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6. Author
Name: I.D. Jacques
I.D. Jacques
Signature
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7. Abstract

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Shallow soil samples were collected from several burn pits located in the 100-NR-1 Operable Unit. The soils were tested for volatile organic compounds (VOC), heavy metals, total petroleum hydrocarbons (TPH), and polychlorinated biphenyls (PCB) using field screening methods. The soil samples tested contained less-than-detectable amounts of VOC, heavy metals, and TPH. One soil sample collected from a burn pit located in the 128N-1 grouping contained PCB at a concentration between 1 and 10 parts-per-million. The source of the PCB may be fluorescent light fixtures disposed at the site. Soil samples from the other burn pit sites contained less-than-detectable concentrations of PCB.

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1.0 SUMMARY

Soil samples were collected from four 128N-1 burn pits located in the 100-NR-1 Operable Unit as directed by the RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) for the 100-NR-1 Operable Unit (DOE/RL 1992a). The samples were collected from shallow holes dug where surface features indicated potential contamination. The soil samples were tested for volatile organic compounds (VOC), heavy metals, total petroleum hydrocarbons (TPH), and polychlorinated biphenyls (PCB) using field screening methods. The results are summarized in this report.

Field screening tests indicated samples collected from four burn pits contained no detectable VOC. The samples also were less than the detection limit of 100 ppm TPH. One soil sample collected from a burn pit located in the 128N-1 grouping contained between 1 and 10 ppm PCB. Samples collected from the other three burn pits contained less than 1 ppm PCB. The samples did not appear to contain heavy metals or metal-complexed compounds significantly different from background levels for these types of soils.

2.0 INTRODUCTION

The 100-NR-1 Operable Unit is a source operable unit located at the 100-N Area on the Hanford Site. This soil sampling and field screening work was conducted based on an agreement with the U.S. Department of Energy (DOE) and the Washington State Department of Ecology (DOE/RL 1992a). The work was completed consistent with the requirements established in Draft B of the RFI/CMS work plan for the 100-NR-1 Operable Unit (DOE/RL 1992a).

Shallow soil samples were collected from the following 100-NR-1 burn pits on November 5, 1992.

- Hanford Generating Plant (HGP) Burn Pit
- 128N-1 Burn Pit Grouping (three separate disturbed areas).

The soil samples were tested for VOC, heavy metals, TPH, and PCB using field screening methods. The field screening results will be used to help identify areas that may be potentially contaminated and require additional sampling.

3.0 METHODS

Each site was visually inspected before the soil samples were collected. Applicable Hanford Site drawings and knowledgeable 100-N Area personnel were consulted to locate each study area. The sample locations were determined in accordance with 100 NPL Agreement/Change Control Form Number 8 (DOE/RL 1992b). The sample areas were selected where surface features indicated potential

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contamination. Each sampling point was numbered and marked for identification in the field. At each sample area a shallow hole was excavated approximately 1 ft in diameter and 8 to 12 in. deep. A clean shovel was used to dig each hole.

Soil samples were collected using clean sampling trowels that had been decontaminated in accordance with Environmental Investigation Instruction (EII) 5.5, 1706-KE Laboratory Decontamination of RCRA/CERCLA Sampling Equipment (WHC 1988). The samples were collected following the requirements of EII 5.2, Soil and Sediment Sampling (WHC 1988) and were assigned unique sample numbers for identification. Information such as soil conditions, texture, and observed signs of contamination was noted in the field logbook (EFL-1039, Field Logbook for 100-NR-1 Soil-Gas Survey). The samples were transported to the Site Remediation Management field laboratory in the 300 Area and tracked using Chain of Custody control in accordance with EII 5.1, Chain of Custody (WHC 1988).

One set of soil samples were collected for VOC field screening analysis from the side-wall of each sample hole. The samples were collected using a clean, plastic 10-mL syringe that had been modified by cutting off the injection end. The syringe plunger was pulled back to allow a volume of about 3 mL in the syringe barrel. The soil surface was scraped with the end of the syringe sampler to expose fresh soil. Then the syringe sampler was pushed into the soil until the syringe barrel contained the desire volume of soil. The soil sample was then quickly transferred to a 40-mL volatile organic analyses (VOA) vial containing approximately 30 mL distilled, deionized water using the syringe plunger to extrude the sample. The sample vial was capped and the mixture vigorously shaken to ensure mixing. The sample vials were labeled with a unique sample number and the collection time.

The sample containers used were 40-mL glass VOA vials with teflon-lined (a trademark of E.I. Dupont De Nemours) septa. Approximately 30 mL of water was added to each vial, leaving approximately 10 mL of headspace. The net mass of water was determined for each sample vial. After the soil sample was added, the net mass of the soil was determined. All measurements were made to the nearest tenth gram.

After each aqueous headspace sample had been collected, a second sample was collected from the same location. This samples consisted of about 500 grams of soil in a small zip-lock bag. This soil was used for X-Ray Fluorescence (XRF) analysis of heavy metals and for screening TPH and PCB levels using enzyme immunoassay test kits.

