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Solid Phase Remediation Strategy and Site Proposal

J. G. Field

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Assistant Secretary for Environment, Safety and Health

Westinghouse Hanford Company
P.O. Box 1970
Richland, Washington 99352

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CONTENTS

1.0 PURPOSE AND OBJECTIVES 1

2.0 BACKGROUND 1
2.1 SOLID PHASE REMEDIATION 1
2.2 SITE APPLICATIONS 2
2.3 CURRENT SITE PROCEDURES 2

3.0 STRATEGY 2
3.1 TREATMENT SITE. 2
3.2 TREATMENT PROCEDURES. 3

4.0 PROGRAM IMPACT 3

5.0 DOCUMENTATION. 4

6.0 SCHEDULE 4

7.0 REFERENCES 4

ATTATCHMENT 1. 6

1.0 PURPOSE AND OBJECTIVES

This document describes general, industry practices for treating soil contaminated by hydrocarbon compounds and proposes a strategy and site for solid phase remediation of soils at Hanford. The site will be used only to remediate those soils currently not classified as a hazardous waste in 40 CFR 261 and WAC 173-303, therefore it will not be a RCRA treatment, storage or disposal site and does not require permitting.

2.0 BACKGROUND

2.1 SOLID PHASE REMEDIATION

Solid phase remediation is an organic process of breaking down carbon compounds by providing an environment to enhance the activity of naturally occurring soil microbes. Soil microbes are most active under conditions conducive to plant growth. These include the following:

Temperature	At least 50°F, the higher the better
Nitrogen	Add ammonium phosphates or other fertilizer
Oxygen	Provided by blow air, tillage or addition of hydrogen peroxide
Water	Volumetric soil/water content should be between 10% and 20%.

Average temperatures at Hanford exceed 50°F from April through October. Therefore, solid phase remediation could be an open-air outdoor process during this time. If remediation were to continue during the winter months, a method of warming the soil would be required. A greenhouse, or other enclosed buildings with adequate controlled ventilation would provide this capability.

Unless soils are saturated, they normally provide an aerobic environment for microbe activity. Additional oxygen will enhance microbe activity and is most easily obtained by rotating the soil. Commercial fertilizers may be added as an additional source of nitrogen, phosphorous, and potassium.

Solid phase remediation is a common, inexpensive practice approved by Ecology and the EPA, to clean hydrocarbon spills. In the state of Washington, Applied Geotechnology Inc. has utilized this technology since 1983 to successfully clean up hydrocarbon spills (AGI, 1989).

2.2 SITE APPLICATIONS

Solid phase remediation activities are needed at Hanford. The DOE-owned, 560 mi^2 Hanford Site, located in southeastern Washington, has recently been added to the EPA's National Priorities List and is subject to CERCLA regulations for remedial investigation and cleanup of suspected waste sites. Extensive site characterization work required for remedial investigation may result in the discovery of soils that could be decontaminated by solid phase remediation. Currently, underground storage tank removal, in compliance with 40 CFR 280, has resulted in the discovery of soils contaminated by diesel fuel. Solid phase remediation would be ideal for cleaning these soils.

2.3 CURRENT SITE PROCEDURES

Although to date no contaminated soils have been disposed of or treated at the Hanford Site, the current accepted procedure for handling hydrocarbon-contaminated soils is not treatment but disposal to a toxic waste landfill. This is undesirable because landfill costs are high and permanent remediation of the soil is an achievable, economically viable alternative.

3.0 STRATEGY

3.1 TREATMENT SITE

Four circular, concrete pads, each about 200 ft in diameter with a 1-inch concrete lip on the perimeter, will be used to contain contaminated soils. These pads are already constructed and are located in the 100-C Area at the Hanford Site (190-C tank pads). Portions of the pads are presently covered by sand and gravel. This will be removed from each pad, as needed, and drains and cracks sealed with grout. Before use, an earthen berm, 12 in. in height with side slopes no steeper than 3:1 will be constructed around the perimeter of a pad and covered with plastic sheeting to provide containment of leaching and runoff water. The berms shall be constructed of soils removed from or near the concrete pads.

