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7. Abstract

This is the decontamination, sampling, and analysis plan for the closure activities at the 105-DR Large Sodium Fire Facility. This document supports the *105-DR Large Sodium Fire Facility Closure Plan*, DOE-RL-90-25. The decontamination, sampling, and analysis plan identifies the decontamination procedures, sampling locations, any special handling requirements, quality control samples, required chemical analysis, and data validation needed to meet the requirements of the *105-DR Large Sodium Fire Facility Closure Plan*.

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105-DR Large Sodium Fire Facility Decontamination, Sampling, and Analysis Plan

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

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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FIGURES

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105-DR LARGE SODIUM FIRE FACILITY DECONTAMINATION, SAMPLING, AND ANALYSIS PLAN

1.0 INTRODUCTION

1.1 Purpose and Scope

This document describes decontamination and the Phase I sampling and analysis activities associated with the proposed *Resource Conservation and Recovery Act of 1976* (RCRA) partial clean closure of the 105-DR Large Sodium Fire Facility (LSFF) under the Washington Administrative Code (WAC) Chapter 173-303-610, *Dangerous Waste Regulations*. This is a supplement to *105-DR Large Sodium Fire Facility Closure Plan* (DOE-RL 1995), and must be used in conjunction with the *Environmental Investigations and Site Characterization Manual* (WHC 1988) for specific procedures.

The strategy for partial clean closure of the 105-DR LSFF is to (1) designate waste for disposal and remove waste, (2) decontaminate surfaces and inspect for reaction deposits, and (3) sample the soil and evaluate the soil data against clean up standards. If the inspection or evaluation indicate that the area requires additional decontamination for partial clean closure, the area will be decontaminated, reexamined or resampled (Phase II sampling), and the results evaluated. If the evaluation indicates that the constituents of concern are at or below action levels, the RCRA TSD unit will be partially clean closed. Or, if the evaluation indicates that the constituents of concern are present above action levels, the condition of the unit will be reevaluated and appropriate action taken.

Lithium and sodium carbonate are Washington State criteria characteristic category D (least toxic) dangerous waste with designation levels of 10 percent weight volume of the contaminated material. Visual inspection will be performed to determine if contamination exists inside the unit. If the concrete walls or associated equipment have visible carbonate deposits, the surfaces will be cleaned as discussed in Section 5.0.

Any contaminated structures or equipment can be treated using the hazardous debris rule to reduce the volume of material going to a hazardous waste landfill. The hazardous debris rule will be used to address the possible threat of lead contamination. The 105-DR LSFF log books document that lithium-lead alloy was burned only in the small fire room. Most characteristic hazardous debris can be treated using a specific technology from the following general categories of technologies: extraction, destruction or immobilization. The treatment selected must meet certain performance standards, in this case defined by 40 CFR 268.45, Table 1 as the following:

"'Clean debris surface' means the surface, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste except that residual staining from soil and waste consisting of light shadows, slight streaks, or minor discolorations, and soil and waste in cracks, crevices, and pits, may be present provided that such staining and waste and soil in cracks, crevices, and pits shall be limited to no more than 5% of each square inch of surface area."

An extraction treatment (sandblasting) will be used at the LSFF.

The action levels are defined as concentrations of dangerous waste constituents above the Hanford Site background concentrations identified in *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes* (DOE-RL 1994) concentrations or above concentrations identified in *Model Toxics Control Act* (MTCA) (WAC 173-340) Method B, whichever concentration is higher.

The criteria used to identify the sample locations, analytical methods, quality control methodology, and data validation methodology were based on the contents of the *105-DR Large Sodium Fire Facility Closure Plan*, Revision 2 (DOE-RL 1995) and further developed through monthly Unit Managers Meeting held during 1994 and 1995. The LSFF can be divided logically into seven areas according to use and deposition of reaction by-products; therefore, these areas will be considered separately.

The gravel from the scrubber (Closure area 3) will be designated and disposed of as described in Section 4.0. The LSFF will be decontaminated using appropriate treatments as described in Section 5.0. Two soil characterization samples and associated quality control samples will be obtained from Closure Area 7 as described in Section 6.0.

