOE and American Society for Testing and Materials (ASTM) methods will be used.

8. DATA REDUCTION AND EVALUATION

8.1 FIELD DATA

Data collected during field activities will be evaluated by checking procedures used and comparing the data to previous measurements. The sampling project manager will be responsible for checking field QC sample results to ensure that field measurements and sampling protocols have been observed. These reviews will check, as a minimum,

- Date and Time Sampled
- Preservation
- SOPs Utilized
- Calibration Method and Frequency
- Chain of Custody Documentation

Field data (information obtained before the sample is delivered to the laboratory) will be recorded on various forms and in field logbooks and transferred to project management. The data will include field recording sheets, calibration logs, instrument outputs, worksheets for calculating results, any deviations from SOPs, and other relevant information.

8.2 ANALYTICAL DATA

All analytical data will be reported to the number of significant digits indicated in the K-25 Energy Systems Waste Management Operations WAC. Analytical data generated will be evaluated for completeness as an ongoing and concurrent process. This will include, but not be limited to, review of completed custody logs, photocopied pages of laboratory notebooks, and data forms completed by the technical staff, including sample weights, dilutions, concentrations, data reduction, instrument logs, and all raw data. Reviewers of materials will include the ER QA Specialist, the ASD Project Coordinator, and the assigned laboratory supervisor.

8.3 DATA VALIDATION AND REPORTING

The data validation process compares the objective with the actual thorough evaluation of the precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. The laboratory will not perform data validation; laboratory QA/QC data will be validated independent of the laboratory by a contract organization or by project staff as appropriate with the requirements specified in *Requirements for Quality Control of Analytical Data for the Environmental Restoration Program* ES/ER/TM-16 (Energy Systems 1991). Data will be entered into common, standardized formats. Project Managers and Data Validators shall retrieve data in hard copy formats. All Raw Data will be archived and made available for validation. Ten percent of the data will be selected at random by the contracted validator, and compliance of the select analytical data set with required methodology and project specifications will be determined. Data will be validated to Level III; 10% will be validated to a Level IV. Documentation flow should follow the Project Records Plan in the *Quality Assurance Plan.* "Appendix A-1." ORNL/ER-225 001-225/0009-0895 (Energy Systems 1995b) . Table 7 lists the data procedures.

Table 7. Data procedures

Document number	Procedure title
ES/ER/TM-16	*Requirements for Quality Control of Analytical Data for the Environmental Restoration Program*
ORNL/ER-225	*Quality Assurance Plan for Oak Ridge National Laboratory, Environmental Restoration Program*
ORNL/ER-225 001-225/0009-0895	"Appendix A-1. Specific Application for Oak Ridge National Laboratory Decontamination and Demolition of Waste Evaporator Facility Building 3506."

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EPA (U.S. Environmental Protection Agency). 1992 (July). *Test Methods for Evaluating Solid Waste.* EPA SW-846. PB94-170313.

*Lockheed Martin Energy Systems, Inc. after June 1, 1995

Appendix A

WASTE EVALUATION CRITERIA FOR STORAGE BY THE K-25 SITE WASTE MANAGEMENT DIVISION

K/WD-2
Rev. 2

Waste Management Division

Waste Evaluation Criteria for Storage by the K-25 Site Waste Management Division

M. B. Kimbrough

Date Issued—April 1995

Prepared for
U.S. Department of Energy
Office of Environmental Restoration and Waste Management

OAK RIDGE K-25 SITE
Oak Ridge, Tennessee 37831-7101
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

- *Waste Acceptance Criteria for the Oak Ridge Reservation*, ES/WM-10; and
- "Waste Certification Requirements for Energy Systems Waste Management Organization (ESWMO)," EP-710.

4. WASTE EVALUATION CRITERIA

These WEC apply to contaminated wastes as characterized in the RCRA or TSCA regulations or DOE Order 5820.2A, "Radioactive Waste Management". Wastes can be in the form of solid, liquid, gas, or sludge and can be categorized as low-level, transuranic, transuranic mixed, RCRA, RCRA mixed, TSCA, or TSCA radioactive. These WEC are applicable to all wastes that ultimately may be stored at the K-25 Site. The waste to be stored will be generated at the K-25 Site or accepted from off-site DOE generators. "Off-site DOE generators" includes waste DOE has accepted for storage and disposition.

4.1 GENERAL REQUIREMENTS

1. Generators must develop a waste certification procedure and have it approved by the K-25 WMD. This procedure must identify the waste streams that are sent to the K-25 Site for storage. Waste shall be certified to meet the characterization requirements of ES/WM-10.
2. Sampling, analyses, and characterization of consistent "profiled" process waste streams will be performed at least annually and as required for all new wastes, unknown wastes, and wastes occurring from process changes. Sampling and analysis conducted for WMD will be in accordance with guidance given in the *Sampling and Analysis Plan for the K-25 Site Waste Management Division*, K/WD-18, Rev. 1. The required methods and quantitation limits are specified in the Appendix to that plan.
3. The sample collection and handling methods used for characterizing all wastes shall be derived from the EPA-recommended protocols in *Test Methods for Evaluating Solid Waste*, EPA SW-846. The SW-846 methods have been detailed and amplified into Standard Operating Procedures in *Environmental Surveillance Procedures Quality Control Program*, ESH/SUB/87-21706/1. These environmental, safety, and health (ESH) procedures have been submitted to and approved by the state of Tennessee and EPA Region IV. Where the ESH procedures allow options, site-/project-specific supplements are authorized; otherwise, the use of other sampling procedures will require the prior approval of WMD.
4. No materials in polyethylene overpack will be received.
5. No waste containing fissile materials will be received without K-25 Site criticality safety approvals.
6. No waste containing any classified material will be received without security approval.
7. No free or drainable liquids (paint filter test) shall be placed into ST-5 containers.
8. No individual containers of laboratory pack size liquids will be received without prior written approval from the waste disposal coordinator (WDC).

9. All mercury-containing thermometers must be double packaged and properly labeled.

10. Mercury must be drained from all glass mercury manometers and the tubing segment shall not exceed 2.5 ft in length. Free liquid mercury must be in approved containers, and the container volume shall not exceed 1 liter.

11. Materials that will generate pressure from decay heat shall be stored in approved containers with provisions either to contain the contents without damage to the container or be equipped with a pressure relief device.

12. Prior notification (minimum of 24 hours) is required for shipment of waste to the K-25 storage units. Any delivery to the Waste Transportation and Storage Operations Department (WTSOD) after 1:00 p.m. requires special prior approval of both the WDC and WTSOD and may require a generator charge number.

4.2 CONTAINER REQUIREMENTS

1. All containers shall comply with the applicable requirements of:

   - Department of Transportation (DOT) Shipping Regulations [Title 49 Code of Federal Regulations (CFR)] or equivalent;
   - Martin Marietta Energy Systems, Inc., Standard Operating Procedures and Policies; and
   - DOE Order 5820.2A, "Radioactive Waste Management".

   In addition, PCB materials must be packaged in accordance with 40 CFR 761.65(c)(6); and waste which contains liquid, and has no immediate disposal options must be in lined containers.

2. Waste shall be placed in containers that are compatible with the waste as determined by testing, literature, or past operating experience. Fifty-five-gallon containers that meet or are equal to DOT specifications are used to store waste in the units. Other containers such as 89- and 96-gallon steel containers, 89- and 96-gallon steel containers with a poly-liner (4–15 mil thick), polyethylene containers, B-25 boxes, and polyethylene-lined containers for raw sludges may also be used to store waste in these units. Recovery drums are used to hold containers that appear corroded or have otherwise lost their integrity. Drums should be palletized with all labels and markings clearly facing the sides not accessible by forklift. The 55-gallon drums should be received on 48-in. by 44-in. oak pallets, and overpacks should be received on 54-in. by 54-in. oak pallets (nominal dimensions).

   Note: Specifications for both sizes of pallets follow. The pallets shall be standard height. The material shall be oak wood and nails. The load capacity shall be 12,000 pounds minimum. They shall be stackable (i.e., bottom of pallet to sit on top of 4 uniform drums) and have 2-way fork entry. The outside runners must be flush with the deck board. Metal pallets meeting or exceeding these specifications are acceptable.

3. No container larger than an ST-5 ($\approx$4 ft $\times$ 4 ft $\times$ 6 ft and gross weight 6,000 lb) will be received without prior approval by WMD.

4. Containers filled beyond design capacity (volume or weight) will not be accepted.

5. Containers in excess of 40 pounds each shall be palletized or configured for forklift access.

6. Containers in excess of 6,000 pounds each require prior approval of WMD.

4.3 LABELING REQUIREMENTS

1. Containers generated on site will be labeled in accordance with Standard Practice Procedure (SPP)-4606.

2. Containers originating off site will be labeled in accordance with the requirements of the originating site (ES/WM-10). Corrections shall be completed as part of the receiving process.

3. Wastes containing chlorofluorocarbon or other ozone-depleting substances will be labeled in accordance with 40 CFR 82 Subpart E. The WDC will advise the generator of the requirements when requested.

4.4 DOCUMENTATION REQUIREMENTS

Waste documentation shall be as specified in ES/WM-10. See Sect. 4.6 for additional requirements for shipments originating off site.

4.5 RADIOLOGICAL REQUIREMENTS

Wastes with transuranic (TRU) constituents will be accepted, but, transuranic waste (TRU activity greater than 100 nCi/g) will not be accepted.

4.5.1 Criticality Safety

- Containers with a fissile mass greater than 350 grams ^{235}U or that exceed the unity rule for fissile isotopes must be accompanied with a Nuclear Criticality Safety Analysis acceptable to the K-25 Site Nuclear Criticality Safety Department.
- Containers with a fissile concentration greater than 5 mg/L must be accompanied with a Nuclear Criticality Safety Analysis acceptable to the K-25 Site Nuclear Criticality Safety Department.

4.5.2 Health Physics

- Containers shall comply with 49 CFR 173 exposure rates.
- The dose rate from the container should not exceed 5 mrem/hour at 30 cm from any surface. Higher dose rates will require that Health Physics determine radiological controls and will require special approval by the WMD prior to receipt.

Appendix B

DOE ENVIRONMENTAL SURVEY MANUAL. APPENDIX E. FIELD SAMPLING PROTOCOLS AND GUIDANCE

DOE/EH-0053
Vol. 4 of 4

U.S. Department of Energy

Office of the Assistant Secretary
Environment, Safety and Health

Office of Environmental Audit

The Environmental Survey Manual

Appendices E, F, G, H, I, J, and K

August 1987

APPENDIX E

FIELD SAMPLING PROTOCOLS AND GUIDANCE

E1.0 INTRODUCTION

Appendix E provides a description of and guidance for the field sampling protocols to be used in the Sampling and Analysis Program of the Survey. Most of the protocols are drawn from the major published sources listed in Section E2.0. The protocols are intended to provide a standard reference source for the Sampling and Analysis Program. These resources will be used to help prepare elements of Sampling and Analysis Plans.

Each protocol is uniquely identified by a section number and a descriptive title. These identifiers will be used to reference protocols in Sampling and Analysis Plans. Information concerning each protocol is presented under four headings: discussion, application, procedure, and sources. The discussion section includes introductory, background, and general guidance information. The application section deals with appropriate uses of the method. The procedure section identifies the specific steps to be followed in using the method, and the sources section identifies the primary source(s) from which the protocol was derived.

Unusual field sampling situations may require departures from the protocols described in this appendix as well as the development of entirely new protocols. Such occurrences will be fully documented in the Sampling and Analysis Plan and/or field logbooks for the affected site.

General guidance for field sampling is provided in Section E3.0. Sampling protocols are presented separately for liquids (Section E4.0), solids (Section E5.0), air (Section E6.0), biota (Section E7.0), radiological monitoring (Section E8.0), and nonradiological monitoring (Section E9.0).

E2.0 REFERENCES

The references provided below are the primary sources of information concerning the sampling protocols to be used by the Sampling and Analysis Program. They were selected for the Survey to assist Sampling and Analysis teams in preparing Sampling and Analysis Plans. Many of the sampling protocols presented in this appendix are based directly on protocols found in these references.

The following is a listing of the primary reference documents for the Sampling and Analysis Program. Other, more specific, references are also provided in the source(s) section of some protocols.

- CH2M Hill and NUS Corporation, Quality Assurance/Field Operations Methods Manual; Volumes I-IV, prepared as a draft document for the Environmental Protection Agency, March 31, 1986.

- United States Environmental Protection Agency, Characterization of Hazardous Waste Sites--A Method Manual: Volume II, Available Sampling Methods, USEPA Environmental Monitoring Systems Laboratory, P. O. Box 15027, Las Vegas, Nevada 89114-5027, EPA-600/4-83-040, September 1983.

- United States Department of Energy, Environmental Monitoring for Low-Level Waste Disposal Sites, National Low-Level Radioactive Waste Management Program, Idaho Falls, Idaho 83415.

- United States Environmental Protection Agency, Soil Sampling Quality Assurance User's Guide, USEPA Environmental Monitoring Systems Laboratory, P. O. Box 15027, Las Vegas, Nevada 89114-5027, EPA-600/4-84-043, May 1983.

- United States Environmental Protection Agency, Practical Guide for Groundwater Sampling, USEPA Robert S. Kerr, Environmental Research Laboratory, Ada, Oklahoma 74820, EPA-600/2-85-104, September 1985.

- United States Environmental Protection Agency, National Enforcement Investigations Center (NEIC) Policies and Procedures, NEIC, Denver, Colorado, EPA-330/9-78-001-R, May 1978 (revised May 1986).

- Code of Federal Regulations, Environmental Protection Agency - Title 40, Part 50, Subchapter C-Air Programs, July 1, 1986.

- United States Department of Energy, 1983 Environmental Measurements Laboratory (EML) Procedures Manual HASL-300, 26th Edition, USDOE, Environmental Measurements Laboratory, 376 Hudson Street, New York, New York 10014, August 1982.

- United States Environmental Protection Agency, Test Methods for Evaluating Solid Waste, 2nd Edition, Office of Solid Waste and Emergency Response, Washington, D.C., EPA SW-846, April 1984.

- United States Environmental Protection Agency, Preparation of Soil Sampling Protocol: Techniques and Strategies, USEPA Environmental Monitoring Systems Laboratory, P. O. Box 15027, Las Vegas, Nevada 89114-5027, EPA-60/4-83-020, May 1983.

