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7. Abstract

The objective of this study is to evaluate diffuse emissions from the Hanford Site's 200 East Area and to evluate the effectiveness of the existing monitoring network. The results from this evaluation may also be utilized to demonstrate Westinhouse's compliance status with the applicable air emissions regulations and determine if additional studies and/or evaluations are necessary.

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1995 Study & Evaluation of Fugitive and Diffuse Emissions From the 200 East Area at the Hanford Site

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December 1994

Westinghouse Hanford Company

CONTENTS

1.0 INTRODUCTION

The Hanford Site contains a number of facilities and waste sites with diffuse and fugitive radioactive emissions. Diffuse and fugitive emissions are recognized as a potential pathway for human intake from the inhalation and ingestion of resuspended contaminants.

Diffuse emissions or emissions from non-point sources are defined as radioactive emissions originating from an area whose extent may or may not be well defined, such as contaminated ground above a near-surface waste disposal unit. Fugitive emissions are defined as radioactive air emissions which are not exhausted through a stack, vent, or other functionally equivalent structure, and which are not feasible to directly measure and quantify. Diffuse emissions, emissions from non-point sources, and fugitive emissions shall be referred to as "diffuse emissions" for the remainder of this document.

40 CFR 61, Subpart H, of the National Emission Standards for Hazardous Air Pollutants (NESHAP) and Washington Administrative Code (WAC) 246-247 titled Radiation Protection - Air Emissions require the dose to the maximally exposed individual living off-site to be calculated annually, which must be below 10 mrem/yr. Dose calculations for the maximally exposed individual currently rely on the results of the Hanford Site air monitoring network. The Hanford Site air monitoring network consists of 50 sampling stations operated by the Pacific Northwest Laboratory's (PNL) Site Environmental Monitoring Program and 45 sampling stations operated by the Westinghouse Hanford Company's (WHC) Operational Environmental Monitoring Program. The PNL sampling stations are located as follows: 23 are on the Site, 13 at the Site perimeter, 11 in nearby communities, and 3 in distant communities.

The WHC sampling stations are located as follows: 4 at 100-K, 4 at 100-N, 35 at the 200-Areas, and 1 at the 300 Area. Hanford's air monitoring network is currently setup to monitor for diffuse emissions collectively or on a site-wide basis.

Washington Administrative Code (WAC) 246-247-075 requires that "Facilities shall monitor non-point and fugitive emissions of radioactive material." WAC 246-247-075 also states "The department may also require the operator of any emission unit to conduct stack sampling, ambient air monitoring, or other testing as necessary to demonstrate compliance with the standards in WAC 246-247-040." This document provides a plan to provide confirmatory measurements of Hanford's diffuse emissions sites, to demonstrate compliance to WAC 246-247-075 and 40 CFR 61, Subpart H.

The Department of Energy (DOE) and the Environmental Protection Agency (EPA) are attempting to develop a Memorandum Of Understanding (MOU), since there is no guidance on demonstrating compliance with NESHAP regulations for diffuse emissions. The EPA is currently developing guidance on how facilities with diffuse emissions can demonstrate compliance, but initial drafts have been met

with much resistance. In the sixth draft of the MOU, DOE made a commitment to collect data on diffuse sources to assist the EPA in developing this guidance.

This study is an evaluation of 200 East Area's major diffuse emission sources to support WHC, DOE and the EPA in developing guidance on demonstrating compliance with NESHAP regulations from facilities with diffuse emissions. Data from this study may also be utilized for the Air Emissions Inventory.

2.0 OBJECTIVE

The objective of this study is to evaluate Hanford's major diffuse emission sources in the 200 East Area and evaluate the effectiveness of monitoring these sources collectively. The results from this evaluation may also be utilized to demonstrate Westinghouse's compliance status with the applicable air emissions regulations and determine if additional studies and/or evaluations are necessary.