1.2 Objectives

The objective of this decontamination and the sampling event is to facilitate a RCRA partial clean closure of the unit by removing RCRA dangerous waste constituents. This objective will be met by the following steps:

- Waste Sampling and Removal
  - Designate gravel in Closure Area 3
  - Dispose of gravel from Closure Area 3
- Decontamination and Analysis of Residue
  - Decontaminate equipment and structures in Closure Areas 1 and 3
  - Inspect decontaminated areas to verify that all visible carbonate deposits have been removed
  - Designate and dispose of any treatment residue generated
- Sampling and Analysis for Closure Determination
  - Collect two soil samples and one collocated duplicate sample from Closure Area 7

- Analyze samples to determine the concentrations of the constituents of concern.

The soils data will be compared to *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes* (DOE-RL 1994) and *Model Toxics Control Act* (MTCA) (WAC 173-340) Method B cleanup levels.

2.0 SITE DESCRIPTION/BACKGROUND

The 105-DR LSFF, which operated from about 1972 to 1986, was a research laboratory that occupied the former ventilation supply room on the southwest side of the 105-DR Reactor facility in the 100-D Area of the Hanford Site. The LSFF was established to investigate fire fighting and safety associated with alkali metal fires in the liquid metal fast breeder reactor (LMFBR) facilities. A schematic of the LSFF is depicted in Figure 1.

Alkali metal tests were conducted in three different rooms: the large fire room, the small fire room, and the exhaust fan room. The large fire room houses the Large Test Cell. The small fire room contains one steel cylindrical pressure vessel with a dished top. Both the Large Test Cell and the pressure vessel in the small fire room could be purged with nitrogen or argon to maintain a controlled atmosphere. In the exhaust fan room, alkali metal reactions were conducted at atmospheric pressure.

Adjacent to the large fire room is the sodium handling room that serviced the large fire room. Other rooms provided office space and storage for nondangerous material. The storage areas contained primarily new materials including stainless steel tubing, small-diameter piping made of stainless and carbon steel, electrical supplies (wiring, extension cords, heaters, etc.), new process equipment, fans, blowers, metal sheeting, new light bulbs, lighting equipment, portable lights, new containers, various fire extinguishing materials, lubricating grease, and lubricating oil. The office area contained papers, operating records, a few tools, and some small portable monitoring instruments.

2.1 Closure Area No. 1

Area 1 consists of the exhaust fan room, two fire rooms, the sodium handling room, and an office area. The sump in the exhaust fan room contains about 4 L (1 gal) of crusty powder and reaction by-products from past burns. Old burn pans stored in this room still contain residues. The exhaust fan room (the only room used to burn waste sodium and lithium) has visible thin layers (less than 1.6 mm [1/16 in]) of reaction by-products in a few places. These deposits are evident as a white film on sections of the walls. The burn vessel in the Small Fire Room was the only vessel used to conduct lithium-lead alloy tests.