E3.0 GENERAL GUIDANCE FOR FIELD SAMPLING

This section of Appendix E provides general guidance to the Sampling and Analysis team for developing sampling designs. This general guidance includes a presentation of basic terms and theories associated with field sampling, descriptions of three common statistical designs useful for sampling, and considerations of sample size. However, the majority of the guidance in this section is provided in media-specific sampling scenarios. Each scenario poses a hypothetical environmental problem that may be encountered in an on-site Survey, defines the sampling and analysis objectives to address that environmental problem, and presents a sampling design which will fulfill the sampling and analysis objectives. These scenarios are designed to illustrate how to select an appropriate sampling technique from those described in the following sections of this appendix for a particular situation.

E3.1 BASIC TERMS AND THEORIES

It is impossible to measure concentrations of contaminants at every location within a particular area. For this reason, samples must be taken that are representative of the entire area. In statistical terminology, any aggregate of sampling units into which an area is divided is known as the population of sampling units. For example, if the contaminants in lake or pond sediment are of interest, then the population for a lake or pond is the total area of bottom sediment. This bottom area can be divided into sampling units of equal size. Each action of a sampler removes one sampling unit from the bottom, and the size of the sampling unit depends upon the type of sampler used. Together, the sampling units constitute the whole population. Similarly, if the contaminants in the water of a lake or pond are of interest, then the population is the total volume of water in the lake or pond. As it is rarely possible to remove all the sampling units in the population, a group of units is selected from the whole aggregate and is thought to be representative of the whole population. In statistical terminology, this group of sampling units forms a sample. The sample is a term frequently used by scientists to refer to the specimen removed from an area. In this context, the specimen is the sampling unit and sample refers to the group or set of sampling units collected from an area or matrix. The units in the sample are of equal size, are taken within a short period of time, and are usually selected at random from the whole population of sampling units.

Variability among sampling units collected from a population is a typical and expected result. Because of this, drawing conclusions from the results for the sample and extrapolating to the population is difficult. Statistical theories of estimation and of hypothesis testing provide solutions to this problem in the form of definite statements that have a known and controllable probability of being correct. Statistics can provide limits that are almost certain to enclose the true population value, where the degree of certainty--as measured by the probability--can be selected by the sampler. These limits are called confidence limits, and the probabilities are called confidence probabilities.

Some common terms are listed here for reference so that they may be standardized and fully understood by all Survey and Sampling and Analysis teams. The following example will be used to introduce some of these terms:

Example: At a DOE site, sampling and analysis will be conducted to estimate the concentration of a pesticide in the top 1-in. layer of sediments in a pond.

Accuracy - closeness of measurement to true value. May include effects of random and systematic errors (bias).

Bias - systematic error, deviation from the true value, which is always of the same magnitude and direction.

Blank - sample composed of same media as actual sample but collected in such a way as to be uncontaminated with analytes of interest.

Confidence interval - one type of interval estimate. In repeated sampling, a known proportion (i.e., 95 percent) of the intervals computed by this method will include the population parameter.

Element - an object on which a measurement is taken. In the given example, an element is a sediment particle. The measurement taken is the concentration of pesticide.

Error (Absolute) - uncertainty, deviation from the true value (unknowable).

Estimate - a number computed from sample data used to approximate a population parameter.

Interval estimate - a statement that a population parameter has a value between two specified limits.

Parameter - summary number used to describe a population (i.e., mean or variance), a constant.

Population - a collection of measurements about which an inference is made. The population in the given example consists of the concentration of pesticide in all sediment particles in the top 1-in. layer of pond sediment.

Precision - random uncertainty, measure of reproducibility or scatter in a set of successive independent measurements. Random uncertainties are measured and assessed by statistical methods.

Random sample - a sample collected such that every individual element has an equal chance of occurring in the sample.

Recovery (percent) - difference between analytical results before and after spiking divided by the known amount of spiking compound and multiplied by 100. The difference in this amount and 100 percent is interference. Recovery is not very powerful statistically due to random error associated with both measurements (before and after).

Sample - a collection of sampling units drawn from the total of all sampling units. In the given example, not every grab of sediment would be collected from the pond. A sample in this case is a number of grabs of sediment from the pond.

Sampling Units - non-overlapping collections of elements from the population. In the given example, a sampling unit is a grab of sediment containing more than one sediment particle (element).

Spike - known amount of an element or compound that is added to a known amount of sample material.

Standard - known amount of an element or compound usually traceable to a National Bureau of Standards (NBS) standard.

Statistic - summary number used to describe a sample; a variable, depending on the sample collected.

E3.2 STATISTICAL DESIGNS FOR SAMPLING

Some of the most commonly used statistical designs for sampling are explained below -- simple random sampling, stratified random sampling, and systematic random sampling. The best design for a given problem is the one that provides the necessary precision in terms of confidence in the results at a minimum cost.

Drawing a random sample from the population of interest using one of these sampling designs is not simple. The sample must be drawn in such a way that every possible sample of a given size has the same chance of being selected. Neither haphazard sampling nor representative sampling leads to a random sample. Haphazard sampling is when the sampler uses his own judgment to select the sample. Representative sampling involves choosing a sample considered to be typical or representative of the population. Both techniques are subject to the sampler's bias and, more importantly, lead to estimators--properties of which cannot be evaluated. Thus, neither or these techniques lead to a random sample. For each type of design, therefore, the method of drawing a random sample is described.

E3.2.1 SIMPLE RANDOM SAMPLING

In simple random sampling, a group of n sampling units is selected in such a way that each sample of size n has the same chance of being selected. For example, if we want to identify pesticide contamination in a pond that is about the same depth from end to end and has no other factors affecting the pesticide distribution, then it could be sampled using a simple random design.

The area to be sampled is gridded or partitioned into equal units and numbered. These grids are the sampling units. If there are few units, then all the numbers are placed in a hat and withdrawn until the desired sample size is reached. An alternative is to use a table of random numbers. For example:

A pond is gridded into 100 sampling units from which a simple random sample of 25 is to be drawn. The units are numbered from 01 to 99 for the first 99 units and 00 for the 100th unit. Drop the last three digits of each number in column 1 of Table E-1. The first two-digit number is 10, the second is 22, the third is 24, the fourth is 42, and the fifth is 37. These five numbers represent field grids to be sampled. If a random number occurs twice, the second occurrence is omitted and another number is selected as its replacement.

E3.2.2 STRATIFIED RANDOM SAMPLING

In stratified random sampling, the population is divided into homogeneous units (strata) based on some additional information about the population, and then a simple random sample is drawn from each stratum. Reduced variability within each stratum produces estimates with smaller variances than do estimators from a simple random sampling of the same area and sample size. If a pond has a process pipe draining effluents into it at one end, there may be a difference in the concentration of the pesticides at that end. In this case, stratified random sampling is preferable.

To draw a sample using stratified random sampling, clearly specify the strata and estimate the area of each strata. Then grid each strata as in the simple random sample and draw a random sample of size n from each strata. If a sample size of 6 is selected as being sufficient and the area was divided into two equal sized strata, 6 units from each strata would be sampled for a total of 12. This is twice as many as would be collected with the random sample. However, it will give a better estimate of the parameter of interest, if stratification is appropriate. The best way to get a representative sample of the entire area is to proportion the number of

Table E-1. Random Digits

Line/Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	10480	15011	01536	02011	81647	91646	69179	14194	62590	36207	20969	99570	91291	90700
2	22368	46573	25595	85393	30995	89198	27982	53402	93965	34095	52666	19174	39615	99505
3	24130	48360	22527	97265	76393	64809	15179	24830	49340	32081	30680	19655	63348	58629
4	42167	93003	06243	61680	07856	16376	39440	53537	71341	57004	00849	74917	97758	16379
5	37570	39975	81837	16656	06121	91782	60468	81305	49684	60672	14110	06927	01263	54613
6	77921	06907	11008	42751	27756	53498	18602	70659	90655	15053	21916	81825	44394	42880
7	99562	72905	56420	69994	98872	31016	71194	18738	44013	48840	63213	21069	10634	12952
8	96301	91977	05463	07972	19976	20922	94595	56869	69014	60045	18425	84903	42508	32307
9	89579	14342	63661	10281	17453	18103	57740	84378	25331	12566	58678	44947	05585	56941
10	85475	36857	53342	53988	53060	59533	38867	62300	08158	17983	16439	11458	18593	64952
11	28918	69578	88231	33276	70997	79936	56865	05859	80106	31595	01547	85590	91610	78188
12	63553	40961	48235	03427	49626	69445	18663	72695	52180	20847	12234	90511	33703	90322
13	09429	93969	52636	92737	88974	33488	36320	17617	30015	08272	84115	27156	30613	74952
14	10365	61129	87529	85629	48237	52267	67689	93394	01511	26358	85104	20285	29975	89868
15	07119	97336	71048	08178	77233	13916	47564	81056	97735	85977	29372	74461	28551	90707
16	51085	12765	51821	51259	77452	16308	60756	92144	49442	53900	70960	63990	75601	40719
17	02368	21382	52404	60268	89368	19885	55322	44819	01188	65255	64835	44919	05944	55157
18	01011	54092	33362	94904	31273	04146	18594	29852	71585	85030	51132	01915	92747	64951
19	52162	53916	46369	58586	23216	14513	83149	98736	23493	64350	94738	17752	35156	35749
20	07056	97628	33787	09998	42698	06691	76988	13602	51851	46104	88916	19509	25625	58104
21	48663	91245	85828	14346	09172	30168	90229	04734	59193	22178	30421	61666	99904	32812
22	54164	58492	22421	74103	47070	25306	76468	26384	58151	06646	21524	15227	96909	44592
23	32639	32363	05597	24200	13363	38005	94342	28728	35806	06912	17012	64161	18296	22851
24	29334	27001	87637	87308	58731	00256	45834	15398	46557	41135	10367	07684	36188	18510
25	02488	33062	28834	07351	19731	92420	60952	61280	50001	67658	32586	86679	50720	94953

samples per strata based on the strata size and homogeneity. For example, assume a pond can be stratified into a shallow area of 1000 square meters and a deep area of 2000 square meters, and you could afford to collect 12 samples. If both areas are equally homogeneous, four samples should be collected from the shallow area and eight from the deep area. If, however, the shallow area is very heterogeneous with respect to the deep area, eight samples should be collected from the shallow area and four from the deep area.

E3.2.3 SYSTEMATIC RANDOM SAMPLING

In systematic random sampling, the first sampling unit is selected randomly, then every nth unit following the first is sampled. This design is easy and offers a convenient means of obtaining sample information. It often provides greater information per unit cost than does simple random sampling. This design is recommended when there is little or no information about the area to be sampled and when we want to locate contaminants as well as quantify them. If a pond is relatively shallow from end to end, and the types of materials in it are not known, a systematic sample might be appropriate.

To draw a sample using this design, randomly select one element from the first n elements in the total and every nth element thereafter. For example, if a pond were divided into 1000 grids numbered from 001 to 1000 and 20 samples were to be collected, we could sample every 50 grids. The key to a systematic sample is the starting point. A random number between 1 and 50 must be chosen as the starting point. From that grid on, every 50th one is sampled. One limitation of this design is that an unbiased estimate of the variance cannot be obtained from only one systematic sample. If the population is truly randomly distributed, then the variance is approximately equal to the variance of the mean based on simple random sampling.

E3.3 SAMPLE SIZE

The sample size is defined as the number of sampling units (or observations) collected in the sample. It is usually referred to as n. The number depends

on cost per sample per analysis, the time needed to collect the sample, and the requirements of the analytical procedure. If the sample is too large, time and labor are wasted. Conversely, it is also wasteful if the sample is too small because inadequate information has been purchased for the time and effort expended; and it may be impossible to increase the sample size at a later time. Therefore, the number of sampling units purchased will depend on the amount and quality of information required.

There are ways to estimate the sample size when there is some estimate of variability. For a 95-percent confidence level, the following equation can be used to calculate the sample size necessary to produce a confidence interval of desired length:

$$n = \frac{4\pi^2}{L}$$

where:

L = Desired length of confidence interval (For example, if the confidence interval is 10 to 100 ug/L, then L would be 90 ug/L)

π = Known population standard deviation (In practice, π is never known; therefore an estimate obtained from previous data should be used.)

σ

The minimum sample size to calculate a confidence interval for an estimate of some parameter is two. However, for purposes of the Survey, the recommended minimum sample size is three. When the variability is large, the number required is between 12 and 20 for a precision of about 20 percent and a variability of about 50 percent. It would be better to limit the number of areas sampled and to increase the samples in each area than to sample a large number of areas with the minimum number of samples. However, only three samples will provide an estimate of the variability in the population.

E3.3.1 PHYSICAL SIZE OF SAMPLING UNIT

If a grid is used to divide an area, the size of the grid must be decided. In general, the smaller the grid size the better. However, if a random sample of 10 is drawn from a pond gridded into 10,000 units, all units might be next to each other. This is fine, if the population is truly randomly distributed. However, it might be a problem if it is not. A rule of thumb is that for a sample of size n, there should be 20 x n grids. This should dictate the size of the grid.

Assuming that there are no measures of variability for the parameters of interest, and that the variability of these parameters among all sites is high and approximately the same, it is desirable to specify a minimum number of samples per stratum for given size areas, so that the sampling is approximately proportional for all sites.

The following list provides guidance concerning the size of an area to be sampled and the minimum number of samples required to address the sampling and analysis objectives. It is based on a knowledge of the size of the sites, their complexity, the cost of sample analyses, schedules, and sampling objectives. If there are estimates of variability (or a range) that can be used to approximate the sample size, the previous equation for n should be used. This table is intended as a guide:

Area or Stratum Size (square meters)	Minimum Number of Samples per Area or Stratum
<100	3
100 - <500	4
500 - <2500	5
2500 - <12500	6
12500 - <62500	7

E3.3.2 COMPOSITE SAMPLING

Composite sampling is an alternative which may be incorporated into a sampling design. For example, if you want to collect a sample of size five from a gridded area, you might take a grab from the center of five randomly selected sampling grids. Alternatively, for each of five randomly selected grids you might take a grab from each of the four corners and center of the

grid. These five grabs may then be composited into a single sampling unit for analysis. This type of sample unit versus the single grab will provide a better estimate of the mean concentration of the contaminants of interest within the sampling grid and correspondingly, a better estimate of the mean concentration of the contaminants in the pond.

E3.3.2.1 Spatial Composites

If the area to be sampled is very heterogeneous, as is the case for most soils and sediments, and the cost of analysis is high relative to the cost of collecting the samples, it might be desirable to collect aliquots from the area and combine them into a single composite sample for analysis.