A detailed study of each of the individual diffuse emission sources is currently not justified, because the existing air sample data indicate that these emission sources collectively contribute to much less than 0.1 mrem/yr total effective dose equivalent (TEDE) to the maximum exposed individual (MEI). It was estimated for 1992 and 1993 the effective dose equivalent (EDE) caused by emissions from diffuse sources were 0.035 and 0.028 mrem/y, respectively, for the MEI (References 12 and 13).

3.0 SCOPE

Air sampling will be conducted downwind of the 200 East Area. This site has been chosen as being representative of most large diffuse sources located on the Hanford waste sites. A review of the 1993 ambient air data indicated that ^{137}Cs was detectable in this area.

This study will take place during February to August of 1995. This time period will enable the collection of sufficient data to assess diffuse radionuclide emissions from the 200 East Area waste sites. This study will use existing ambient air monitoring stations supplemented with temporary air monitoring stations. Plots of the 1993 average concentrations of ^{137}Cs and ^{90}Sr collected from the existing stations may be found in Appendix A. Upon completion of this evaluation a recommendation will be made to perform additional sampling studies, or to discontinue further data gathering based on the evaluation's results.

4.0 DESCRIPTION OF TEST

4.1 Test Item

The 200 East Area will be the only area tested within the scope of this plan.

Air samples will be collected during the months February to August. All ambient samples will be submitted to the Waste Sampling and Characterization Facility's (WSCF) routine air filter sample analysis program, for an initial non-destructive analysis. The WSCF will perform non-destructive gross alpha and gross beta analyses on all samples.

When sampling is completed, the ambient air samples will be composited as deemed necessary and submitted to International Technology Corporation (IT) for isotopic analyses. Upon receipt of the analyses the airborne concentrations of radionuclides will then be calculated for each sampling period and location.

The prevailing wind directions for the 200 East Area will be determined from Pacific Northwest Laboratory's (PNL) meteorological data. Two lines of ambient air samplers will be established downwind of the 200 East Area (See Appendix B). One to two existing background air samplers will be used for the 200 East Area.

4.2 Test Environment

The Appendix C shows the waste sites located within the 200 East Area. These waste sites are predominately contaminated with isotopes of ^{137}Cs and ^{90}Sr. Other radiological contaminants may include: ^{60}Co, ^{134}Cs, ^{154}Eu, ^{155}Eu, ^{129}I, ^{210}Pb, ^{212}Pb, ^{214}Pb, ^{238}Pu, $^{239/240}Pu$, ^{226}Ra, ^{106}Ru, ^{125}Sb, ^{235}U, and ^{238}U (Reference 14). Contamination levels at several locations within some of the waste sites exceed $1x10^6$ dpm/100 cm^2 for beta and gamma as indicated by the most recent radiological surveys.

4.3 Equipment

The following equipment will be utilized:

1. Environmental air sampling station equipped with constant flow air samplers.
2. 47 mm particulate sample filters and envelopes.
3. Electric generators and extension cords as needed.

The following facilities and personnel will be utilized.

1. Site Surveillance Radiological Control
2. Near-Field Monitoring
3. Effluent Monitoring
4. Waste Sampling and Characterization Facility

4.4 Data

All air samples collected will be analyzed for gross alpha and gross beta activity, by WSCF, to screen for anomalous data. At the end of the sampling period for each site, the samples will be composited as deemed necessary. The composited samples will then be submitted to IT for analysis under the current IT Statement of Work (SOW), Contract 163589-A-M1. IT shall perform Gamma Energy Analysis (GEA), Pu isotopic, U isotopic and ^{90}Sr analysis on all composites. All sample results reported by IT will have a two sigma statistical error. The contractual Minimum Detectable Concentrations found in the SOW will be included in the final report.

4.5 Criteria/Constraints

This test is to evaluate current methods of determining the diffuse emissions from radioactive waste sites and facilities. This test will provide data to determine whether or not these waste sites and facilities are in compliance with the Clean Air Act and National Emissions Standards for Hazardous Air Pollutants.