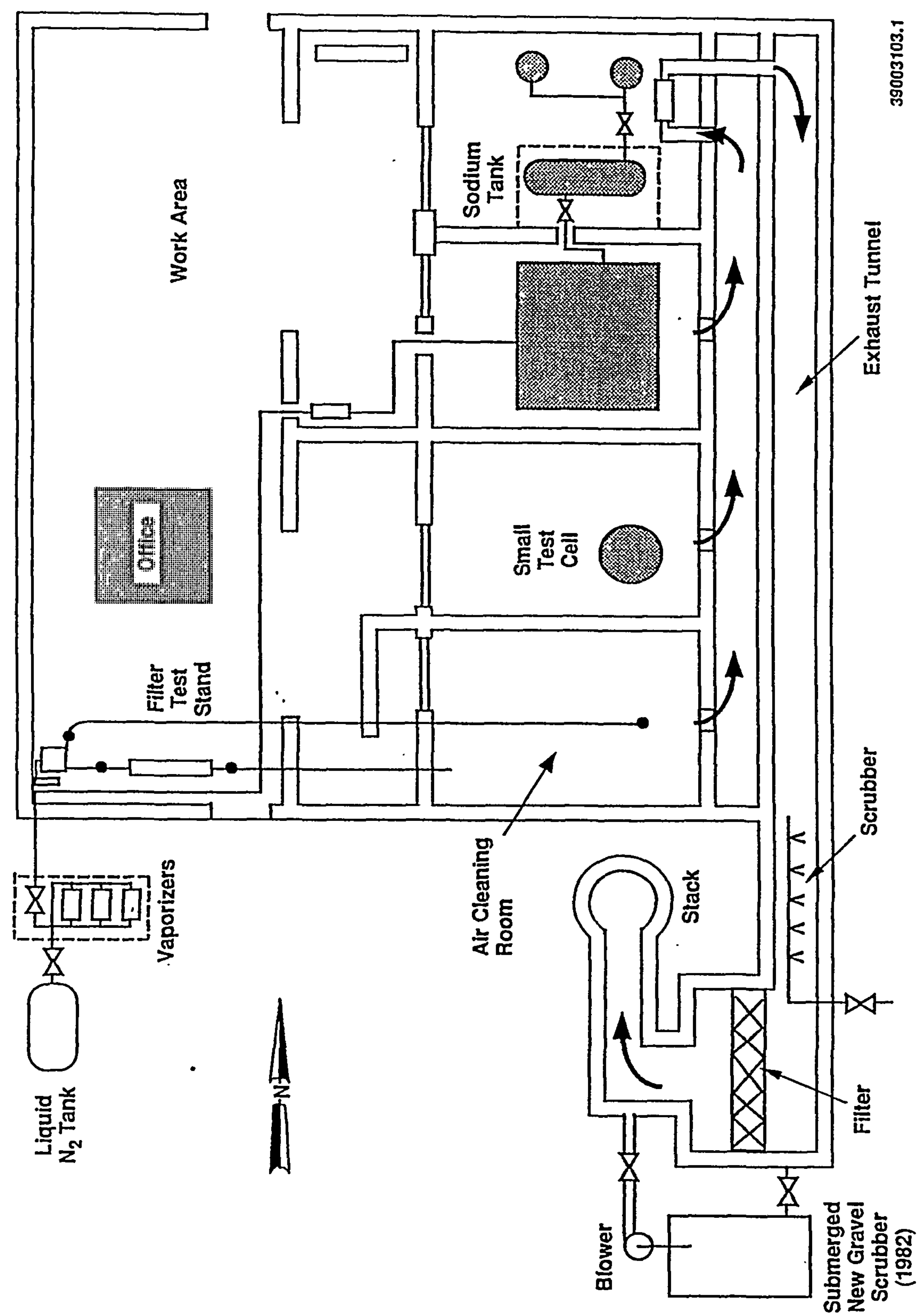

Figure 1. A Schematic of the Large Sodium Fire Facility

2.2 Closure Area No. 2

Area 2 consists of the upper and lower exhaust tunnel, the blower that moved LSFF exhaust from the lower to the upper tunnel, the exterior underground tunnel to the 117-DR HEPA filter building (south of the LSFF), and the ducts to the submerged gravel scrubber.

2.3 Closure Area No. 3

Area 3 consists of the gravel scrubber and ducts, which were installed in 1982. Operation of the gravel scrubber and ducts occurred 16 years after the 105-DR Reactor ceased operations; consequently, no radioactivity is expected. The scrubber contains a 3-m (10-ft) by 4-m (12-ft) by 60-cm (2-ft) gravel bed. Because the scrubber and duct walls are metal, the carbonates would not have penetrated the wall surfaces.

2.4 Closure Area No. 4

Area 4 consists of the 117-DR HEPA filter building and the downstream tunnel to the reactor stack. The original HEPA filters from the 105-DR Reactor were reportedly replaced for the LSFF. However, remnant radioactivity from the exhaust tunnels or filter holders has probably been picked up by the new filters.

2.5 Closure Area No. 5

Area 5 consists of the reactor exhaust stack. Over the life of the LSFF, there were two routes for the exhaust to take before entering the reactor exhaust stack. Before 1982, the exhaust traveled from the LSFF through underground concrete tunnels to a spray scrubber and HEPA filters before exiting through the stack. The HEPA filters have a 99.95 percent efficiency rating; thus, no measurable amounts of reaction by-products are expected in the stack from this route. In 1982, a submerged gravel scrubber with an efficiency rating of approximately 99 percent was used to vent the exhaust instead of the underground HEPA filters. Similarly, no measurable deposits are expected from this route.