If the sampling objective is to determine the presence of a contaminant above some specified level or criterion, and the criterion is much greater than the detection limit of the analysis, then aliquots may be composited for analysis. A limitation to the use of composites is that the variability between samples in the area is large compared to the rest of the sources of variability (at least an order of magnitude larger). The number of aliquots (A) to combine must be less than or equal to the ratio of the criterion (C) to the determination limit (D):

$$A \leq \frac{C}{D}$$

If the criterion is close to the detection limit, then A is near 1 and individual aliquots must be analyzed. When concentrations of contaminants are near the detection limit, then compositing may dilute concentrations of those samples below the limit.

Compositing, in general, may be useful for large areas to be sampled where relatively few samples can be collected and analyzed. If one of the sampling objectives is to locate areas with significant levels of contamination, the preferred method of sampling an area that has unknown contaminants is to use systematic random sampling. This should provide coverage of the entire area. It will, however, require a very large number of samples to accomplish

this coverage if the area is large. If the soil or sediments in a large area are to be sampled (such as in a landfill), and only a limited number of samples can be collected (so that coverage of the entire area is impossible), composite sampling may be preferable to random sampling of the area. The recommended method of compositing in this case follows.

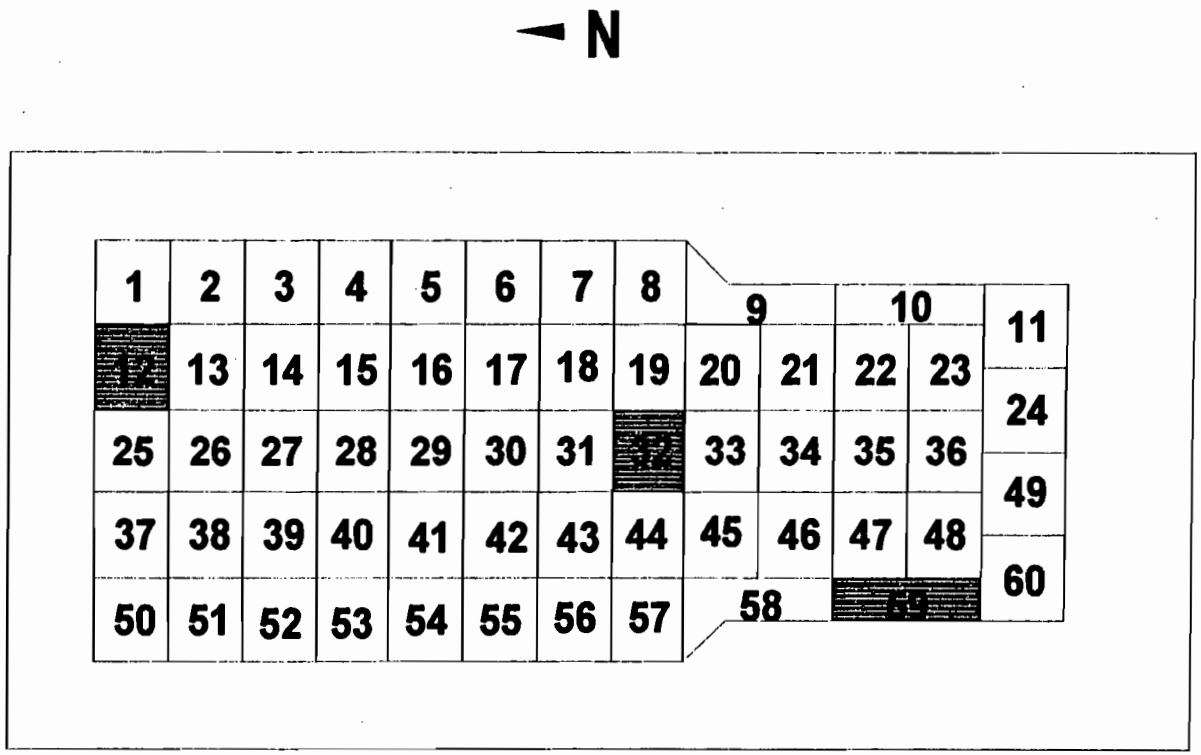
Given that you can analyze six samples, the landfill should be divided into six arbitrary, equally sized subareas. From each of these areas aliquots should be collected and composited for analysis. When compositing, the aliquots should be taken from as small an area as possible to minimize variability between the samples. The limitations on the use of compositing require that the concentrations of the contaminants not be close to the detection limit or that the ratio of some criteria to the detection limit be greater than one.

When forced to composite samples, information needed to locate the areas of highest contaminant concentrations is lost. If possible, sufficient material may be retained if analysis of the individual aliquots is required. Analysis of individual aliquots might be necessary if the concentration of contaminants in the composite is high and one of the objectives is to locate areas with significant levels of contamination. This subsequent analysis requires a knowledge of holding times, adequate labeling of individual aliquots, and sufficient laboratory space for handling.

In general, spatial compositing should probably be limited to soils and sediments due to the heterogeneity between samples. Spatial compositing is not desirable for liquid samples, due to the homogeneity in these samples relative to other sources of variability. This does not suggest that liquids are homogeneous. There may be strata within a creek, stream, river, drainage ditch, etc. Sources of variability, such as an effluent, will require stratification of the water body prior to sample collection. The liquid within each strata should then be relatively homogeneous. At least three samples should be collected within each strata. These may be composites or individual samples.

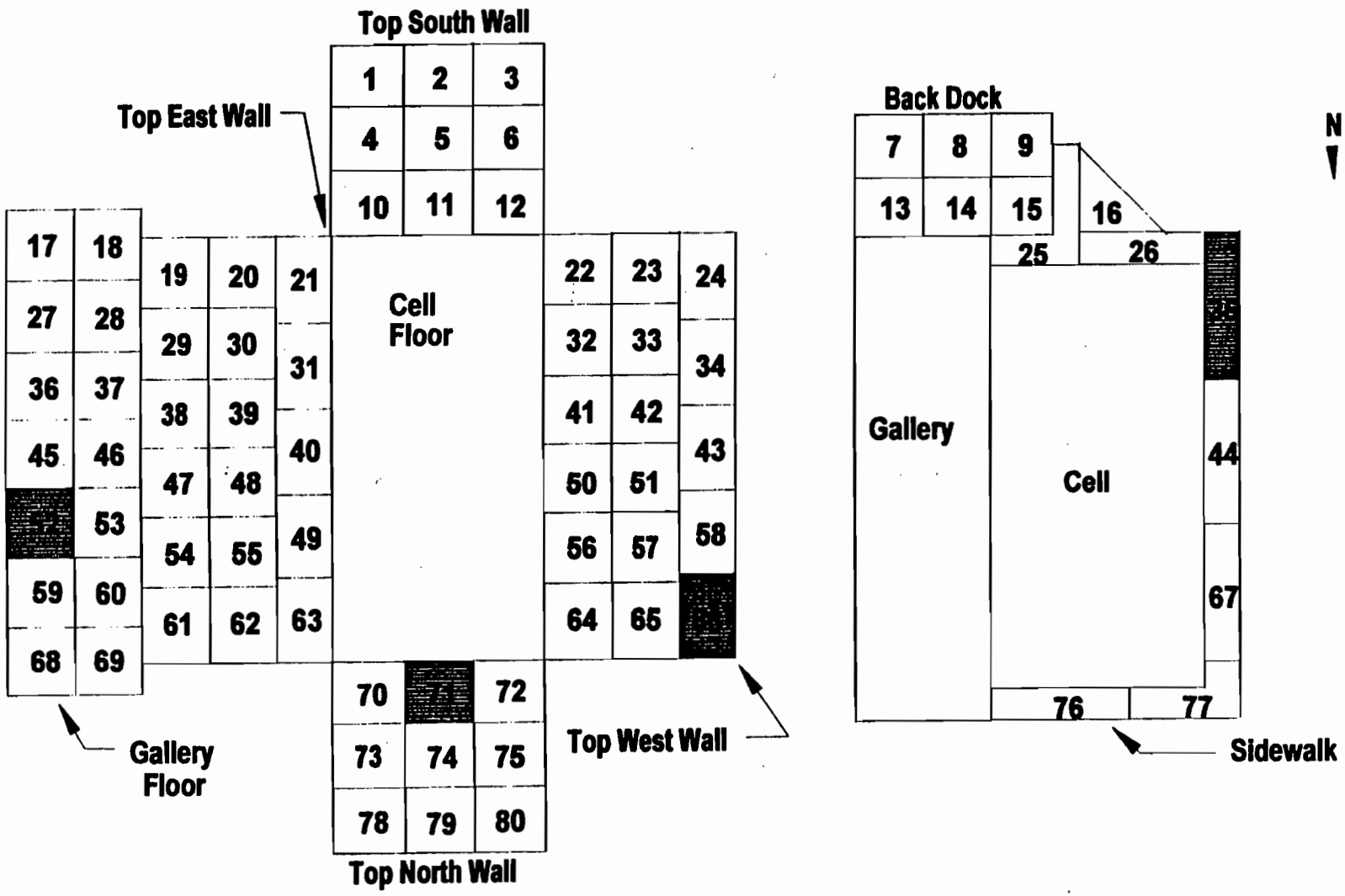
Appendix C

GRID FOR EACH HOMOGENEOUS AREA



3506 Cell

Water in Cell Floor (WCF) Area



Poured Concrete Area (PCA)

Appendix D

COPIES OF FORMS

APPENDIX 3
Chain-of-Custody Form Example

CHAIN OF CUSTODY FOR INORGANICS

Sampler Signatures:			Project:		Lab:			Analysis					
Sample Identification	Sampling Date (dd/mmm/yy)	Sampling Time (military)	Sample Type	Container Type	Preservative	Added	pH Ck						

Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:

APPENDIX 4
Request for Analytical Services Form Example

REQUEST FOR ORNL ANALYTICAL SERVICES

SEE REVERSE SIDE FOR INSTRUCTIONS

ACD REQUEST NO.

PAGE ___ OF ___

*(4) CHAIN OF CUSTODY YES [ ]	(5) SAMPLE MATRIX	(6) DEADLINE (MM/DD/YY)
(7) PROJECT NO	(8) SERIES	(9) CUSTOMER NAME / BUILDING - MAIL STOP
(10) CHARGE NO	(12) CUST. DEPT. NO.	(13) SAMPLED FROM
(16) FREQUENCY	(19) MATERIAL DESCRIPTION	

COMMENTS:

NOTE: Customers should pick up samples within 10 days of reporting results. Additional charges may result if ACD is required to dispose of samples.

Compliance Sample? RCRA [ ] NPDES [ ] OTHER [ ]

If Other, please specify in comments

ACD NUMBER	(11) CUSTOMER SAMPLE ID (15)	(17) SAMPLE DATE MM/DD/YY	TIME	(23) ANALYSIS (30)	METHOD ID (14)	DETECTION LIMITS

* (AnaLIS Field No) Field Name (No Char)

To arrange E-trans of data send E-mail to STC : NTJ or TEASLEYNAJR on OA VAX

RECEIVED BY:

SUBMITTED BY:/PHONE

UCN-16522
(3) 5-90

Special Project Sampling Log

Project ID_____ Entered by_____

Date and Time of Entry_____

Field Analysis_____ Results_____ Method_____

Sample Taken ☐ Indoors Climate Controlled ☐ Indoors Non Climate Controlled

☐ Outdoors Protected ☐ Outdoors Non Protected

Ambient Cond: Approx. Temp._____ Precip._____ Sky Cond._____

Samples From ☐ Container ☐ Air ☐ Surface Soil ☐ Subsurface Soil

☐ Flowing Water (river/stream etc.) ☐ Pooled Water (pond, pool, etc.)

☐ Other

Container description and condition_____

_____

Comments:_____

_____

Appendix E

QUALITY ASURANCE PLAN. ORNL/ER-225. APPENDIX A-1. SPECIFIC APPLICATION FOR ORNL DECONTAMINATION AND DEMOLITION OF WASTE EVAPORATOR FACILITY BUILDING 3506. 001-225/3701-0895.

ORNL/ER-225

Energy Systems Environmental Restoration Program
ORNL Environmental Restoration Program

Quality Assurance Plan for Oak Ridge National Laboratory Environmental Restoration Program

Date Issued— April 1994

Prepared by
Gilbert/Commonwealth, Inc.
Knoxville, Tennessee
under subcontract 90X-GJS75C

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

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831-6285
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

Appendix A-1
Specific Application
for Oak Ridge National Laboratory
Decontamination and Demolition
of Waste Evaporator Facility
Building 3506

Quality Assurance Plan
ORNL/ER-225

001-225/0009-0895

Date Issued—September 1995

For
Oak Ridge National Laboratory
Environmental Restoration Program

APPROVAL

QUALITY ASSURANCE PLAN FOR ORNL DECONTAMINATION AND DEMOLITION OF WASTE EVAPORATOR FACILITY BUILDING 3506

001-225/0009-0895

September—1995

G. J. Mandry 10/26/95

G. J. Mandry
ORNL Environmental Restoration Project Manager

Peter A. Schrandt 10/26/95

P. A. Schrandt
Environmental Restoration Quality Assurance Engineer

W. E. Palmer

W. E. Palmer
Waste Management Quality Assurance Engineer

David M. Carden 10/27/95

D. M. Carden
DOE - ORO Environmental Restoration QA/QC Program Manager

MARTIN MARIETTA ENERGY SYSTEMS, INC.
OAK RIDGE, TN - PADUCAH, KY

PROJECTS RECORDS PLAN (PRP)

PROJECT TITLE: ☒ TOTAL PROJECT ☐ WBS	DOC. NO.	ISSUE DATE (REV DATE) June 16, 1995
Building 3506 Demolition Project	PROJECT ENGINEER G. J. Mandry	PRINCIPAL ENGINEER R. B. Jones
REV	PROJECT NO. ORIG.	BASE ESO NO. ORIG. ~~AX5701~~ PXA546-01
	REV.	REV.

PLANT ORNL	BUILDING/LOCATION Building 3506	PRN	☒ DIRECTIVE ☐ ☐ SUB DIR.