5.0 EXPECTED RESULTS

All results are expected to demonstrate that the contribution of dose from resuspension of radioactive contamination from waste sites and facilities to be below 0.1 mrem/yr TEDE for the 200 Area facility fence line boundary and less than 0.1 mrem/yr for the MEI. The results are also expected to demonstrate the existing environmental ambient air program is sufficient for monitoring diffuse emissions.

6.0 TEST PROCEDURE

6.1 Preparations

The test will incorporate the use of constant flow air samplers. Samplers will be located upwind of the contamination source and at downwind locations, which will be determined by Effluent Monitoring (EM) and Near-Field Monitoring (NFM). The upwind samplers will determine the background level of suspended contamination and will be subtracted from the downwind samplers to determine the contribution of the resuspended contamination from the monitored site. All sampling heads will be set to 2 meters above the ground's surface.

EM and NFM will determine and record the exact location for each of the air samplers involved with this test. All sampler locations will have Electronic Data Processing (EDP) codes assigned to them so that the data can be entered into the Automated Bar Coding of Air Samples at Hanford (ABCASH) system. Samples will be collected in accordance with the established Site Surveillance Radiological Control and Operational Environmental Monitoring procedures.

Downwind samplers will be situated so that they face towards the 200 East Area. The upwind samplers will be situated such that they face into the prevailing wind direction, as determined from Reference 5. Hourly averaged atmospheric data such as: wind velocity, wind direction, and stability class will be collected from the PNL Meteorological Stations and recorded with the test results.

6.2 Sample Collection

Radiological Control Technicians (RCTs) will collect the air samples in accordance with task descriptions, desk top instructions, and/or procedures used to assure quality data collection for the OEM.

Air samplers will be equipped with flow meters and/or volume totalizers. All samplers will be operated at 2 CFM drawn across a 47 mm Versapor 3000 membrane filter. When feasible, air samples will be exchanged in the course of the normal OEM sample exchange schedule. Flow rates will be verified, using a calibrated flow meter, at the beginning and end of each sampling period, by Site Surveillance Radiological Control. A minimum of 1,500 m^3 of air sampled will be collected to obtain the required Minimum Detectable Concentrations (MDCs) specified in the International Technology Corporation (IT) Statement of Work, Contract 163589-A-M1.

The accuracy of the flow meters on the air samplers will be verified by comparing them to a secondary flow meter calibrated to NIST standards. This will be documented on the ambient air sample collection sheet.

One field blank will be submitted with all of the samples collected as a part of the test plan's quality control. A chain of custody for all samples will be maintained per the requirements of WHC-CM-7-4 Section 4.0 Rev. 8.

6.3 Sample Analyses

All air samples taken for this test plan will be submitted to the WSCF for the standard air sample analyses. The standard air sample analyses consists of a gross alpha and gross beta analysis.

At the end of the sample collection at each site, the upwind and downwind air samples will be composited respectively as determined by EM and NFM. The composited samples will then be submitted to IT for the following analyses:

1. Gamma Energy Analysis (GEA)
2. Isotopic Plutonium
3. Isotopic Uranium
4. Strontium-90

These will be completed using procedures outlined in the International Technology Corporation (IT) Statement of Work, Contract 163589-A-M1.

Upon completion of sample analyses a report will be issued to Near-Field Monitoring on the results. After analysis, all samples will be retained and stored per the IT Statement of Work, Contract 163589-A-M1. The Near-Field Monitoring Organization will review and verify analytical results. All samples requiring storage and/or disposal will be done in accordance with the IT Statement of Work, Contract 163589-A-M1.

6.4 Data

All collected data will be stored in accordance with WHC-CM-3-5, Document Control and Records Management. All air sample total alpha and total beta results collected for this test plan will be recorded on the ABCASH system. Also all other analytical and test data collected for this test plan will be stored on the Environmental Release Summary (ERS) system. A final report of the results will be on file at Central Files.

7.0 SAFETY

Sampling and analyses must be conducted in accordance with the General Safety Rules, Industrial Safety Manual (WHC-CM-4-3) and the Hanford Site Radiological Control Manual (HSRCM-1, Rev. 2) or as specified in the International Technology Corporation (IT) Statement of Work, Contract 163589-A-M1. Compliance with all applicable Radiation Work Permits (RWP) is mandatory for collecting and handling all samples.