Water is available from a nearby fire hydrant. A backflow preventer, and pressure-reducing flow valve, and impact sprinklers spaced 50 to 60 ft apart and nozzled for equivalent full-, half-, and quarter-circle application rates will be required.

3.2 TREATMENT PROCEDURES

Prior to removal soil samples collected at random and within known contaminated areas will be analyzed to determine the type, depth, and extent of contamination. Soils will then be excavated and transported to the treatment site, where they will be placed in 1- to 2-ft layers on the pad. The soils will be placed at least 1 ft from the outside edge of the concrete pads.

A set-move irrigation system will uniformly apply water to the soils at a rate to minimize leaching and runoff. Average soil-water content will not exceed 20% by volume. Commercial fertilizer will be applied as specified by the manufacturer to enhance nitrogen and phosphorous in the soil. Using a disc or rototiller, soils will be turned at least weekly to enhance aeration. The time required for soil remediation decreases with more frequent aeration. Natural soil microbes should be sufficient to break down all hydrocarbons present, but additional microbes will be added if necessary.

After 2 months of treatment, soil samples will be collected every 2 weeks and every week after 3 months. Treatment will continue until concentrations of hydrocarbon compounds are below the cleanup levels established by Ecology in Policies and Procedures for Underground Storage Tank Removal (Ecology 1988) and shown in Table 1. After soil remediation is completed, the soil will be returned to the ground either at the original site or at a designated area where it can be retrieved for future fill. This is to be determined on a case-by-case basis.

An example of a specific application for soils contaminated by diesel fuels is included in Attachment 1.

4.0 PROGRAM IMPACT

This program will result in a site for treatment, rather than disposal, of hydrocarbon-contaminated soils. The program will not be subject to RCRA regulations and requires no permitting, as only nonhazardous soils will be treated at the site. Contaminated soils will be analyzed and transported to a central site for solid phase remediation. Following treatment, "clean" soils, as defined by Ecology (1988), will be returned to the ground.

All Westinghouse regulatory, health, safety, and quality assurance requirements shall be met in the completion of soil remediation tasks. This shall include, as applicable, wearing protective clothing, respirator protection, and using the proper equipment. These requirements will vary depending on the type of hydrocarbons in the soils.

5.0 DOCUMENTATION

This proposal shall be approved by Ecology prior to beginning site preparations. A Memo to File will then be sent to DOE headquarters and appropriate NEPA documentation performed.

Soil analysis reports will be sent to the state to determine cleanup levels for waste oils and all other hydrocarbon compounds not included in Table 1. Records will be kept for all soils transferred to the site, including laboratory soil analysis records, soil volumes and original locations. The time required to restore soils to acceptable cleanup levels and final soil sample analysis records will also be kept. After soils are cleaned to the designated level, a final clean up report including copies of records and analyses will be submitted to the state.

6.0 SCHEDULE

Preparation of the site and approvals to begin treatment will be performed according to the following schedule:

- Obtain site for treatment	Jan 01, 1990
- Completion of proposal	Apr 20, 1990
- Submit proposal to Ecology	May 01, 1990
- Estimate site preparation and operation costs	May 01, 1990
- Ecology approval	Jun 15, 1990
- Begin site preparations	Jun 15, 1990
- Begin soil remediation operations.	Aug 01, 1990

7.0 REFERENCES

Applied Geotechnology Inc., 1989. Statement of Qualifications, Petroleum Hydrocarbon and Underground Storage Tank Evaluation, Bellevue, Washington. Prepared for Westinghouse Hanford Company. Richland, Washington.