☐ LINE ITEM ☒ GPP ☐ EQUIPMENT ☐ EXPENSE	TEC ☐ <$1.2M ☒ >$1.2M

CONTAINS SPECIAL FACILITIES? ☒ YES ☐ NO	CONCEPT PLANNING START FY 95	EXECUTION START FY 95	COMPLETION/TERMINATED DATE FY 96

RECORDS RETENTION SEE EP-B-36 TABLES C-1 AND C-2	A. PROJECT RECORDS	B. RECORD COPY (RC) SEND TO ESDCC	C. RETENTION
	RETAIN PWF NORC NAME G. J. Mandry SEND TO PLANT RECORDS AT PROJECT COMPLETION	QA PLAN ☒ YES ☐ NO, IF YES, IDENTIFY QA NON-PERMANENT (6 YRS) - RC, AND QA LIFETIME - RC	RETENTION BY RECORDS ANALYST WITH PJ DESCRIPTION INPUT years

PROJECT RECORDS PLAN (PRP)

PURPOSE: To implement record management requirements for use during conceptual-planning phases. See PRP revisions f o r execution and completion/termination.

REFERENCES: Engineering Procedures EP-A-12 and EP-B-36.

RESPONSIBILITIES: All Engineering team members.

1. Establish a file, Project Working File (PWF), for retention of all documents issued or received by team member.

2. Identify all documents originated or collected (if official receipt from external sources) as RECORD COPY (RC) OR NONRECORD COPY (NORC) based upon the RC documents listed on the attachment. Note that a document is not identified as RC or NORC until issued approved or CFC. Up to this point, the documents are handled as NORC. For those documents required to show evidence that an activity was performed to meet a requirement (e.g., check-off lists), mark "RC-Nonpermanent."

3. For RC Documents - when issued approved:
   a. On the transmittal show ESDCC - RC, "2 copies".

4. For NORC Documents, when issued approved:
   a. On the transmittal, show by originator or collector as listed on Table C-2 from EP-B-36 "RETAIN PWF G. J. Mandry ," 1 copy.

PREPARED BY	REVIEWED BY	ISSUED BY
J. W. Jones	W.E. Palmer	G. J. Mandry

CHECK LIST OF PROJECT RECORDS COPY (RC) MATERIAL

Ref.	Description	Applicable
	AUTHORIZATION	
EP-B-06	Project Funding	X
EP-B-03	ESO's (W.O.'s) (Final)	X
EP-B-09	Project Cost Estimate	X
EP-B-23	Preliminary Proposal	
EP-B-24	Directive Authorizations (Planning Base Letter)	X
EP-B-21	Congressional Data Sheets Final	
EP-B-22	Form OR-F-5190.1	
	DESIGN	
ES-6-	Drawing tracings	X
ES-6-	Microfilm of each tracing issue	X
ES-6-	Drawing Index (No. Dept., Bldg., etc.)	X
EP-C-17	Design Review Records (After Resolution)	X
EP-C-35	As-Built Drawings and Documents	X
EG-C-22	Equipment Spec. (YS)	X
EG-C-30	Engineering Standards (ES)	
EG-C-21	Bills of Material (BM-Procure)	X
EG-C-23	Equipment Data Sheets (DS)	X
EP-C-20	Design/Analysis Calculations	
EP-D-11	Procurement	X
EG-C-25	Manufacturer's Data	X
EG-C-25	Shop Drawings	
EP-D-20	F.P. Construction Bid Package (Sp. Cond. and Tech. Specs)	X
	DESIGN REPORTS	
EP-B-19	Site Selection Approval	
EP-C-06	Conceptual Design Report (TID)	
EP-DC3-01	Design Criteria	
EP-DC3-05	Design Checklist	
EP-E-12	Construction Project Requirements Summary	X
EP-E-17	Construction Waste Management Plans	X
EP-C-26	Design Change Notice	X
	CONSTRUCTION	
GP-24	Readiness Review Reports (Approved)	X
------	Site Safety and Health Plan	X

Ref.	Description	Applicable
	TECHNICAL ASSESSMENTS AND PLANS	
EP-E-02	Configuration Management Plan	
EP-E-05	Systems Requirements Documents (SRD)	X
EG-E-07	Safety Systems - SA, PSAR, FSAR	X
EG-E-08	Environmental -ADM, EA, EIS, FONSI, Decision Record, Engr. Rpt.	X
EP-E-10	Quality Assurance Plans/QAE	X
EP-PSI-02	Risk Assessments and Plans	X
EP-A-26	Surveillance Reports	X
ESS-QA-16.0	Corrective Actions	X
XGP-13	Occurrence Reports	X
	MANAGEMENT PLANS AND REPORTS	
EP-B-08	Project Management Plan	
EG-D-18	Transition Plan	
EP-B-46	Construction Completion Report	X
EP-B-16	Project Change Orders, Log and Memorandum	X
EG-D-09	Field Changes	X
EP-D-10	Nonconformance, Deviation, and Waiver Reports	X
EP-B-16	Project Change Control	X
QA-L-3-101	Deviations Request	X
	COST-SCHEDULE-PROGRESS REPORTS	
EP-B-26	Closing Statement of Costs	X
——	Cost Accounting Reports - Final Issue	X
——	Construction Photographs	X
	TEST AND INSPECTION REPORTS (FOR CRITICAL FACILITY ITEMS)	
EP-D-11	For Energy Systems Vendor/ Shop (Proc. Coord)	
EP-E-12	For Energy Systems Inspection and Maintenance Divs.	X
EP-D-01	Energy Systems Construction Engineering (Title III)	X
EP-D-01	Architect-Engineers (Title III)	

Appendix F

ORNL ER SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR WASTE CHARACTERIZATION SAMPLING OF BUILDING 3506

ORNL ER SITE-SPECIFIC HEALTH AND SAFETY PLAN APPROVAL

WORK PROJECT TITLE: Waste Characterization Sampling of Bldg. 3506

TASK: Characterization sampling SSHASP No.

WAG Report Year

Brief description of purpose of project and specific task(s) entailed: Waste characterization sampling will be performed at Bldg. 3506 for the purpose of determing future disposal methods for hazardous waste located within the Bldg.

SSHO Training Level II

Gerald J Mandry

Date 11/1/95

ORNL ER Site Project Manager*

Melinda Patton

Date 10-30-95

SSHO or ES&H technician

Phillip W. Ah

Date 11-2-95

Office of Radiation Protection representative

Other

Date 10-30-95

ORNL HAZWOPER Program Coordinator or SHEST†

Date 11-2-9

ORNL ER Program ES&H Manager or designee

UCN-20275 (3 7-94)

ORNL ER SITE-SPECIFIC HEALTH AND SAFETY PLAN
(SSHASP)

WORK PROJECT TITLE: **Waste Characterization sampling for Bldg. 3506**

ISSUED DATE: SSHASP No. □□□ □□□/□□□□ □□□□

Addendum issued date (if applicable): _____ Date: _____

Six month compliance review: By _____ Date: _____

- This SSHASP is to be used in conjunction with the ORNL ER Programmatic Health and Safety Plan (PHASP); all referenced sections of the PHASP must be available on-site.
- In order to be valid, this SSHASP must undergo review and approval and have a signed approval page attached to it documenting such approval.
- This SSHASP is to be reviewed and updated (as necessary) every 6 months if the duration of the project is projected to be 6 months or greater.
- Changes in this SSHASP may require the completion of a Field Change Request/Variance Form. (Refer to Sect. 3.3 of the PHASP.)

SECTION I: Work Plan

Provide a detailed description of project objectives and how the work will be accomplished. Include all procedures or reference procedures in documents that will be available on-site. Attach additional sheets, if necessary.

Waste Characterization sampling will be performed at 3506 for the purpose of determing future disposal methods for hazardous waste located within the Bldg. Sampling will be done in a four phase approach. Items to be sampled in the first phase include: Water that has collected in the cell floor. Phase II will be the sampling of the sludge that is found in the cell floor. Phase III will be the sampling of the concrete that is to be dismantled during the D&D activity. Phase IV will be the sampling of all other materials generated as construction debris and placed in waste containers. Various equipment, including a concrete drill, trier-type sampler, mixing dish, COLIWASA, chisel, hammer, and stainless steel spoon, will be used for collection of samples. Where ever possible stainless steel or glass sampling equipment will be used. The work will be performed by ORNL Environmental Surveillance and Protection Group. The ORNL Health Physics Department will provide hp support. The ORNL SHEST Group will provide Industrial Hygiene support, and the Measurement, Application and Development Group will provide Health and Safety support for the project.

SECTION II: Key Personnel:

Complete Table 1 If site roles and/or responsibilities differ from those presented in the PHASP, attach a sheet describing the differences.

Table 1. Key personnel

Responsibility	Name	Telephone No.	Radio No./ Beeper No.
Program Management			
ORNL ER Program Manager	Harry Boston	6-0311	
ORNL ER Program ES&H Manager	Charles Clark	4-8268	686
Project Site Organization			
ORNL ER Site Project Manager	Gerald Mandry	6-5557	
Facility Manager	Gerald Mandry	6-5557	
ORNL Construction Engineer	Robert B. Jones III	4-8185	
Site Safety and Health Officer	Melinda B. Patton	6-6562	
Alternate Site Safety and Health Officer	Paul Abston	4-4588	
Industrial Hygiene/Health Physics Technician (ES&H Technician)	SHEST	4-6447	
Office of Radiation Protection representative	Phillip Allen	4-6524	
Industrial Hygiene representative	SHEST	4-6447	
Office of Industrial Safety representative	SHEST	4-6447	
HAZWOPER Program Coordinator	Ann Saulsbury	6-5064	
Office of Environmental Compliance and Documentation	Denise Reynolds	6-1409	

SECTION III: Site Roles and Responsibilities

The sections that immediately follow contain descriptions of anticipated site roles and responsibilities. Site roles and responsibilities are not limited to those listed in these sections. Additional site roles and responsibilities or changes in key personnel shall be added as an addendum to this plan, if the roles are permanent for all site activities. Key personnel shall be identified in each work project SSHASP. If roles and responsibilities differ from those listed here, they also should be specified in the SSHASP.

In addition to the responsibilities listed below, all site personnel are required to follow Energy Systems' facility-wide rules and regulations and employee conduct rules detailed in General Employee Training and in *You and Martin Marietta Energy Systems, Inc.* (Energy Systems 1988[1]). In accordance with these regulations, the use or possession of intoxicants on the premises or reporting to work under the influence of such is strictly prohibited.

III.A ORNL ER Site Project Manager

Responsibilities of the SPM may include, but are not limited to, the following:

- Coordinating all field activities with the ER Program ES&H Manager and the Waste Management Manager.
- Coordinating support personnel required for field operations, including both Energy Systems, subcontractor personnel, and DOE prime contractors.
- Notifying the LSS of planned activities, as required.
- Notifying the Facility Manager of planned activities.
- Coordinating with ORNL the distribution and control of security access badges required for Melton Valley and/or WAG access, if needed.
- Obtaining all required documentation and permits.
- Providing programmatic oversight of field activities.
- Determining and communicating site project objectives to all personnel involved in site activities.
- Participating in weekly health and safety briefings to summarize planned activities, to identify new hazards, or to clarify any task or project-related issues.
- Coordinating the completion of the state of Tennessee workers' compensation forms with injured personnel, the supervisor, and the SSHO, in the event of employee injuries.
- Assuring that all site personnel have proper training and experience and medical certification for their job.
- Assuring that all personnel adhere to all ES&H, QA, Waste Management, and any other procedures appropriate to the project.

---

[1]Energy Systems, December 1988. *You and Martin Marietta Energy Systems, Inc.*, Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee.

- Assuring that all heavy/specialty equipment has been certified as being safe to operate and that personnel operating these items have the appropriate training or experience to operate the heavy/specialty equipment.

III.B Responsibilities of SSHOs

The general responsibilities of the SSHO shall include, but are not limited to, the following:

- Following the prescribed chain of command when reporting ES&H issues.
- Ensuring that all immediately dangerous to life and health (IDLH) and environmental impact issues are reported to the LSS.
- Conducting pre-entry and daily health and safety briefings that include, but are not limited to, subjects such as site hazard communications; information concerning the site emergency action plan and emergency response actions and responsibilities; the locations of fire alarms, extinguishers, telephones, and sanitation facilities; and discussion of any unexpected site hazards that may have recently evolved.
- Conducting H&S briefings if site conditions change.
- Ensuring that workers have been briefed or trained in recognizing unexpected hazards.
- Ensuring that information covered in the daily safety briefing is recorded in the project logbook.
- Ensuring that all prospective site personnel sign and date the field logbook (or appropriate document) to verify that the requirements for informing personnel of site-specific potential health hazards and other health and safety information covered in the PHASP and applicable SSHASP have been fulfilled.
- Overseeing the selection, inspection, storage, and maintenance of personal protective clothing and equipment to be used on-site, in conjunction with the ORP representative and IH, IS representatives as applicable.
- Establishing and maintaining work zones to prevent the potential spread of contamination during work and decontamination activities, after consultation with the ORP representative and other applicable H&S disciplines.
- Coordinating and minimizing the number of personnel and the amount of equipment in work zones.
- Controlling entry into and exit from the work zones of all personnel and observers.
- Ensuring that all personnel arriving or departing the site during activities are logged in and out at the appropriate place in the project logbook.
- Participating in the preparation of the SSHASPs and ensuring their implementation.
- Complying with and implementing the ORNL ER PHASP and ORNL HAZWOPER Program Manual.
- Conducting periodic inspections (self-assessments) to ensure the compliance of all site entrants with environmental, health, and safety measures outlined in the PHASP, the SSHASP, and other appropriate documents.