No unusual industrial, radiological, chemical, fire, compressed air, release of energy, or criticality safety hazards are known or expected to be associated with the performance of this test plan.

8.0 QUALITY ASSURANCE

Quality Assurance Project Plans and Statements of Work:	Existing Quality Assurance Project Plans and Statements of Work shall govern execution of this test plan.
Licensing Requirements:	None applicable for this test plan.
Test Witness:	No certified Quality Control witness is required for this test plan.
Traceability:	Air sampler flowmeter will be checked with a flowmeter calibrated to standards traceable to the National Institute of Standards Testing (NIST).

Determination of radioactivity levels of filter samples will be made with equipment calibrated with standards traceable to the NIST.

9.0 ORGANIZATION FUNCTION AND RESPONSIBILITIES

The primary organizational interdependencies associated with this test are found within the following organizations.

Near-Field Monitoring, Effluent Monitoring:	Responsible for writing test plan; field support in determining sample locations and length of each sampling period; technical support for execution of test plan; gathering, analyzing, and reporting test plan results.
Site Surveillance Radiological Control:	Responsible for providing input, reviewing and approving this test plan; responsible for providing support for collecting filter samples for this test plan.
Waste Sampling and Characterization Facility:	Responsible for providing analytical support and non-destructive gross alpha and gross beta analyses.
International Technology Corporation:	Responsible for providing isotopic analyses and analytical support per Statement of Work, Contract 163589-A-M1.
Safeguards and Security:	None.
Safety Engineering:	None.
Environmental Quality Assurance:	Review the test plan and final report to ensure the quality of the test plan and results.
Outside Agencies:	None Required.

10.0 SCHEDULE & ESTIMATED COSTS

10.1 Schedule

	Item	Scheduled Date of Completion
1.0	Issue test plan (Rev. 0)	12/31/94
2.0	Determine sampler locations	12/31/94
3.0	Collect & analyze samples	06/30/95
4.0	Evaluate results	08/30/95
5.0	Prepare & issue final report	09/30/95

10.2 Estimated Costs of Materials & Services

Quantity	Item	Cost
(1450 ft)	Extension Cords	$ 300
(3)	Electric Generators	$10000
(3)	Propane Tanks Rental	$ 400
(6)	Ground Fault Circuit Interrupters	$ 300
(1000gal)	Propane	$ 600
	Laboratory Analyses	$18000
	Sample Shipping/Transportation	$ 5000
	Servicing of Generators	$ 500
	Total	$35100

11.0 REPORTS

A final report will be prepared and issued according to the requirements stated in the Standard Engineering Practices Manual, WHC-CM-6-1. The report will make the recommendation of whether an additional resuspension study, additional sampling, or no additional studies should be conducted. Copies of the report will be distributed to Pacific Northwest Laboratory, Radiological Engineering, Facility Environmental Compliance Officers, Effluent Monitoring, and Near-Field Monitoring.

12.0 REFERENCES

(1) Memorandum of Understanding Between the U.S. Environmental Protection Agency and the U.S. Department of Energy, R.F. Pelletier (DOE) to J.W. Gunter (EPA), 6th Draft, dated 11/27/92.

(2) G.A. Sehmel, "Particle Resuspension: A Review", Environment International, Vol. 4, pp. 107-127, 1980.

(3) BNWL-SA-5228, G.A. Sehmel, "Experimental Measurements and Predictions of Particle Deposition and Resuspension Rates", dated March 1975.

(4) BNWL-2081/UC-11, G.A. Sehmel, "Radioactive Particle Resuspension Research Experiments on the Hanford Reservation", dated February 1977.

(5) PNL-9809, "Climatological Summary for the Hanford Area", dated June 1994.

(6) G.F. Knoll, "Radiation Detection and Measurement", 2nd ed.,John Wiley & Sons, New York, 1989.

(7) WHC-CM-7-4, Operational Environmental Monitoring.