Ecology, 1988. Policies and Procedures for Underground Storage Tank Removal, Draft, Washington Department of Ecology, Olympia, Washington

TABLE 1. SOIL CLEANUP LEVELS FOR HYDROCARBON CONTAMINANTS

Contaminant	Parameter	Soil Cleanup Level
Gasoline	Benzene	660 ppb
	Toluene	143 ppm
	Ethyl benzene	14 ppm
Diesel	Total Petroleum Hydrocarbons (TPH)	200 ppm
Waste Oil	TPH*	200 ppm

* Waste Oils have the same TPH cleanup goals as diesel. In addition, Ecology may require monitoring for EP toxicity metals, polychlorinated biphenols (PCB's), solvents, and dissolved metals. Cleanup levels for these and other contaminants in addition to those listed will be established on a case-by-case basis.

ATTACHMENT 1

REMEDIATION OF DIESEL CONTAMINATED SOILS

1.0 DESCRIPTION

The 3000-5 and 3000-6 underground tanks, used to store diesel fuels, were excavated and removed by Operations Support Services on September 15, 1989 in compliance with 40 CFR 280 and 281. The tanks were more than 30 years old, constructed of galvanized steel, and had a storage capacity of 20,000 gal each. At the time of excavation, the tanks were rusted in places, but no holes were found. However, black stained soils found under the tanks were determined to be diesel fuel spills, probably as a result of tank overfill.

Organic vapors of up to 150 ppm were found from organic vapor monitoring (OVM). Random soil samples were collected from around the tanks to determine the extent of contamination and the presence of other chemical constituents or radioactive materials.

The 3000-5 and 3000-6 tank sites are within the 1100-EM-3 operable unit in the 3000 Area (Figure 1). The excavated surface area is roughly 110 by 40 ft^2. The depth of soil to be removed is uncertain, but may be several feet in some locations.

2.0 SOIL ANALYSIS

Soil sample locations are shown in Figures 2 and 3. Table 1 shows a summary of the sample analysis. Petroleum Hydrocarbon content ranged from 22,000 to less than 50 ppm. The depth and area of the spill is uncertain, but organic vapor concentrations 4 ft below the excavated surface registered 40 ppm. The soil is mostly sand, so the depth of hydrocarbon seepage may be great.

Radiation counts were negligible and no other significant chemical constituents were found in a soil analysis by the Hanford Environmental Health Foundation Laboratory. Therefore, this soil is not classified as a hazardous waste, and current RCRA and NESHAP (National Air Emissions Standards for Hazardous Air Pollutants) restrictions are not applicable. Further excavation to determine the extent of contamination will be performed.

3.0 TREATMENT REQUIREMENTS

Soils will be placed on concrete pads in 1- to 2-foot layers. For the concentration of diesel fuel in the soils and an outdoor operation, no respirator protection is needed.

The soils will be fertilized then irrigated three times a week to maintain high moisture levels. Soils will be turned or tilled weekly to enhance aerobic activity of naturally occurring microbes. With weekly aeration, the microbes are expected to break down all diesel compounds to below 200 ppm within a 3- to 4-month period.

After remediation is completed, as verified by soil sample analyses, soils will be returned to the original site or a designated fill site.

4.0 DOCUMENTATION

Reports were previously submitted to Ecology for diesel fuel spills and soil analysis for the 3000-5 and 3000-6 underground storage tanks. Following remediation, a report will be filed containing soil volume information and confirmation that soils are clean, as determined by laboratory analyses. Copies of all sampling records and laboratory analyses will be included.