2.6 Closure Area No. 6

Area 6 consists of the 116-DR-8 Crib. The 116-DR-8 Crib was originally used from 1960 to 1964 to percolate low-level waste drainage from the 117-DR Building seal pits. When used for the LSFF, the 116-DR-8 Crib received noncorrosive water only [i.e., the pH level was less than 12.5 as documented in the field logbook (WHC 1983)]. The remediation of the crib will be part of the 100-HR-3 RFI/CMS (Ecology et al. 1994); it will not be sampled or treated under this closure plan.

2.7 Closure Area No. 7

Area 7 consists of the area to the north and west of the 117-DR HEPA filter building. Because the burn pans used in the alkali metal fires were sometimes stored in this area, there is a chance that the soil could have been contaminated. However, because of: (1) the passage of time, (2) low amounts of carbonates that may have drained to the soil, (3) dissolving effects of rain, and (4) natural levels of carbonates in the soil, no significant concentrations of carbonates above background are expected.

3.0 GENERAL ACTIVITIES

Before decontamination and sampling activities begin, scans for radiation will be made according to established Westinghouse Hanford procedure (EII 2.3, "Administration of Radiation Surveys to Support Environmental Characterization Work on the Hanford Site," [WHC 1988]) in all areas for worker protection and unit characterization. In areas where scans show measurable radioactivity, the samples collected and residue removed also will be surveyed for radiation to protect workers who are handling these materials.

4.0 WASTE SAMPLING AND REMOVAL

This section discusses designation and disposal of the gravel in the scrubber located in Closure Area 3.

Two representative composite samples of the gravel bed will be analyzed for waste designation only. These samples will be obtained as the gravel is removed from the scrubber. After it has been designated dangerous or nondangerous waste, the gravel will be disposed in accordance with applicable regulations.

5.0 DECONTAMINATION

This section discusses the decontamination of equipment and structures associated with alkali metal burns at the LSFF.

Both fire rooms, the exhaust fan room, and the sodium supply room (Closure Area 1) will be cleaned by sweeping or water washing carbonate deposits. Decontamination will include inspecting and cleaning all concrete structures and associated burn equipment located within the two fire rooms, the exhaust fan room, and the sodium supply room. Sandblasting will be used to remove lead waste from the small fire room burn vessel, which is the only vessel used to burn the lithium-lead alloy. When all decontamination activities are completed, all treatment residue will be collected, analyzed, and disposed of in accordance with appropriate regulations.

The sump in the exhaust fan room will be thoroughly cleaned and inspected for cracks through which carbonates could have penetrated. If cracks are found on or near the floor of the sump, a characterization sampling program to examine the underlying soil may be developed at a later date, if so directed by the Washington State Department of Ecology (Ecology).

The structure that contained the gravel in Closure Area 3 will be cleaned of all visible carbonate deposits with the techniques as previously discussed for Closure Area 1.

Once all decontamination activities have been completed, the assigned Field Team Leader will conduct a visual inspection to determine if decontamination standards have been meet. If the Field Team Leader determines that decontamination standards have been met, no further decontamination is necessary. If decontamination standards are not met by sweeping deposits, high pressure water wash and acid bath will be used as a secondary decontamination treatment. After treatment with high pressure steam, the decontaminated areas will again be inspected by the Field Team Leader. At this point, if the decontamination standards have not been achieved, work will stop. A new decontamination plan will be developed, then approved by Ecology before any other decontamination activities occur.

6.0 SAMPLING AND ANALYSIS FOR CLOSURE DETERMINATION

This section discusses Phase 1 sampling of hazardous materials at the 105-DR LSFF.

Closure Area 7 is the only area to be sampled for closure determinations under this plan. The gravel from Closure Area 3 will be sampled for waste designation only and then will be removed and disposed of appropriately as described in Section 4.0. Closure Areas 1 and 3 will be decontaminated and visually inspected as described in Section 5.0. All sampling of Closure Areas 2, 4, 5, and 6 are deferred to the reactor decontamination and decommissioning activity.