In the field screening laboratory, a sample of the headspace vapors above the soil/water mixture in each 40-mL VOA vial was withdrawn by syringe and analyzed for detectable VOC using a Century 128 Organic Vapor Analyzer (OVA 128) (a trademark of the Foxboro Company) in the gas chromatograph (GC) mode. The OVA 128 uses a Flame Ionization Detector (FID) to detect VOC. Injections of 200 μ L of headspace were routed through a 12-in. packed column (T-12 column) to separate the volatile compounds. The samples were analyzed at room temperature (20 to 30 °C). Heavier hydrocarbons not eluting during the GC run were detected by reversing the carrier gas flow through the column. The resulting "back-flush" peak gives a qualitative indication of the presence of heavier hydrocarbons.

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Standard solutions were prepared by injecting known concentrations of specific compounds into 40-mL glass VOA vials containing 30 mL water. The headspace above these standard solutions was analyzed using the OVA 128 under the same conditions. Compounds detected in the sample headspace were quantified by comparing the elution time and peak height of the analyte to the results of headspace analysis of the standard solutions. Soil concentrations for each analyte were estimated by multiplying the observed aqueous concentration by the volume of water and dividing by the mass of the soil.

Soil samples collected for XRF analysis were analyzed at the field screening laboratory using an XRF Spectrometer (X-Met 880) (a trademark of Outokumpu Electronics). The X-Met 880 uses a 60 mCi Cm^{244} and a 30 mCi Am^{241} radioactive source to excite the sample materials. XRF spectra for both sources were recorded for each sample using a 60-second count time. Index values were obtained by summing gross count rates over six contiguous bands for each spectrum. These index values were then compared to data from representative background soils. Deviations of more than two standard deviations from mean background values were interpreted as evidence of contamination. Also, individual XRF spectra were examined for the presence of anomalous peaks relative to the background spectra.

Finally, the soil samples were tested for TPH and PCB using enzyme immunoassay test kits. These tests use a specific antibody-antigen reaction to produce a colorimetric indication of concentration. The TPH test kit, PETRO RISC Test (a trademark of EnSys Inc.), provides a rapid comparison of sample concentration relative to standards of 100 ppm and 1,000 ppm TPH. The PCB test kit, PCB RISC Test (a trademark of EnSys Inc.), gives a rapid comparison of concentration relative to standards of 1 and 10 ppm PCB.

4.0 RESULTS AND DISCUSSION

Each soil sampling location is shown on Figure 1. Table 1 summarizes the field screening test results for soil samples collected from each of the sampling areas.

Sample HGP-FS-1 was collected from the HGP burn pit located on the west side of the Hanford Generating Plant (see Figure 1). This burn pit is a very small site located in a shallow depression. It appeared that the burn pit may have been used somewhat recently. Relatively fresh charred wood and rusted metal scrap was observed on the soil surface. The soil beneath the charred wood and burned metal scrap appeared to be undisturbed and did not show any observable signs of contamination. No detectable concentration of the target contaminants was identified in soils from the HGP burn pit.