- Confirming each worker's suitability for hazardous waste site work based on a physician's recommendation or participation in the ORNL HAZWOPER medical surveillance program (as required). Maintaining written records on-site, including documentation of worker participation in the necessary medical surveillance programs and respiratory protection programs.
- Ensuring that any injury, illness, or exposure related to work performance is reported to the SPM, the Health Division, ORNL ER ES&H Manager (or designee), the IS Section, and the Office or Radiation Protection, as appropriate.
- Ensuring that training requirements for site access by individual workers have been met.
- Maintaining and updating each on-site worker's training record in accordance with 29 CFR 1910.120. (Note: ORNL Special Access training badges will be used to verify training for ORNL employees, subcontractors, and DOE prime contractors, if applicable).
- Monitoring of ambient site conditions for potential chemical and radiological exposures, as approved.
- Observing the workers for symptoms of exposure or for conditions related to other on-site hazards, including physical stresses such as temperature extremes.
- Observing the work parties for signs of stress.
- Assuring that appropriate ES&H instrumentation is available on-site for monitoring personnel, equipment, and the environment.
- Performing or ensuring performance of daily field calibrations of environmental monitoring equipment used to detect ambient site conditions and potential personnel exposures as outlined in the PHASP and SSHASP, as well as maintaining documentation of such instrument calibration in the project logbook or on an instrument calibration form. All calibration shall be performed in accordance with the manufacturer's guidelines and/or approved SOPs.
- Ensuring that all monitoring equipment is operating correctly according to the manufacturer's guidelines and providing maintenance or ensuring that maintenance is provided, if required or authorized.
- Performing daily ES&H self-assessment/surveillance activities and submitting biweekly written summaries of these surveillance activities and any associated corrective actions to the ER Program ES&H Manager (or designee).
- Establishing and posting (if appropriate) at the site an emergency action plan, telephone numbers, and radio communication information.
- Confirming that the emergency action plan, telephone numbers, beeper numbers, and radio numbers are current and correct.
- Advising emergency response personnel in an emergency.
- Ensuring that needed work permits are obtained and available on-site.
- Ensuring that the appropriate ES&H disciplines are contacted prior to beginning field activities and requesting oversight or monitoring support, as appropriate.
- Ensuring that all personnel are frisked before leaving a potentially contaminated work area such as a controlled access area, CRZ, or EZ.
- Ensuring that all equipment leaving any potentially contaminated work area has been surveyed and/or smeared for contamination.

- Ensuring that all sample containers are properly bagged, labeled, scanned, and/or smeared before leaving the work area.
- Ensuring that appropriate fall protection measures are in place, as warranted.
- Ensuring that an approved ORNL hoisting and rigging plan, or equivalent, is available on-site, as appropriate.
- Ensuring that appropriate measures are taken to prevent and control spills with the materials on hand.
- Ensuring that good housekeeping practices are being followed on-site.
- Ensuring that all personnel are following proper donning and doffing procedures.
- Ensuring that all waste is properly containerized and labeled.
- Verifying the buddy system is being implemented, if warranted.
- Ensuring that all workers are aware that their recommendations concerning how a task may be performed safely will be noted and taken into consideration.
- Assisting the Facility Manager in completing any occurrence report.
- Completing the ORNL ER Incident Report.

The SSHO has the authority to order a cessation of any site activities that the SSHO or any site member perceives to be dangerous to life, to the health of site personnel or the community, or to the environment. The SSHO is also authorized to order the commencement of work activities once the subject of concern has been resolved to the satisfaction of all health and safety disciplines that were consulted.

III.C Field Team Leader

The Field Team Leader is a designated individual who is responsible for field team operations and routine safety issues for all field personnel. In some cases, the Field Team Leader may be the SPM or another individual who is acting in a supervisory capacity on the project. The Field Team Leader shall be considered a "site essential" person. The project-specific responsibilities of the Field Team Leader shall include, but are not limited to, the following:

- Managing field operations.
- Executing the work plan and work schedule.
- Enforcing safety procedures.
- Coordinating with specific ORNL ES&H disciplines on all safety & health issues (including protection levels).
- Enforcing site control.
- Documenting field activities, including sampling collection.
- Assuring that the PHASP and SSHASP are followed.
- Conducting site H&S pre-entry briefings, as warranted.

III.D Decontamination Officer

The Decontamination Officer is responsible for decontamination procedures, equipment, and supplies. In some cases, the Decontamination Officer may also serve as the Field Team Leader or another key site position. This individual should be considered a "site essential" person if decontamination activities are associated with the project. The responsibilities of the Decontamination Officer shall include, but are not limited to, the following:

- Establishment of site decontamination lines and the selection of decontamination solutions appropriate for the site contaminants to be encountered.
- Controlling the decontamination of all equipment and personnel, if warranted.
- Assisting in the disposal of contaminated clothing, materials, and solutions.
- Ensuring all required decontamination equipment is available and in working order.
- Providing for the collection, storage, and disposal of waste, as appropriate.

III.E Security Officer

The security officer is responsible for managing site security. This individual is not required for all projects but is anticipated to play an important role at ER remedial action sites. When necessary and/or requested, an individual from the ORNL Security Department shall fill the role of Security Officer. In other situations, the SSHO or an appointed individual may fill this role. The Security Officer should be considered a "site essential" person, should the project necessitate such a role. The main responsibility of the Security Officer shall be maintaining site control. Other duties should include, but are not limited to, the following:

- Conducting routine area site patrols.
- Controlling facility access and egress.
- Assisting with communication during an emergency.
- Securing accident/incident scenes.
- Maintaining a log of site access and egress, as warranted, in the SSHASP.

III.F Radiation Protection and the Office of Radiation Protection Representative

ORNL ORP shall provide oversight for all ER project sites. ORP will also provide monitoring and on-site coverage as dictated by the SSHASP. All ER HP technicians shall meet the same standards required of ORNL HP technicians, which includes testing to ensure compliance with the *Radiological Control Manual* (DOE April 1994[2]) by December 31, 1994.

HP technicians or ES&H technicians providing on-site support to ER operations will be provided by, subcontracted through, or approved by the ORP. The ER ES&H Manager (or designee), in consultation with the ORP, may in some cases approve the SSHO to fulfill some

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[2]DOE April 1994. *Radiological Control Manual*, DOE/EH-0256T, Revision 1, U.S. Department of Energy, Assistant Secretary for Environment, Safety and Health, Washington, D.C.

obligations of the ORP representative. The HP technician may also serve as the on-site SSHO. The responsibilities of the ORP representative shall include, but are not limited to, the following:

- Reviewing, commenting on, and approving all SSHASPs prior to mobilization of personnel and equipment and the commencement of project activities, based on compliance with 29 CFR 1910.120 and the adequate address of HP concerns.
- Attending pre-entry and daily health and safety briefings and presenting radiation protection information and recommendations to all site workers during the briefings.
- Being present during ongoing site operations.
- Assuring that personnel and equipment are surveyed for contamination before leaving the CRZ, sampling area, or work zone.
- Assuring that equipment and other items leaving the work area have been properly surveyed for contamination, bagged if necessary, and tagged appropriately.
- Monitoring and documenting all radiological hazards at the site.
- Overseeing all site operations to ensure that work is conducted in accordance with all ORNL Radiation Protection procedures and practices.
- Assisting in the selection of the appropriate PPE for radiological hazards, including respiratory protective equipment.
- Assisting the SSHOs in establishing zones for work project activities.
- When serving as the SSHO, fulfilling the responsibilities of the SSHO.

The ORP representative has the authority to order a cessation of site activities for any concern that is perceived to be dangerous to the life, to the health of site personnel or the community, or to the environment. The ORP representative is also authorized to permit the commencement of work activities after the subject of concern has been resolved to the satisfaction of line management responsible for the work and the Radiological Control Manager in ORNL ORP (DOE April 1994[3]).

III.G Hazardous Waste Operations and Emergency Response Program Coordinator

The HAZWOPER Program Coordinator is responsible for the review written approval of all SSHASPs and the oversight of all field activities with respect to compliance with the requirements of 29 CFR 1910.120. The HAZWOPER Program Coordinator or a representative of that group shall have the authority to perform on-site inspections of site operations at his or her discretion and shall have the authority to order the cessation of work activities. Responsibilities of the HAZWOPER Program Coordinator shall include, but are not limited to, the following:

- Reviewing all SSHASPs prior to mobilization of personnel and equipment and the commencement of project activities and granting written approval by signature or disapproval of the plan(s) on the basis of compliance with 29 CFR 1910.120.
- Authorizing the commencement of work activities once the subject of concern has been resolved to the satisfaction of all health and safety personnel consulted.

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[3]Ibid.

- Assisting the SSHOs and the ORP representative in the selection of PPE and respiratory protection, as needed.
- Determining in special circumstances whether equivalent training status as allowed by 29 CFR 1910.120 can be granted or waived and documenting the same in writing, as detailed in Sect. 7.1.12 of the PHASP. This determination is made in conjunction with the Technical Resources Training Section.
- Review and approval of all SSHOs.

III.H Industrial Hygiene

The IH Section of the Office of Safety and Health Protection at ORNL or the ORNL SHEST shall be responsible for the review of field operations with respect to industrial hygiene concerns. For some work project activities (e.g., confined space entry), IH may be called upon to perform site assessments, perform personnel monitoring of ORNL employees, or serve as the SSHO or ES&H technician. In addition, IH may be required to assist the SSHOs and the ORP representative in the selection of appropriate PPE and respiratory protection for IH concerns. IH shall review and comment on all SSHASPs prior to the mobilization of personnel and equipment and the commencement of field activities.

IH has oversight responsibilities for all ER project sites. The IH representative has the authority to order a cessation of any site activities that IH perceives to be dangerous to life, to the health of site personnel or the community, or to the environment. The IH representative is also authorized to order the commencement of work activities after the subject of concern has been resolved to the satisfaction of all health and safety personnel consulted.

III.I Industrial Safety

The IS Section of the Office of Safety and Health Protection at ORNL or the ORNL SHEST shall be responsible for the oversight and approval of field operations with respect to industrial safety concerns. IS shall review and comment on all SSHASPs prior to the mobilization of personnel and equipment and the commencement of field activities. IS has the authority to order a cessation of any site activities that it perceives to be dangerous to life, to the health of site personnel or the community, or to the environment. is also authorized to order the commencement of work activities after the subject of concern has been resolved to the satisfaction of all health and safety personnel consulted.

III.J Field Personnel

The responsibilities of all field personnel involved in site operations include, but are not limited to, the following:

- Following the prescribed chain of command when reporting ES&H issues.

- Taking all reasonable precautions to prevent injury to themselves and their fellow employees; using *all of their senses* and information collected from field instrumentation to alert them of potentially harmful situations.
- Performing only those tasks that personnel believe they can do safely, and immediately reporting any accidents and unsafe conditions to the SSHOs.
- Notifying the SSHOs of any existing medical conditions (e.g., allergies, diabetes) that require special consideration. ORNL Health Division approval and/or a physician's recommendation is required before an individual with a medical condition may be assigned specific field tasks.
- Avoiding unnecessary or deliberate contact with any potentially contaminated substances (i.e., walking through puddles, pools, and mud) and avoiding placement of monitoring and sampling equipment on potentially contaminated surfaces.
- During the equipment decontamination process, preventing spillage of decontamination water, whenever possible. If a spill occurs, containing the liquid with the materials provided in the spill-control kit. If a spill-control kit is not available, the spill should be contained with materials at hand. If this cannot be done safely or with available materials, the area must be evacuated. The SSHOs should be notified immediately.
- Avoiding splashing contaminated materials.
- Being familiar with the physical characteristics of the site, including
  - wind direction;
  - accessibility to site authorities, equipment, and vehicles;
  - operation of available fire alarm boxes, telephones, and radios;
  - areas of known or suspected contaminations or "hot zones";
  - site access;
  - nearest site resources (e.g., rest rooms and break rooms);
  - overhead power lines;
  - buried electrical lines and underground piping systems (when relevant); and
  - primary and secondary assembly points.
- Maintaining for proper disposal all wastes generated during site operations.
- Reporting all injuries, regardless of how minor, to the SSHOs.
- Reporting in person to the ORNL Health Division when any injury or illness related to work activities is incurred. (The SSHO must be notified first.)
- Abiding by a buddy system, with each site worker being responsible for keeping track of his or her partner in the event of an incident or emergency situation.
- Reporting to the ORP representative, SSHOs, or approved alternates for frisking prior to egress from the CRZ, EZ, or controlled access area (CAA) as directed by the SSHOs.
- Being familiar with the procedures required within the PHASP and SSHASPs.
- Conducting all tasks in accordance with the PHASP and SSHASPs for each project.
- Reporting to the SSHO, the ORP representative, or their direct supervisor any information regarding site operations or conditions that may have an impact on the health and safety of the operation.

III.K Facility Manager

The Facility Manager is a designated Energy Systems employee who is primarily responsible for the oversight and coordination of all operations and activities at their facility. The responsibilities of the Facility Manager include, but are not limited to, the following:

- Maintaining an awareness of the status of the assigned facility, including a general knowledge of current and planned research, experimental activities, and operations and maintenance.
- Ensuring that operations and maintenance involving radioactive, hazardous material, and energy sources are conducted safely and in compliance with applicable ES&H standards. Knowing and understanding the requirements for Radiation Work Permits, Safety Work Permits, and lockout/tagout. Ensuring that appropriate facility Radiation Work Permits, Safety Work Permits, and lockout/tagouts are initiated, approved, and issued.
- Directing the termination or restriction of operations in the assigned facility when judgement dictates that such action is necessary to protect the H&S of workers or the public or to protect property.
- Ensuring that notification and occurrence reporting is carried out in accordance with applicable orders and procedures and that remedial action is included when required.
- Conducting periodic walk-through inspections of the assigned facility to ascertain proper facility maintenance, to ensure that ES&H requirements are being met, and to promote good housekeeping within the facility and its surrounding area. Identifying improvements or needed repairs and recommending and/or initiating action to correct deficiencies.
- Ensuring that the division's Self-Assessment and Conduct of Operations Implementation Plans are being carried out appropriately at assigned facilities.
- Ensuring that the facility and surrounding grounds are maintained in a clean, uncluttered fashion in keeping with professional standards.
- Ensuring that appropriately reviewed and approved procedures for experimental activities, operations, and maintenance are in place that are commensurate with the hazard involved.
- Monitoring to resolution the status of ES&H noncompliances at the assigned facilities. Ensuring that noncompliances are properly reported to the applicable ES&H representative as necessary.
- Monitoring to resolution the status of corrective actions from internal and external appraisals and audits applicable to the facility.
- Maintaining the status of, and ensuring documented compliance with, facility safety documentation (i.e., safety analysis reports, safety studies, safety assessments, hazard screening, preliminary hazard screening) including technical specifications and operational safety requirements. Ensuring that action is initiated to review and to revise safety documentation as necessary.
- Ensuring that facility access training requirements are adequate. Ensuring that facility visitors without access training are properly escorted, as appropriate. Ensuring that changes are made as described in configuration control documentation.
- Ensuring that any facility configuration changes have been reviewed, approved, and documented in accordance with division and ORNL procedures before changes are implemented. Ensuring that changes are made as described in configuration control documentation.
- Ensuring that facility maintenance is planned, tracked, and coordinated. Coordinating with the applicable field or building engineer and craft foremen to maintain the facility's material status.