(8) HSRCM-1 Rev. 2, Hanford Site Radiological Control Manual.

(9) WHC-CM-4-2, Quality Assurance.

(10) WHC-CM-6-1, Standard Engineering Practices.

(11) WHC-CM-3-5, Document Control and Records Management.

(12) DOE/RL-93-36, Radionuclide Air Emissions Report for the Hanford Site, CY 1992, June 1992.

(13) DOE/RL-94-51, Radionuclide Air Emissions Report for the Hanford Site, CY 1993, June 1994.

(14) WHC-EP-0573-2 Rev. 0, Westinghouse Hanford Company Operational Environmental Monitoring Annual Report -- CY 1993, 1994.

(15) WHC-EP-0538-1 Rev. 1, Operational Environmental Monitoring Program Quality Assurance Project Plan, January 1993.

(16) Contract No. 163589-A-M1, Battelle Memorial Institute, Pacific Northwest Laboratories.

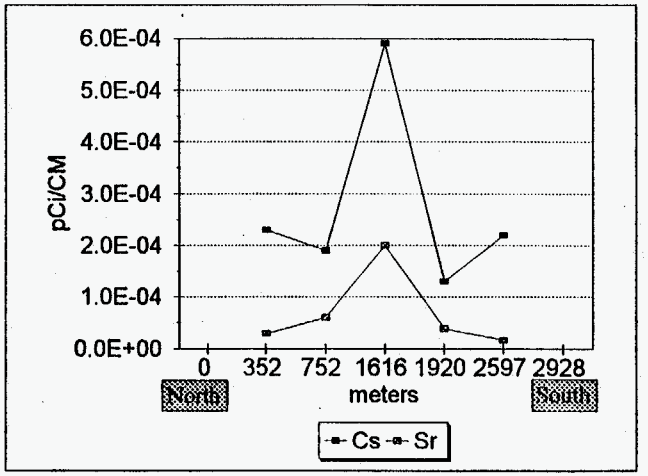
(17) ASTM D 1357, Standard Practice for Planning the Sampling of the Ambient Atmosphere, Reapproved 1989.

Appendix A

1993 Average Concentrations of Cs^{137} and Sr^{90} Collected from the Existing Stations

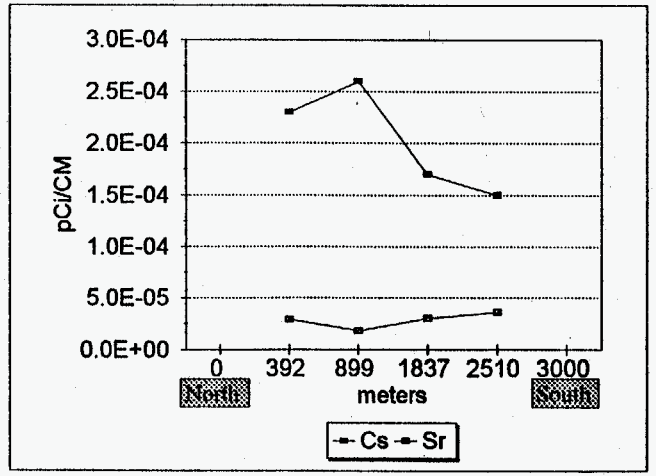
Site	Distance	Cs	Sr
	0		
998	352	2.3E-04	2.9E-05
972	752	1.9E-04	6.0E-05
158	1616	5.9E-04	2.0E-04
985	1920	1.3E-04	3.8E-05
977	2597	2.2E-04	1.6E-05
	2928		

Air Samplers Located Along 200 East Area East Fence.