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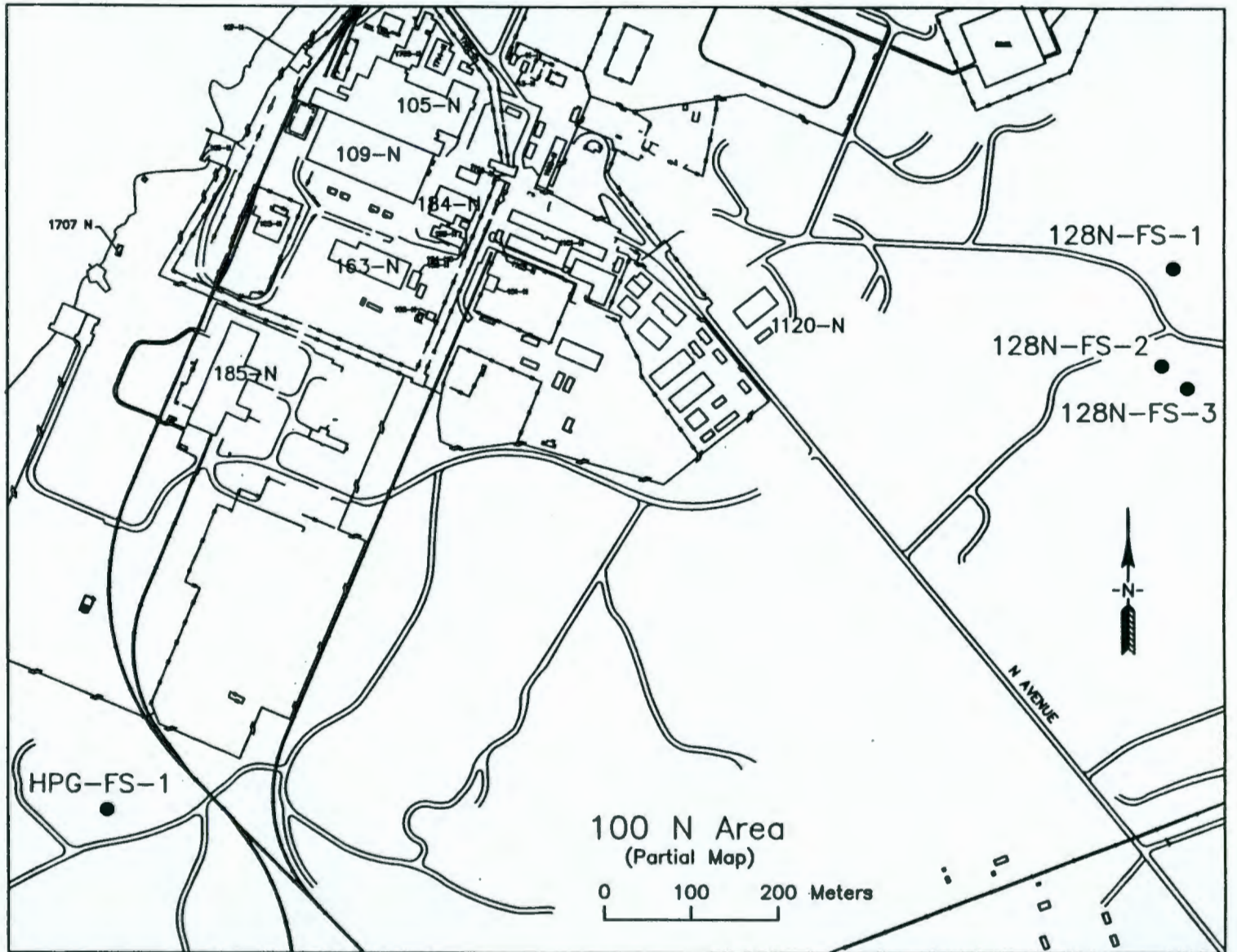


Figure 1. Soil Sampling Location for the HGP and 128N-1 Burn Pits.

Table 1. Soil Sampling Results for the HGP and 128N-1 Burn Pits.

Sample site	VOC ^a (ppm)	TPH ^b (ppm)	PCB ^c (ppm)	XRF ^d (ppm)
HGP-FS-1	<1	<100	<1	No significant deviation from background.
128N-FS-1	<1	<100	<1	No significant deviation
128N-FS-2	<1	<100	<1	No significant deviation
128N-FS-3	<1	<100	1-10	No significant deviation

^a Volatile Organic Compounds.

^b Total Petroleum Hydrocarbons.

^c Polychlorinated Biphenyls.

^d X-Ray Fluorescence Spectroscopy.

Samples 128N-FS-1 and 128N-FS-2 were collected from two burn pits located southeast of 100-N Area (see Figure 1). These two sites appeared to contain mostly construction debris, gardening waste, and other inert materials. Some discarded materials were visible on the surface at the 128N-1 burn pits. The 128N-FS-1 sample was collected beneath an area covered with sand blast grit. The underlying soil also contained sand blast material. The 128N-FS-2 sample was collected beneath an area where resin beads used for water purification had been discarded. This soil was somewhat discolored, with visible stains. The field screening results indicated no detectable concentrations of the target contaminants in either the 128N-FS-1 or 128N-FS-2 sample.

The 128N-FS-3 sample was collected from a burn pit about 100 to 150 m² in size located south of the 128N-FS-2 sampling area (see Figure 1). The burn pit is a natural depression that appears to have been filled with discarded materials and graded with a bulldozer. The surface of the burn pit is covered with pieces of debris including metal scraps, transite (asbestos), and glass. Broken fluorescent lamps, light fixtures, and objects that appeared to be discarded fluorescent light ballasts were also observed on the surface of the burn pit. The underlying soil appeared to contain debris similar to what was observed on the surface.

The 128N-FS-3 soil sample tested positive for PCB. The estimated concentration based on the field screening test is between 1 and 10 ppm (Arachlor 1248 equivalent). This soil did not contain detectable concentrations of any of the other target analytes in this field study.

Also, when this site was initially investigated, a pile of discarded soil was observed outside of the burn pit on the east side of the site. This soil was noticed because it is devoid of natural vegetation. Although not a part of this study, an aliquot of this soil was later collected for field observation. Field tests on this soil indicate it contains TPH at a concentration between 100 and 1,000 ppm. The soil tested negative for PCB. No other tests were conducted on this soil sample.

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5.0 REFERENCES

DOE/RL 1992a, *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-NR-1 Operable Unit, Hanford Site, Richland, Washington*, DOE/RL-90-22, Draft B, U.S. Department of Energy-Richland, Field Office, Richland, Washington.

DOE/RL 1992b, *100 NPL Agreement/Change Control Form Number 8, Unit Manager's Meeting: 100 Aggregate Area/100 Area Operable Units*, dated November 18, 1992.

WHC, 1988, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

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