6.1 Controlling Procedures

The activities associated with implementing this decontaminating, sampling and analysis plan will be conducted in accordance with the following environmental investigations instructions (EII) procedures (WHC 1988):

- EII 1.1, Hazardous Waste Site Entry Requirements
- EII 1.13, Environmental Readiness Review
- EII 1.5, Field Logbooks
- EII 5.1, Chain of Custody
- EII 5.2, Soil and Sediment Sampling

- EII 5.4, Field Cleaning and/or Decontamination of Equipment
- EII 5.5, 1706 KE Laboratory Decontamination of RCRA/CERCLA Sampling Equipment
- EII 5.10, Obtaining Sample Identification Numbers and Accessing HEIS Data
- EII 5.11, Sample Packaging and Shipping
- EII 14.1, Analytical Laboratory Data Management.

6.2 Sampling of Closure Area No. 7

Two soil samples will be obtained from an interval of 0 to 20 cm (0 to 8 in). The sampling area will be divided by a 3-ft by 3-ft grid. Random sampling grid location coordinates (9,6) and (6,4) have been selected using a random number generator (See Figure 3). One collocated sampling duplicate will be obtained within a 15-cm (6-in.) radius of soil sample 2 [coordinate (6,4)].

6.3 Collection Procedures for Soil Samples

Soil samples will be collected using a clean, stainless-steel spoon and placed in precleaned bottles. Fresh laboratory decontaminated collection equipment will be used for each sample. After the soil has been collected, all samples will be labeled, sealed, and placed in a container for preservation on ice or other appropriate cooling medium for shipment to the laboratory. Holding times as specified in SW-846 (EPA 1992) will be adhered to.

A chain-of-custody form will establish the documentation necessary to ensure the traceability of the sample from time of collection through shipping and analysis to disposal. All field activities will be recorded in a field logbook according to the protocols outlined in EII 1.5, "Field Logbooks" (WHC 1988). All entries will be made in ink, signed, and dated. Photographs will be taken of each sampling location and of any unusual circumstances encountered during the investigation.

6.4 Total Activity Samples

Collocated soil samples will be taken from grid locations (9,6) and (6,4) for total activity analysis to determine the transportation and handling requirements for the samples. Total activity samples will be collected as determined by the Sampling Field Team Leader and transported to the 222-S Analytical Laboratory for analysis. Data will be examined before samples are shipped to an offsite contract laboratory.