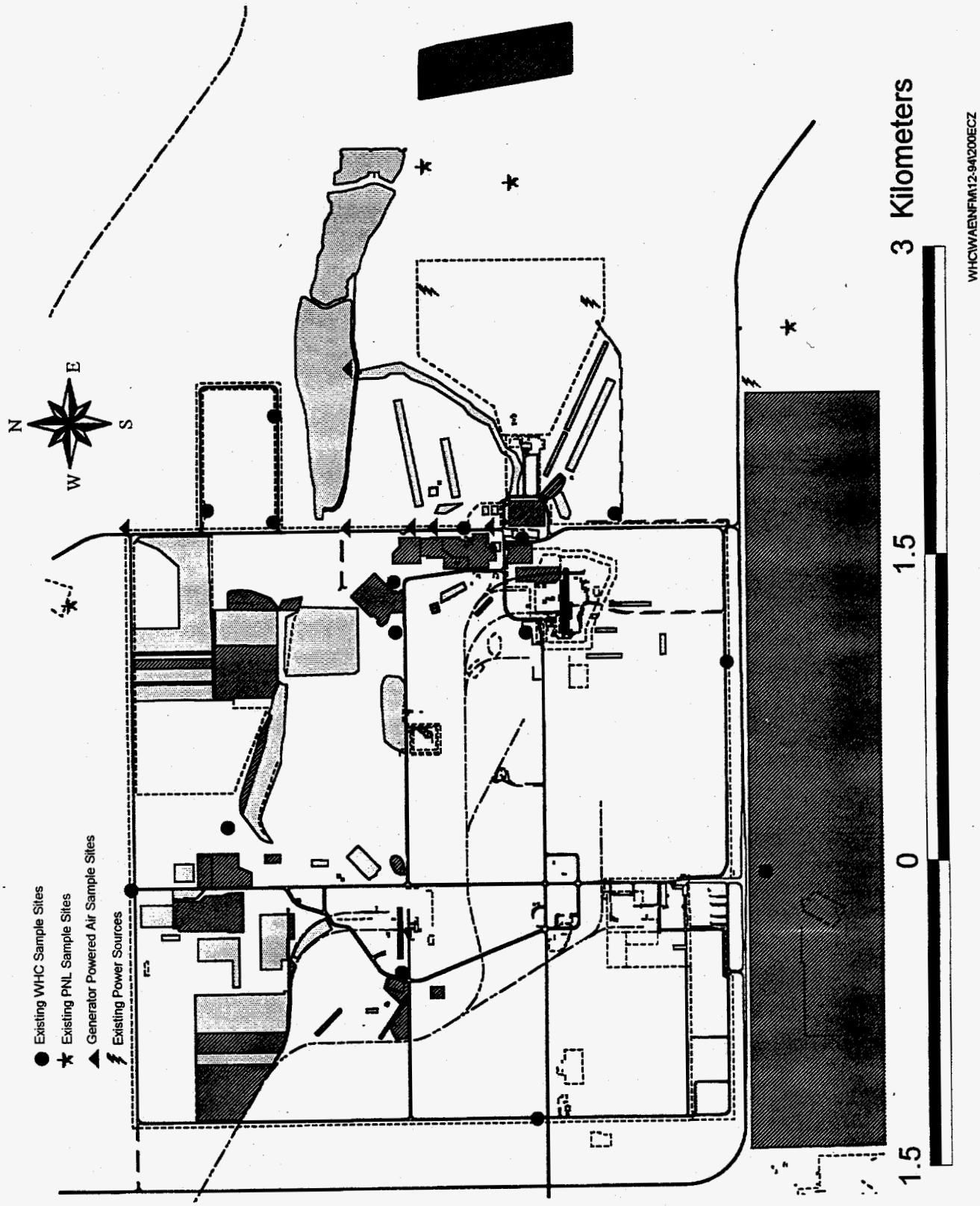
Site	Distance	Cs	Sr
	0		
998	392	2.3E-04	2.9E-05
999	899	2.6E-04	1.8E-05
992	1837	1.7E-04	3.0E-05
991	2510	1.5E-04	3.6E-05
	3000		

Air Samplers Arcing to the East of 200 East Area.