5.0 REFERENCES

Mihalic, M. A, October, 1989. Twenty-day report for underground storage tank 3000-5, WHC Correspondence No. 8955855

Mihalic, M. A., October, 1989. 45 Day report for 3000-5 and 3000-6 tanks, WHC correspondence No. 8956353

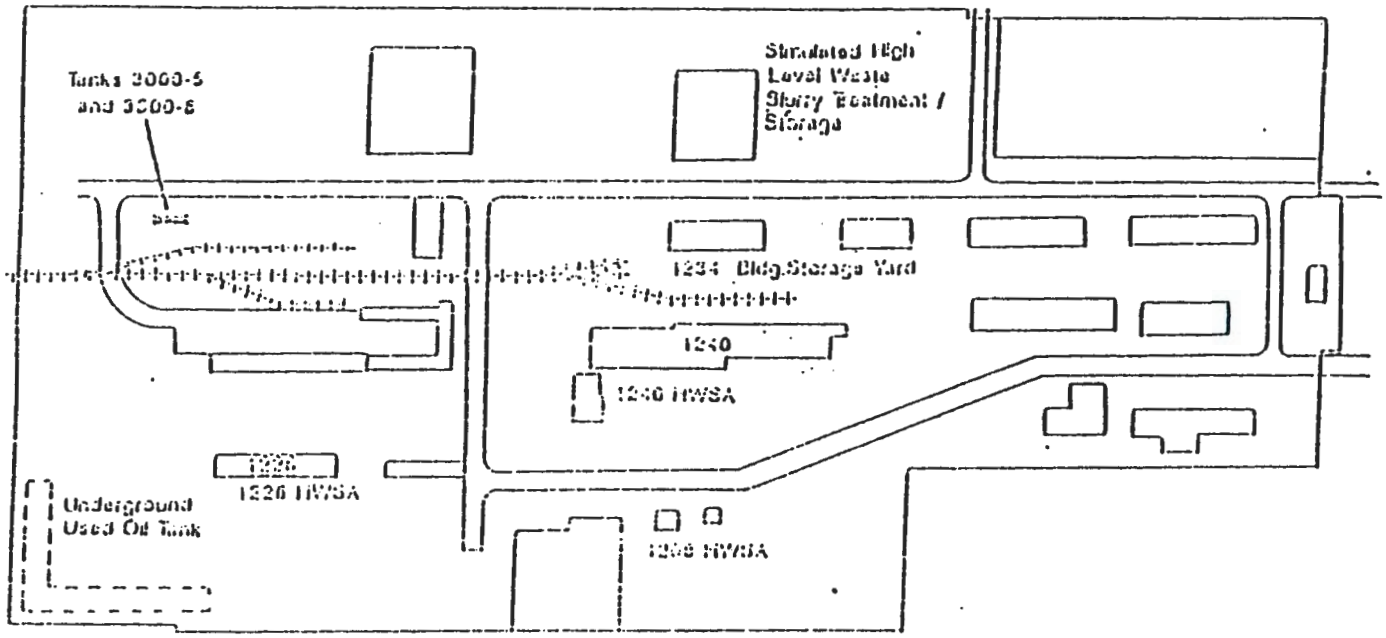

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Figure 1. Location of Underground Storage Tanks 3000-5 and 3000-6 within the 1100-EM-3 Operable Unit in the 3000 Area at the Hanford Site.