- Ensuring that quantities of radioactive and hazardous materials maintained within the facility are known, documented, and within applicable limits.
- Ensuring that current boundaries of controlled and other hazardous areas (e.g., contamination zones and RCRA storage areas), discharge streams, and air and water permits are well marked and maintained as appropriate.
- Ensuring that emergency plans are in place, up-to-date, and accurate. Providing resources and oversight for the local emergency squad, as applicable.
- Interfacing with the DOE facility representative, as appropriate.
- Notifying the Waste Management and Remedial Action Division Facility Manager Program Coordinator of any changes within the facility to ensure that the ORNL facility data base remains current.

III.L ORNL ER Program ES&H Manager or Designee

The ORNL ER Program ES&H Manager is a designated Energy Systems employee who is responsible for the oversight of all ES&H issues affiliated with ORNL ER Program activities. The responsibilities of the ORNL ER Program ES&H Manager (or designee) include but are not limited to, the following:

- Promoting safety as the highest priority for all ER activities.
- Reviewing and approving the PHASP and all SSHASPs or equivalent documentation.
- Reviewing all ES&H self-assessment and surveillance reports.
- Interfacing between ER projects and the HAZWOPER Program Coordinator.
- Reviewing qualifications of SSHOs.
- Approving all SSHOs who are to perform tasks on ER sites.
- Acting as a designated alternate SSHO for all ER projects, as appropriate.
- Serving as a focal point of contact between ER and ORNL ES&H disciplines and Waste Management.

When the ORNL ER ES&H Manager is not available to carry out the duties and responsibilities of the position, a person will be designated (the designee) to perform such obligations so that affected activities can go forward with no delays.

III.M Construction Engineer

The Construction Engineer is responsible for overall site activities of specific projects; for safety; for meeting time tables and completing tasks on schedule; and for interfacing with various ORNL disciplines such as Plant and Equipment, ES&H, engineering, etc.

III.N ORNL ER Program Manager

The ORNL ER Program Manager is responsible for budgeting; for interfacing with regulators, DOE officials, and state officials; and for the overall safety of activities occurring on ER sites under their jurisdiction.

III.P ORNL Office of Environmental Compliance and Documentation

The ORNL Office of Environmental Compliance and Documentation provides support to ORNL by interacting with Energy Systems, Central Environmental Compliance, and ORNL Environmental Restoration and Waste Management organizations in the interpretation of DOE, federal, and state regulations regarding environmental standards. The ORNL Office of Environmental Compliance and Documentation provides assessment and oversight at waste generation areas and permitted areas, verifying compliance with regulatory requirements. They also provide oversight and monitoring for ER sites to verify compliance under existing regulations and standards, and they provide site date to the HAZWOPER Program Coordinator and ES&H disciplines.

III.Q Laboratory Shift Superintendent

The LSS is the authorized individual, who shall direct, control, and evaluate all site emergency response/emergency activities. The ORNL LSS shall be notified immediately of all site emergencies and/or occurrences. The ORNL LSS may be contacted by telephone at **4-6606** or by 2-way plant radio at **Station 103**. The LSS shall direct a team response effort for all site emergencies. The emergency functions and responsibilities of the LSS shall include, but are not limited to, the following:

- Emergency response for fire, hazardous materials, radiological emergencies, security issues, energy and/or utility interruptions, medical assistance, site rescues, environmental monitoring, and damage control.
- Assuring the evacuation, emergency treatment, and emergency transport of site personnel, and notifying emergency response units and the appropriate management staff.
- Requesting assistance from local authorities, if applicable.
- Acting as a liaison to off-site organizations as necessary (i.e., local police, fire departments, hospitals, etc.).

Emergency Personnel	Phone	Radio No.
ORNL Emergency Response	911	
Laboratory Shift Superintendent	574-6606	Station 103
Fire Department	574-5678	
Medical Center	574-7431	
Security	574-7196	401
SHEST	574-6314	
Radiation Protection	574-6701	334
Environmental Compliance	574-8870	650
Facility Manager	576-6557	
ORNL ER Site Project Manager	576-6557	
ER Program ES&H Manager	574-8268	686
HAZWOPER Program Coordinator	576-5064/576-6445	69

NOTE: These phone and radio numbers are subject to change and **must be verified** before posting or including in the SSHASP.

ORNL-DWG 94-8245

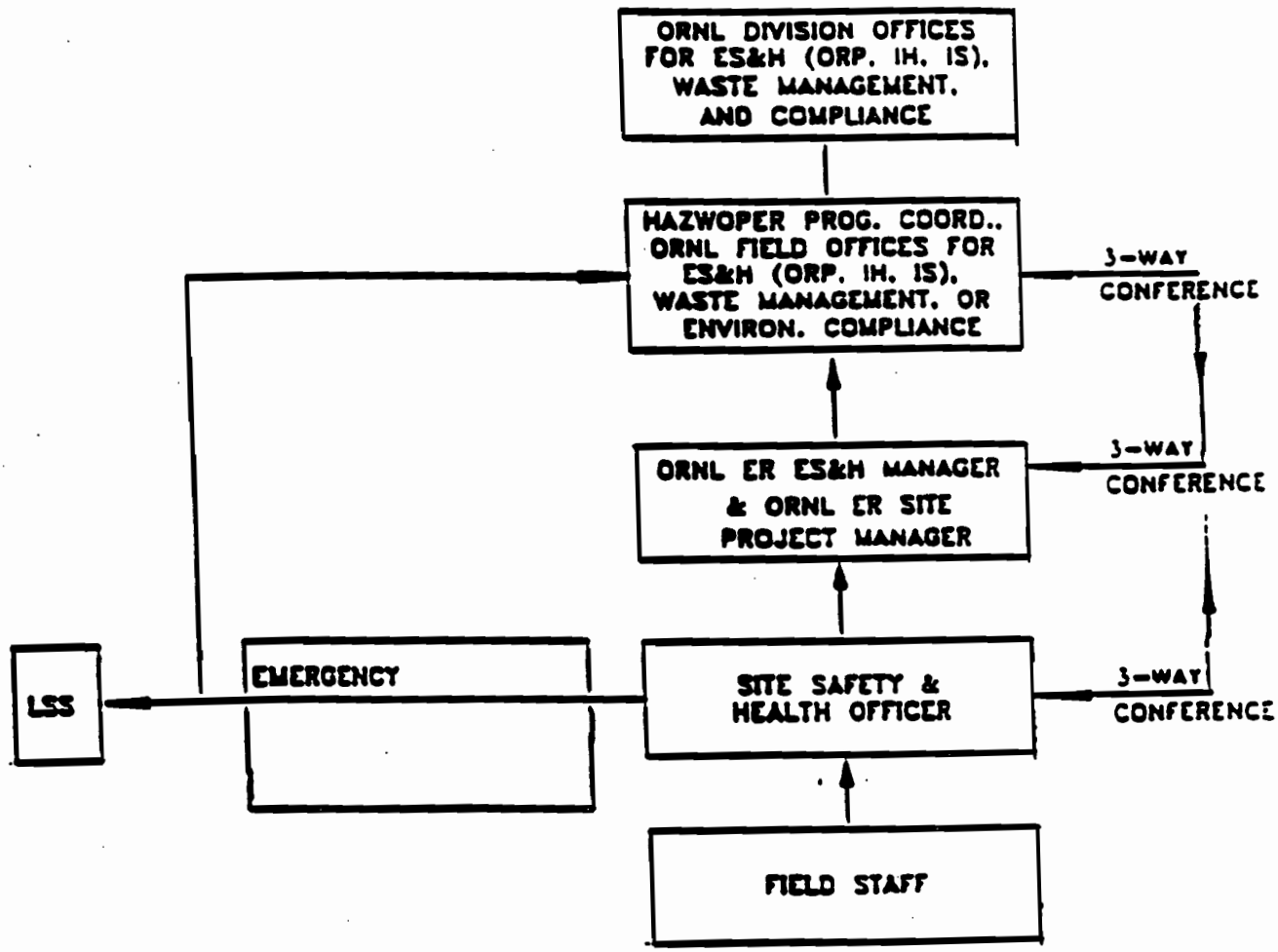
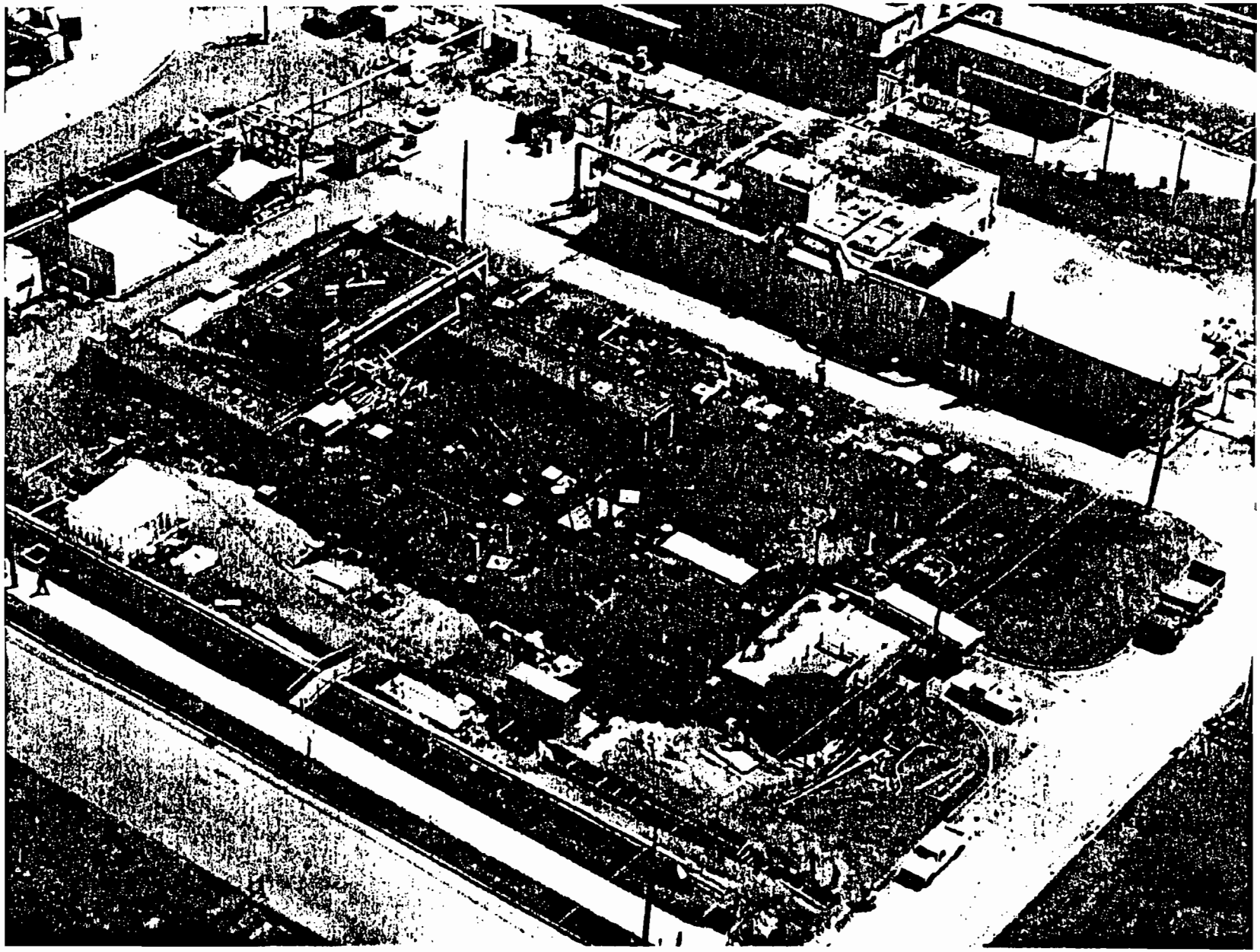
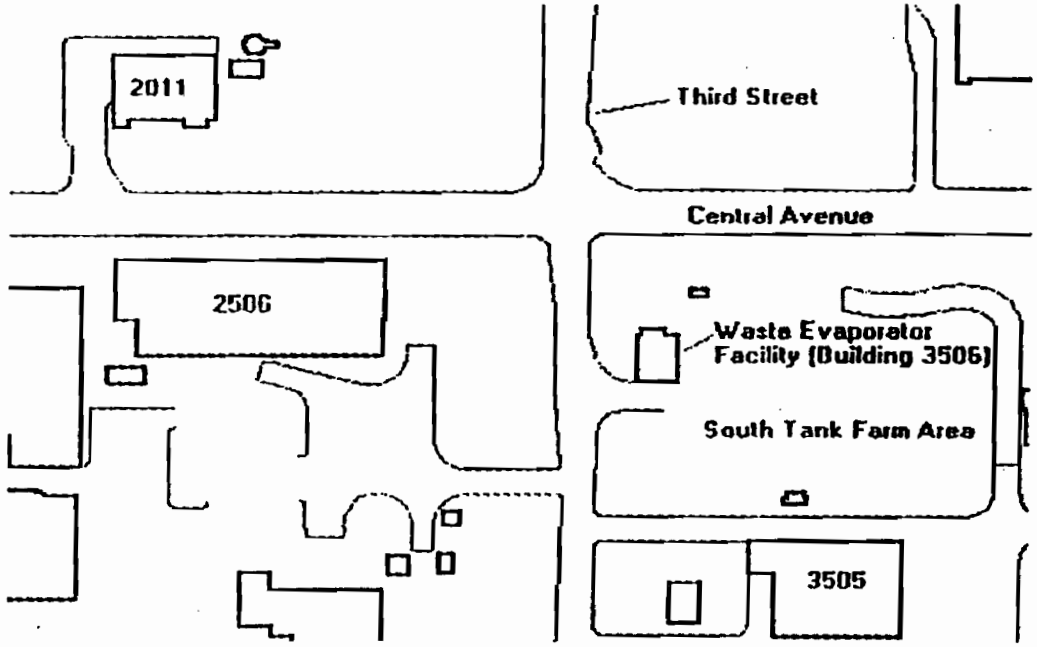


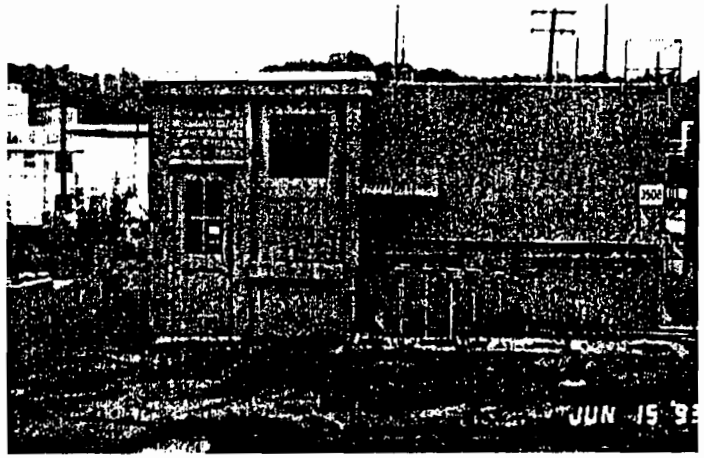
Fig. 1. ORNL ER chain-of command for reporting health and safety issues. The SSHO first contacts the ORNL ER ES&H Manager and the ORNL ER Site Project Manager (SPM) Then, a 3-way conference is initiated involving the SSHO, the ORNL ER ES&H Manager (or the SPM if the ER ES&H Manager is not available), and the appropriate discipline(s): HAZWOPER Program Coordinator, Office of Radiation Protection, Industrial Hygiene, Industrial Safety Waste Management, or Environmental Compliance. In an emergency contact the LSS For non emergency situations when neither the ORNL ER ES&H Manager (or designee) nor the SPM is available, the SSHO should contact the appropriate discipline(s) directly.