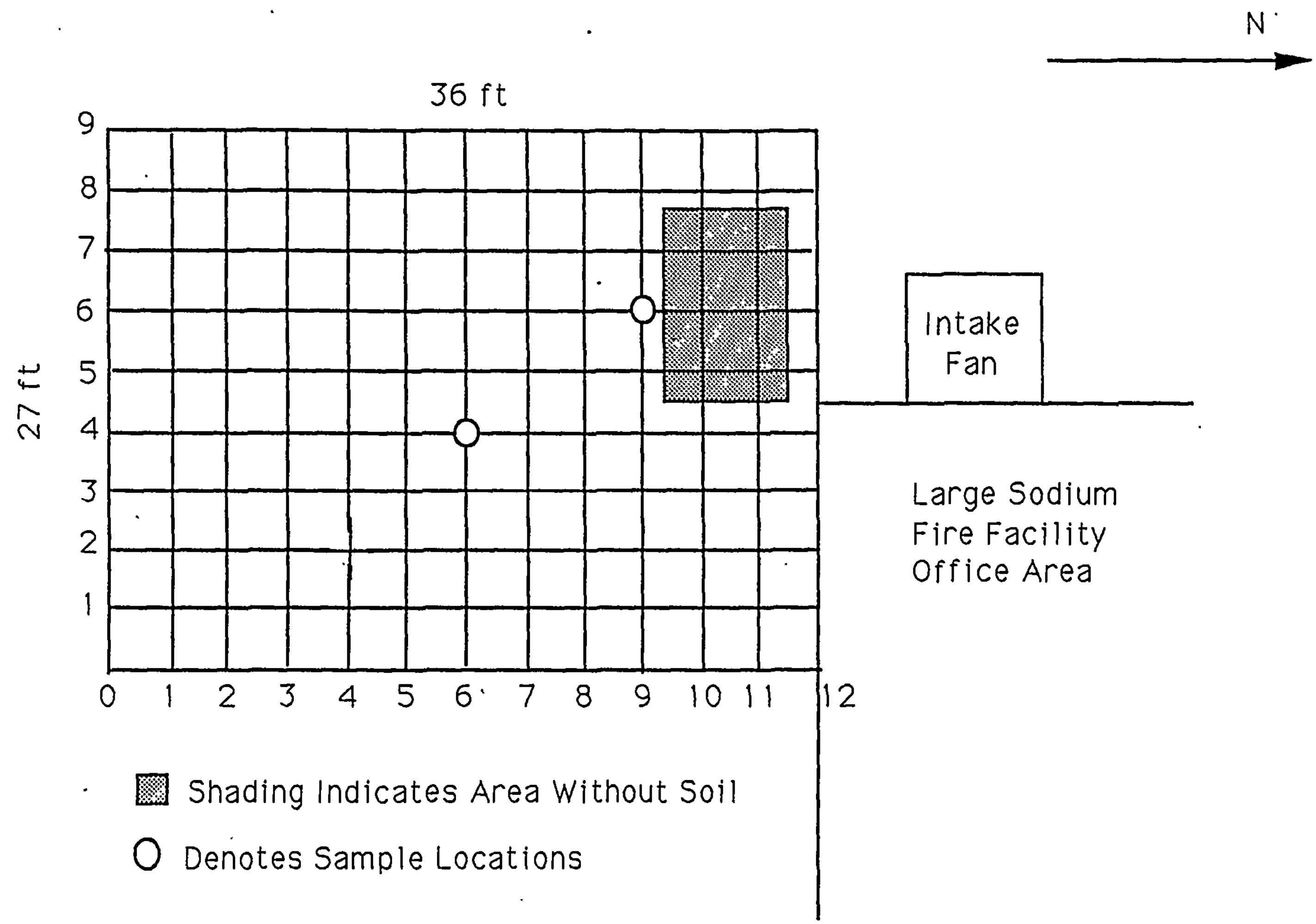

Figure 2. Soil Locations for Area 7.

6.5 Quality Assurance and Quality Control

Quality assurance and quality control of sampling and analysis will be ensured by field QC and laboratory procedures. Procurement and/or coordination of laboratory services will be the responsibility of a sample management organization (Analytical Services), which will ensure that contractor laboratories meet minimum QA/QC requirements. The sample management organization also will be responsible for the review of all laboratory QA/QC programs.

Field QC requires the collection of at least one duplicate sample for every 20 samples collected or one per day of sampling, whichever is more. Duplicate samples will be identified as such in the field logbook only.

If possible, stainless-steel sampling equipment will be decontaminated in the laboratory as described in EII 5.5 (WHC 1988) and wrapped to ensure cleanliness. Enough laboratory decontaminated sampling equipment should be on hand so that no sampling equipment is used more than once. If laboratory decontamination of sampling equipment is performed, equipment blanks will be unnecessary for this project. If field decontamination of sampling equipment is required, EII 5.4 (WHC 1988) will be followed and an equipment blank will be taken on each day of sampling. If equipment blanks are needed, deionized water will be used because it is sensitive to contamination.

Because volatile organics are not a constituent of concern, no field or trip blanks will be used for this project.

7.0 LABORATORY ANALYSIS

The samples to be collected from the soil will be analyzed for total lithium and sodium. These constituents of concern will be analyzed in accordance with SW-846, Method 6010, inductively coupled plasma metals. All soil samples and associated QC samples must be analyzed in the same batch by the analytical laboratory. In addition, the laboratory duplicate and matrix spike must be run on a sample from this project.

Representative samples of the gravel will be analyzed for corrosivity and TCLP metals.

Treatment residue that is generated will be analyzed for corrosivity using SW-846, Method 9040 (EPA 1992) and for total lead, lithium, and sodium with SW-846, Method 6010, inductively coupled plasma metals.

To expedite closure activities, analytical data will be provided to the cognizant engineer for immediate review.

8.0 DATA VALIDATION

Validation of all analytical data is required for this project. Data validation will be conducted to Level D as defined in the *Data Validation Procedures For Chemical Analyses* (WHC 1993b). Level D validation consists of the following:

- verification of required deliverables
- verification of requested versus reported analyses
- verification of transcription errors
- evaluation and qualification of results based on analytical holding times
- matrix spikes
- laboratory control samples
- laboratory duplicates
- analytical method blanks
- chemical recoveries
- tracer recoveries
- surrogate recoveries
- initial and continuing instrument calibrations
- quench monitoring
- counting instrument resolution checks, and
- calculation checks.

9.0 REFERENCES

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