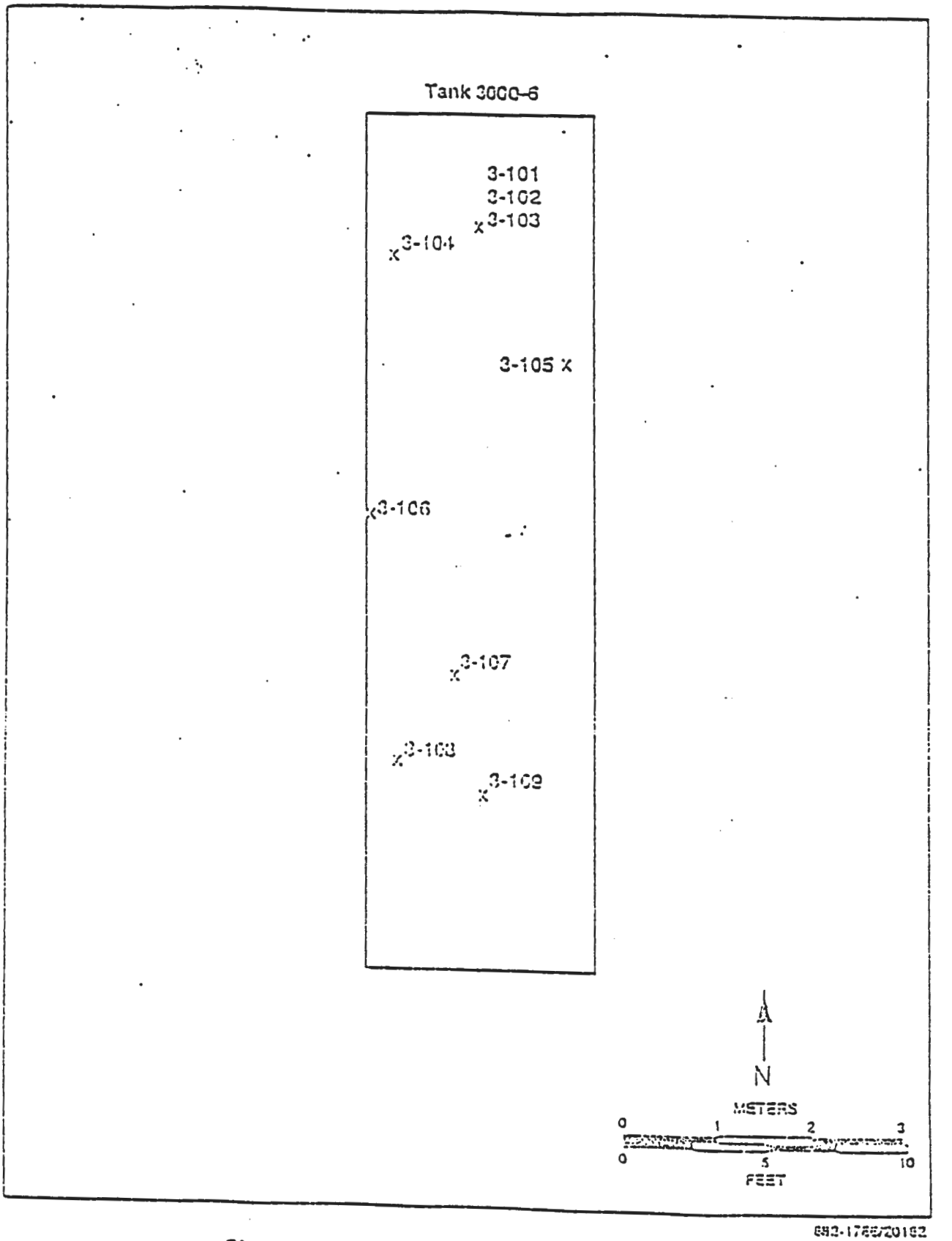

Figure 2. Sampling Locations at tank 3000-6

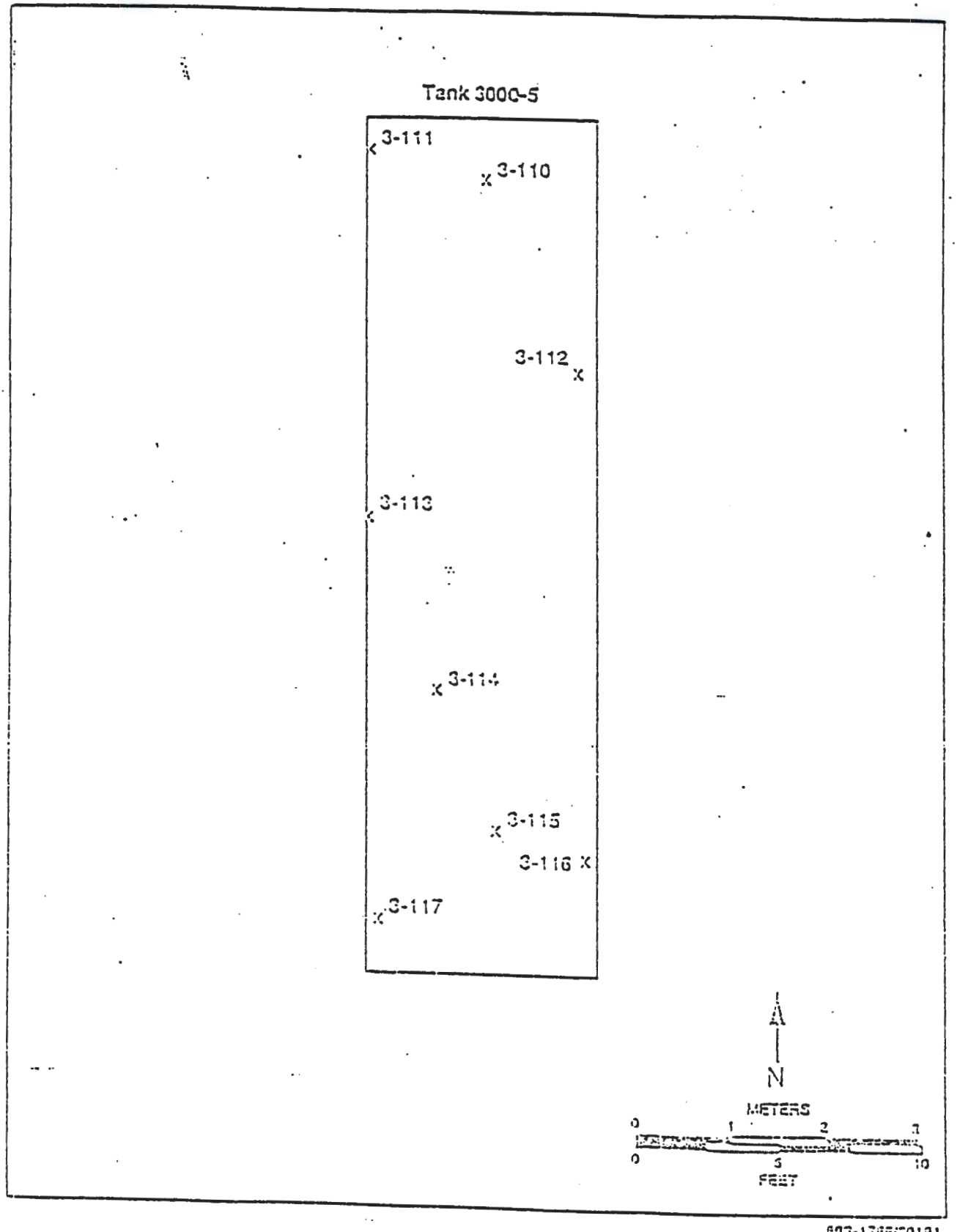

Figure 3. Sampling Locations at tank 3000-5

Table 1. Summary of Sample Results for Tanks 3000-5 and 3000-6 from HEHF.

Tank	Sample	Description	Petroleum Hydrocarbons (ppm)
3000-5	3-110	Random Sample	79
	3-111	Random Sample	55
	3-112	Random Sample	< 50
	3-113	Random Sample	13,800
	3-114	Random Sample	< 50
	3-115	Random Sample	55
	3-116	Southeast portion of tank impression	17,400
	3-117	Random Sample	22,200
	3-118	Equipment blank	< 50
3000-6	3-101	Random Sample	3,390
	3-102	Random Sample	4,220
	3-104	Random Sample	55
	3-105	Random Sample	55
	3-106	Random Sample	< 50
	3-107	Random Sample	< 50
	3-108	Random Sample	< 50
	3-109	Random Sample	< 50

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Author	Addressee	Correspondence No.
R. D. Izatt, DOE-RL	T. M. Michelena, Ecology	9002516

Subject: REQUEST FOR REVIEW AND CONCURRENCE OF A SOLID PHASE REMEDIATION PROPOSAL

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Note: Reference Letter 9053406.