* The SSHO / Facility manager shall contact the LSS Offic when stop work conditions occur due to a suspected Hazard (s).

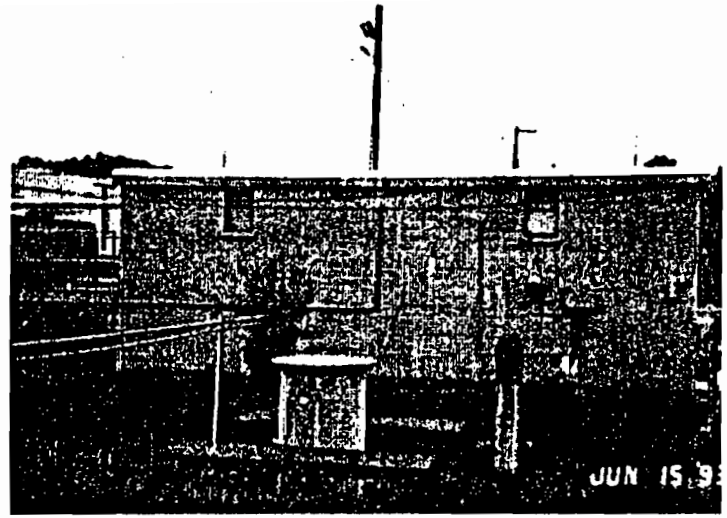


Aerial photograph of Building 3506 and vicinity.

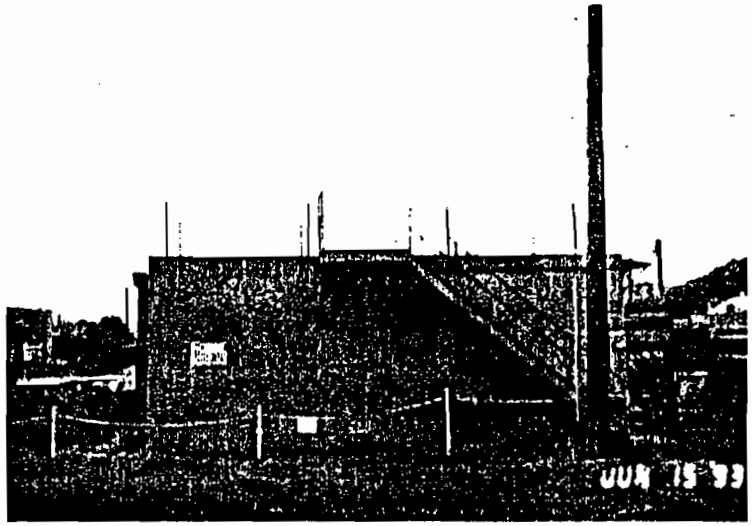

2011
Third Street
Central Avenue
2506
Waste Evaporator
Facility (Building 3506)
South Tank Farm Area
3505



North side.



East side.

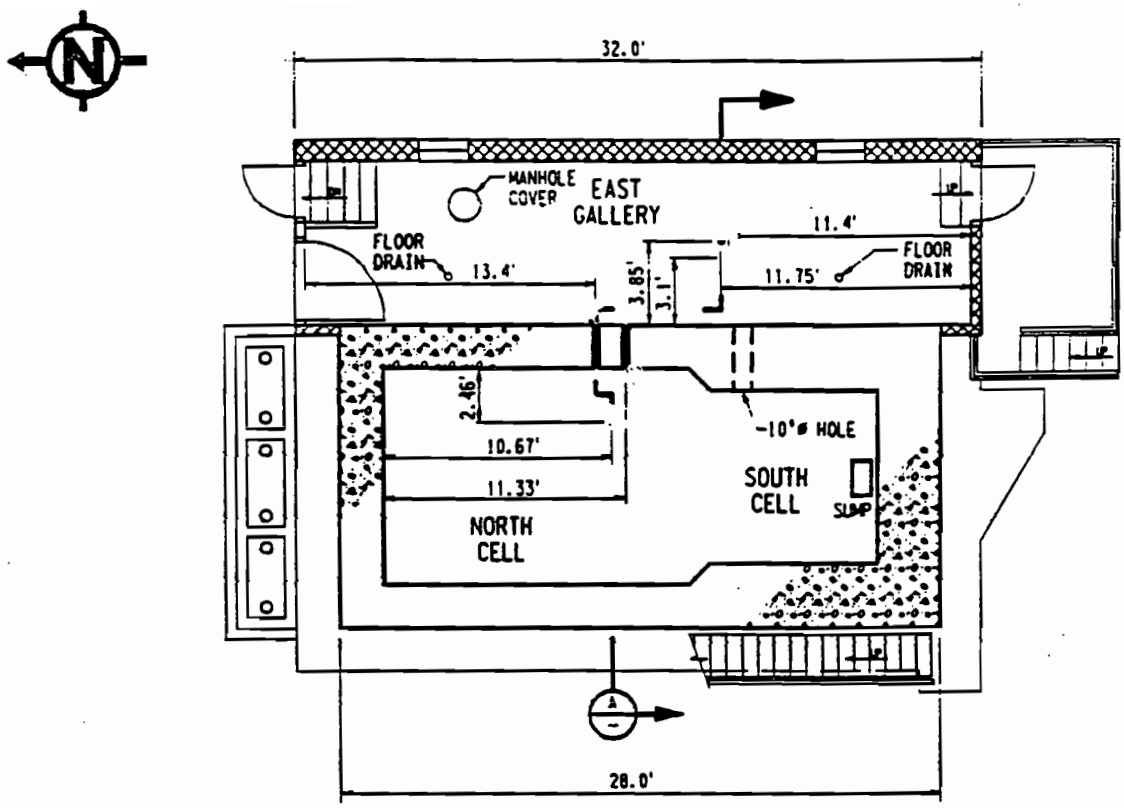


West side.

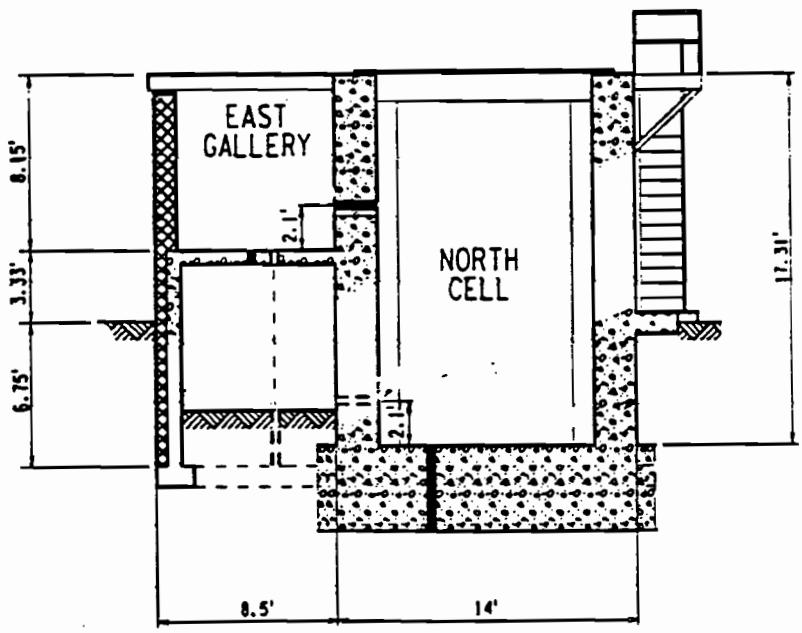
South side.

Building 3506.

SYQ59 47642



BUILDING 3506 PLAN



BLDG SECTION A

Note: If there are several tasks, duplicate and complete Sects. IV through VIII for each tasks. Sects. VI and VIII may not need to be duplicated (see NOTE in each section).

SECTION IV: Project Hazard Evaluation

Place an X in each ☐ to indicate existing conditions or those that may be a result of site operations.

Task: Sampling

Intrusive Activity:
XYes ☐ No

Safety Work Permit or equivalent required?
☐Yes XNo

Excavation/Penetration Permit or equivalent required?
☐Yes XNo

Hot Work Permit/Burning Permit or equivalent required?
☐Yes XNo

Radiation Work Permit required?
XYes ☐No

List other permit requirements: NA

Waste Management Plan checklist required?☐ Yes XNo

Physical hazards: Industrial Safety, Industrial Hygiene, and/or the Fire Department may be contacted for assistance in completing this section.

☐ Heat stress	X Cold stress	X Noise
☐ Confined space	☐ Enclosed space	☐ Manual lifting
X Tripping/falling	☐ Ergonomic	☐ Vibration
☐ Oxygen deficient atmosphere	☐ Explosive/fire hazards	X Dusts
☐ Oxygen enriched atmosphere	☐ Water	☐ Compressed gasses

* **Follow the controls established in section 6.2.4 of the ER PHASP for cold stress.**
* **Follow the controls established in section 6.2.1 of the ER PHASP for noise.**
* **Workers will be instructed to be aware of tripping/falling hazards in pre-entry briefing. Fall protection will be decided on a case by case basis.**
* **Follow the controls established in section 6.6.2 of the ER PHASP for dusts.**

Safety/Construction Hazards: Industrial Safety, Industrial Hygiene, and/or the Fire Department may be contacted for assistance in completing this section.

☐ Trenching	☐ Drum handling	☐ Work in water/boat
☐ Demolition	X Elevated work heights	☐ Welding/cutting/burning
☐ Hoisting/rigging	☐ Underground hazards	☐ Overhead hazards
☐ Personnel decon	X Equipment decon	☐ New technology
X Drilling/hand augering	☐ Underground storage tanks	☐ Heavy equipment
X Environmental sampling	☐ Well installation	

* **Follow the controls established in section 10.2 ER PHASP for equipment decon.**
* **Follow the controls established in section of the ER PHASP for drilling/hand augering.**
* **Fall protection will be decided on a case by case basis.**

Chemical Hazards: Industrial Hygiene may be contacted for assistance in completing this section.

☐ Volatile organics	☐ Inorganics	☐ Carcinogen
☐ Corrosive	☐ Reproductive toxicant	X Metals
☐ Mutagen	☐ Flammable/explosive	X PCBs
X Mercury	☐ Asbestos	

List known primary chemicals on-site that pose a major health and safety concern. Also list exposure limits for each chemical (refer to Table 3, Sect. 6.3 of PHASP for target organs and toxic effects).

Chemical	TLV/PEL/STEL
Lead	TLV: 0.15mg/m^3 ; PEL 0.05 mg/m^3
Cadnium	Proposed TLV: 0.01mg/m^3; PEL 0.02 mg/m^3
Mercury	TLV/PEL: 0.05 mg/m^3
Chromium	TLV: 0.05 mg/m^3; PEL 1 mg/m^3

Attach Material Safety Data Sheets (MSDSs) or have available on-site.

Ionizing Radiation Hazards: An Office of Radiation Protection representative may be contacted to assist in completion of this section.

Any known contamination present
(from prior scanning or history) XYes ☐ No

List primary contaminating isotope(s)	Range of concentration (pCi/g, pCi/L, μCi/mL)	Media (soil, water, air, etc.)
Cs^{137}	30,800 pCi/g	soil
Cs^{137}	100 BQ/L	water

(DACs given in Table 4, Sect. 6.4 of PHASP.)

Ionizing Radiation Hazards (continued)

Radiography source **NA**
Type of source _____ HP Source ID _____ Activity (Ci) _____

Radiation type ☐ Alpha **X** Beta
X Gamma ☐ Neutron

Location on site Soil, Water

Exposure rate measured
on-site: Ground surface
average .1-.3 μR/h

Maximum exposure rate expected <5 mR/h

Surface contamination XYes ☐ No ☐ Not known
fixed 1.9 mR/h
removable 9420 dpm/100 cm^2

Airborne contamination ☐ Yes XNo ☐ No prior history
_____ μCi/mL

Will operations generate a hazardous atmosphere?
☐ Yes XNo ☐ Not known

Water contamination potential
(such as tritium) Xyes ☐No ☐ **Not known**

If yes, list type _____

ES&H coverage required **Xyes** ☐ **No**
Type **X Continuous** ☐ **Intermittent**

If no, explain why not _____

Ionizing Radiation Hazards (continued)

Nonionizing Radiation Hazard NA

- ☐ **UV**
- ☐ **Laser**
- ☐ **Radio frequency**
- ☐ **High voltage**
- ☐ **Microwave**

Biological/Vector Hazards NA

- ☐ **Wildlife (snakes, rodents)**
- ☐ **Bacteria**
- ☐ **Insects/ticks stings/bites**
- ☐ **Plants (poison ivy)**
- ☐ **Parasites**
- ☐ **Medical waste**
- ☐ **Animal research waste**
- ☐ **Allergens (grasses, pollens)**

SECTION V: Monitoring Requirements: The IH and/or ORP representative may be consulted to assist in preparing this section.