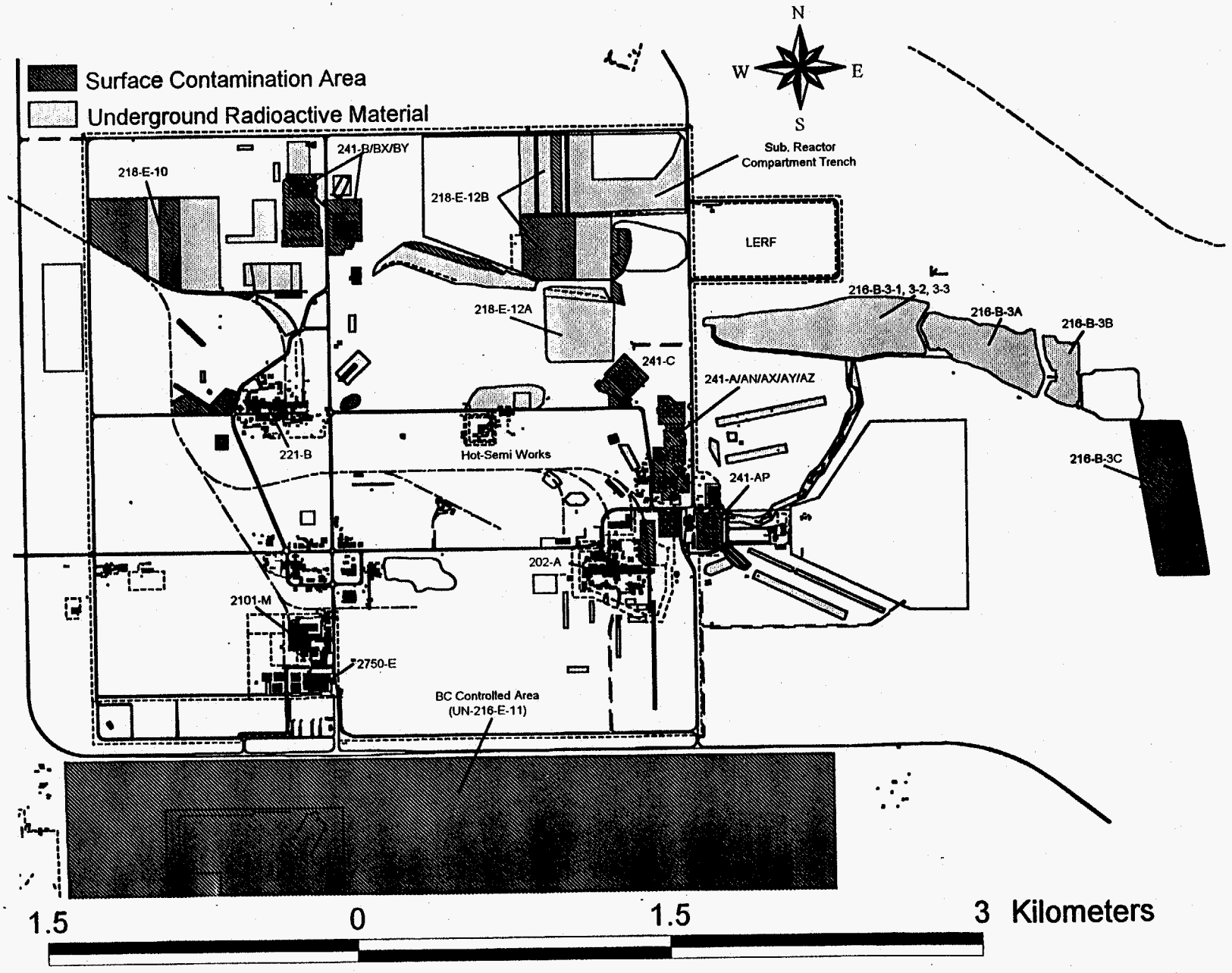
Appendix B

Proposed Air Sampling Locations


N
E
S
W
Existing WHC Sample Sites
Existing PNL Sample Sites
Generator Powered Air Sample Sites
Existing Power Sources
1.5
0
1.5
3 Kilometers
WHCWAENFM12-94200ECZ

Appendix C

200 East Area Waste Sites and Facility Maps



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