ES&H Cover age X Continuous ☐ Intermittent ☐ Not required
Type of Coverage X HP X IH ☐ Safety ☐ Cross trained ES&H discipline

Direct Reading Instruments	Task(s)	Monitoring Frequency	Action Levels	Action
Combustible Gas Indicator	NA			
LED		_____	5% (confined space) >10%	_____
H_2S		_____	5 ppm	_____
Photoionization Detector (PID)	All	Continuous	5 ppm for 1 min unless the chemical indicates <5 ppm	Leave area and contact Shest Group.
Flame Ionization Detector (FID)	NA	_____	5 ppm for 1 min unless the chemical indicates <5 ppm	_____
Mercury Vapor Analyzer	Soil Sampling	Continous	0.025 mg/m³	Leave Area and contact Shest Group.
Alpha Meter	All	Continuous	>300 dpm/100 cm²	Leave area and contact H.P
Beta/Gamma Meter	ALL	Continuous	>1000 dpm/100 cm²	Leave area and contact H.P
Personal Monitoring				
Visual pocket/Electronic dosimeter	NA	_____	_____	_____
Whole-body dosimetry	NA	_____	_____	_____
Extremity dosimetry	NA	_____	_____	_____
Whole-body count	ALL	Annually	_____	_____
Urinalysis/bioassay	All	Semi-Annually	_____	_____
Area Monitoring				
Chemical area monitoring	NA	_____	_____	_____
Radiation area monitoring	NA	_____	_____	_____
Personal Sampling Pumps				
Chemical	NA	_____	_____	_____
Radiological	NA	_____	_____	_____

[a]See Table 11, Site monitoring action limits, in Sect. 8.2 of the PHASP.

Instruments used by ORNL IH Section will be calibrated and maintained in accordance with IH SOP. Instruments used by the ORP are calibrated and source checked in accordance with established health physics procedures. Source-check procedures for all radiological field instruments used with this SSHASP must be attached or referenced.

Site monitoring requirements may change based upon site conditions. All changes must be reported to the SPM, the ER Program ES&H Manager (or designee), the HAZWOPER Program Coordinator, and the appropriate ORNL ES&H discipline(s).

SECTION VI: Initial Level of Personal Protective Equipment

NOTE: If all tasks require the same PPE, Sect. VI can be completed only once. If project tasks require differing combinations of PPE, Sect. VI must be completed for each different PPE ensemble.

Task **ALL**

Level of Protection: ☐ A ☐ C **X** Modified
☐ B X D Specify **TYVEK**
☐ Anti-radiological contamination PPE

Respirator: ☐ SCBA ☐Full face* *☐ Half-face Resp.
☐ Escape SCBA ☐ PAPR* ☐ Other
*** Possible: Based on results of Hg vapor monitoring.**
*** May need to be full-face due to contamination levels.**

Cartridge:

Protective Clothing:**X Tyvek ☐ Encapsulating suit
☐ Saranex ☐ Splash suit
☐ Other X Energy Systems clothing
☐ Energy Systems under apparel

Head/eye/ear: ☐ Hard hat **X** Safety glasses ☐ Goggles
X Splash shield
(During water sampling) ☐ Ear plugs ☐ Ear muffs
☐ Other

Gloves: ☐ Nitrile ☐ Neoprene ☐ PVC
☐ Latex X Vinyl ☐ Leather
☐ Cotton ☐ Other

Footwear: X Hard-toed leather ☐ Other
☐ Hard-toed rubber X Rubber boots
☐ Chemical over boots

Other: Fall protection XYes ☐ No
List item(s):. **Specific fall protection will be discussed during the pre-entry briefing.**

Welding goggles/ apron/gloves	☐ Yes	XNo	List type _____
Rescue equipment	☐ Yes	XNo	List type _____
Nonsparking tools	☐ Yes	XNo	List type _____
Fire extinguisher(s)	☐ Yes	XNo	List type _____

Describe the donning/doffing steps if different from those in Sect. 7.3.5 or Attachment I of the PHASP:

*Powered air-purifying respirator.

**Subcontractors are to wear MMES supplied clothing or disposable clothing for working in CRZ, EZ, CAA or any areas deemed to be contaminated with radiological or chemical hazards. All workers should shower at the end of the workday if their activities occurred within a CRZ, EZ, CAA, or contaminated area.

SECTION VII: Decontamination

If decontamination is required during the course of this project:
reference in PHASP (see Sect. 10.1).

1. List materials/equipment needed for decontamination.

   (See Section 10.2 of the PHASP, "Equipment Decontamination.")

2. Provide a description of the decontamination steps/stations.

   (See Section 10.1.1 of the PHASP, "Level D Protection Decontamination and Doffing Guidelines.")

3. Describe equipment decontamination procedures (for instruments, hand tools, heavy equipment, etc.)

   (See Section 10.2 of the PHASP, "Equipment Decontamination.")

4. List health and safety controls to protect the workers.

   Level D+ PPE, frisking upon exit, employee monitoring, verification of proper training for employees.

SECTION VIII: Sanitation

NOTE: If the same sanitation facilities will be used for all tasks, Sect. VIII need only be completed once. If some tasks have differing or additional sanitation requirements, Sect. VIII must be completed for each task.

Task(s):**ALL**
Potable water available? **X Yes** ☐ **No**

If yes, location **Bldg. 3505**
If no, how will it be supplied? _____

Eating, drinking, chewing, use of tobacco products permitted on site?
X Yes ☐ No

If yes, location **In support zone**
Toilet facilities available: **X** Yes ☐ No

If yes, location **Bldg. 3505**
If no, how will this be addressed? _____

Washing facilities available: **X** Yes ☐ No

If yes, location **Bldg. 3505**
If no, how will this be addressed? _____

Change rooms required? ☐ Yes **X** No

If yes, specify _____

If no, how will this be addressed? **Employees will change at their own Bldg.**

SECTION IX: Training/Medical Requirements (see Sects. 7.1 and 7.4 of the PHASP).
This form should be completed by the ORNL ER Site Project Manager or designee before initiation of any field activities.

List applicable training/medical requirements for this project. Routine site workers requiring access to the work zones (contamination reduction zone and exclusion zone) must meet access requirements. Upon agreement of the ER Program ES&H Manager and the HAZWOPER Program Coordinator, the SSHO may waive specific access requirements for occasional visitors and emergency personnel.

X Medical examination (**Note:** All persons performing field activities as part of this SSHASP must have a medical examination verifying that he/she is physically capable of performing the assigned tasks.)
X Whole body count (in vivo)
X Bioassay (in vitro)
_____ List specific radionuclides assayed as part of the bioassay program
_____ 24-hour HAZWOPER (SARA/OSHA) training
X 40-hour HAZWOPER (SARA/OSHA) training
X HAZWOPER 8-hour Annual Refresher
X HAZWOPER 8-hour Supervisor Training(For SSHO Only)
X ORNL General Employee Training (GET)
X ORNL photo ID badge required
X TLD badge required
X Respirator fit test/training
_____ Radiological Worker Training I
X Radiological Worker Training II
X HAZWOPER SSHO Training (for SSHO)
_____ Asbestos Worker Training
_____ Defensive Driving and Nonpaved Surfaces
_____ Hazardous Waste Characterization/Waste Generator Training for Satellite Accumulation Areas
_____ CONFINED Space Entrant Training
_____ CONFINED Space Attendant Training
_____ Specialized Equipment Training
_____ Additional site-access requirements
Specify _____
X First aid/CPR(For SSHO Only)
_____ Additional tra ining or medical requirements
Specify _____

HAZWOPER Medical Surveillance (see Sect. 7.4)

X ORNL Hazardous Waste Worker Medical Surveillance Program (only for individual meeting criteria specified in the ORNL HAZWOPER Program and Sect. 7.4.2 of the PHASP).

Note: If site conditions change, or other hazards are detected, the training and access requirements will be revised accordingly.

Site Personnel Qualifications: Copy this page and complete for each site worker.

Employee: _____ Badge No. _____

Assigned task(s):

	Yes	Date
Medical examination	☐	
Whole body count (in vivo)	☐	
Bioassay (in vitro)	☐	
List specific radionuclides to be assayed as part of the bioassay program (if applicable)		
OSHA 24-hour Training	☐	
OSHA 40-hour Training	☐	
OSHA Refresher 8-hour Training	☐	
HAZWOPER 8-hour Supervisor Training	☐	
ORNL General Employee Training	☐	
ORNL photo badge required	☐	
TLD badge required	☐	
Respirator fit test/training	☐	
Radiological Worker Training I	☐	
Radiological Worker Training II	☐	
HAZWOPER SSHO Training	☐	
Asbestos Worker Training	☐	
Defensive Driving and Nonpaved Surfaces Training	☐	
Hazardous Waste Characterization/Waste Generator Training for Satellite Accumulation Areas	☐	
Confined Space Entrant Training	☐	
Confined Space Attendant Training	☐	
Specialized Equipment Training	☐	
Additional site access requirement Specify:	☐	
Additional training or medical requirements Specify:	☐	
First aid/CPR	☐	

ORNL ER Documentation of HAZWOPER Field Experience: Copy this page and complete for each site worker. **NOTE:** A copy of this form should be available on-site and a copy should be sent to the ORNL ER ES&H Manager before reposit in the ORNL ER Document Management Center. This form is to be completed by supervisor that observed the field experience.

Name:	Badge:	
Company:	Work Date(s): —	
Completed OSHA 24-Hour Training ☐ Yes ☐ No		
Completed OSHA 40-Hour Training ☐ Yes ☐ No		
Description of hazards anticipated or encountered:		Hours
Description of duties performed:		
Tools, equipment, or instruments used:		
Level of PPE:		
Description of site briefing to personnel:		
Person appropriately performed donning/doffing of PPE:		
Person appropriately entered/exited zones and followed proper decontamination and frisking procedures:		
Total hours of field experience		

I certify that the above information accurately represents the field experience that occurred during the period noted:

_____ _____
Trainee Signature Date

_____ _____
Supervisor Signature (SSHO) Date
(person who observed the field experience)

Incident Report

An ORNL ER Incident Report (on the following page) is required to be completed by the SSHO for any incident that lead to the following:

PERSONAL INJURY
FATALITY
UNPLANNED ENVIRONMENTAL RELEASE OR SPILL
PROPERTY DAMAGE
UNPLANNED PERSONNEL EXPOSURE (Rad, Chem, etc.)
ZONE ACCESS INFRACTION
CONTAMINATION CONTROL INFRACTION (Frisking, Using Plastic, etc.)
VIOLATION IN ADHERING TO THE PHAWP OR THE SSHO INSTRUCTIONS
OTHER _____

For those activities that may not have a SSHO assigned, then it will be the responsibility of the team leader to complete and file the ORNL ER Incident Report.

The filing of these incident reports shall be in conjunction with the MMES Occurrence Reporting Procedure. The project manager and the facility manager shall be contacted immediately in order to determine if any occurrence report needs to be completed. If no one from the program office can be reached then contact LSS Office for guidance.

ORNL ER INCIDENT REPORT

INCIDENT REPORT NO. ☐☐☐ - ☐☐☐☐ - ☐☐☐☐ - ☐☐
(SSHASP#) WAG # - Report # - Year - Frequency Rate

The Incident Report Number is the number assigned to the SSHASP that the task was being performed under. The frequency rate will be assigned by the ER ES&H Manager. A copy of the signed form must be sent by the SSHO or Team Leader to the ORNL ER Document Management Center.

TO: ER PROGRAM MANAGER, ER ES&H MANAGER, ER QA MANAGER, ER SITE PROJECT MANAGER, FACILITY MANAGER, and ORNL ER DOCUMENT MANAGEMENT CENTER

DATE OF INCIDENT _____ | TIME OF INCIDENT _____ AM/PM

I. INCIDENT (Check As Applicable)
- ☐ PERSONAL INJURY
- ☐ FATALITY
- ☐ UNPLANNED ENVIRONMENTAL RELEASE OR SPILL
- ☐ PROPERTY DAMAGE
- ☐ UNPLANNED PERSONNEL EXPOSURE (Rad, Chem, etc.)
- ☐ ZONE ACCESS INFRACTION
- ☐ CONTAMINATION CONTROL INFRACTION (Frisking, Using Plastic, etc.)
- ☐ VIOLATION IN ADHERING TO THE PHAWP OR THE SSHO INSTRUCTIONS
- ☐ OTHER _____

II. NAME(S) OF INDIVIDUALS INVOLVED, BADGE NO., AND SITE LOCATION

III. DESCRIPTION OF INCIDENT (Attach additional information if needed)

IV. CORRECTIVE ACTION

V. PERSON OR DEPT. RESPONSIBLE FOR ACTION _____
DATE ACTION REQUIRED OR COMPLETED _____

☐ CHECK IF ADDITIONAL INFORMATION IS ATTACHED. NUMBER OF PAGES _

_____ _____ INVOLVED INDIVIDUAL(S) DATE ER PROJECT MANAGER DATE
SIGNATURE SIGNATURE

_____ _____ SSHO/TEAM LEADER DATE ER ES&H MANAGER DATE
SIGNATURE SIGNATURE

UCN-20223 (3C 7-94)

ORNL ER SSHO
Request Form

In order to be valid, this form must be signed by the ORNL ER Site Project Manager and the ORNL HAZWOPER Program Coordinator, with concurrence from the ORNL ER Program ES&H Manager. Qualifications for SSHOs and conditions or situations for which a waiver will be granted are listed in the ORNL ER Programmatic Health and Safety Plan (ORNL/ER-226), Sect. 4.3.2.

Requestor _____ Title of Requestor _____ Date _____

1 ☐ 2 ☐ 3 ☐ Team leader ☐

Name of Personnel _____ SSHO Level Requested

List the educational background and experience of the above named person for whom you are requesting approval as SSHO or a waiver. List any special training (e.g., ORNL Radiological Worker Training II, ORNL SSHO Training, OSHA 40- or 24-hour Training, HAZWOPER 8-hour Supervisor Training) and experience operating Health Physics or Industrial Hygiene equipment. You may attach any additional information that will assist in the approval or waiver process.

_____ _____

_____ _____

_____ _____

_____ _____

Describe in detail the task(s) that will be performed for which approval or wavier of an SSHO is requested. Also list location and potential hazards that may be encountered.

_____

_____

_____

_____

_____

1 ☐ 2 ☐ 3 ☐ Team Leader ☐ Denied ☐ ☐

ORNL ER Site Project Manager _____ SSHO Level Granted

Denied request due to the following:

_____

_____

_____

_____

	1	2	3	Team Leader	Denied		
ORNL HAZWOPER Program Coordinator	SSHO Level Granted						

Denied request due to the following:

A signed copy of this form is to be maintained at the work site; copies should also be mailed by the ORNL ER Site Project Manager to the ORNL ER Document Management Center and the ORNL ER Program ES&H Manager (Bldg. 7078A, MS-6402).

	Yes	No
ORNL ER Program ES&H Manager	Concurrence	

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