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OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

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December 29, 1995

W. Alexander Williams, Ph.D
EM-421
Cloverleaf Building
U. S. Department of Energy
Washington, D.C. 20874-1290

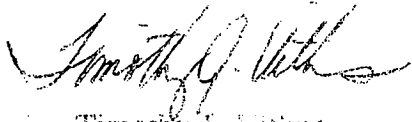
**SUBJECT: VERIFICATION SURVEY OF LATTY AVENUE PROPERTY 3, ST. LOUIS
AIRPORT SITE VICINITY PROPERTIES, HAZELWOOD, MISSOURI**

Dear Dr. Williams:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education has completed the verification activities for the subject property. This was one of the two St. Louis Airport Site (SLAPS) Vicinity Properties that were remediated by Bechtel National, Inc. (BNI) during the period June through September 1995.

Enclosed is an interim letter report describing the procedures and results of the verification survey. ESSAP will provide draft reports for each property for review and comment following the issuance of BNI's post-remedial action report. Please contact me at (423) 576-5073 or William L. (Jack) Beck at (423) 576-5031 should you have any questions.

Sincerely,



Timothy J. Virkus
Environmental Project Leader
Environmental Survey and
Site Assessment Program

TJV:kew

Attachment

cc: J. Wagener, DOE/HQ
D. Adler, DOE/ORO
G. Palau, BNI
W. Beck, ORISE/ESSAP
File/387

**VERIFICATION SURVEY
OF
LATTY AVENUE VICINITY PROPERTY NUMBER 3
ST. LOUIS AIRPORT SITE VICINITY PROPERTIES
ST. LOUIS, MISSOURI**

INTRODUCTION AND SITE HISTORY

The St. Louis Airport Property Site (SLAPS) was acquired by the Manhattan Engineer District (MED) and operated from 1946 to 1966. The site was used for storage of waste materials that were generated during uranium processing from 1942 until the late 1950s at the Mallinckrodt facility, located in downtown St. Louis. These processing wastes, which included pitchblende raffinate residues, radium-bearing residues, and barium sulfate cake, were purchased by Continental Mining and Milling Company of Chicago (CMMC) in 1966 and, subsequently transported to 9200 Latty Avenue for storage under an Atomic Energy Commission (AEC), predecessor agency to the U.S. Department of Energy (DOE), license. During transit, some of the materials spilled onto the haul roads (including Latty Avenue) and contiguous properties, primarily collecting in drainage ditches. Redistribution of the contaminated materials probably occurred as a result of flooding, surface runoff, and road and utility line activities. The waste residues, stored at the Latty Avenue site, were eventually dried and shipped by rail to a mill site in Colorado.

Pursuant to specific direction in the 1984 Energy and Waste Appropriations Act, remedial action at the Latty Avenue site was assigned to the DOE, and DOE began investigating the site and nearby properties. Oak Ridge National Laboratory (ORNL) performed a radiological survey of the haul roads in 1985. This survey identified areas with elevated gamma exposure rates and/or Th-230 concentrations in soil (ORNL 1986). As a result, the haul roads were designated in 1986 for remedial action under the Formerly Utilized Sites Remedial Action Program (FUSRAP).

FUSRAP was created in 1974 to identify, investigate, and cleanup or control sites where contamination above today's guidelines remains from the early years of the Nation's atomic energy program. Bechtel National, Inc. (BNI) is the project management contractor for FUSRAP.

BNI performed site characterization activities during the period 1986 to 1989, in order to delineate contamination boundaries, the results of which are provided in the St. Louis Sites characterization reports (BNI 1990). Six properties, located along Latty Avenue, designated as Latty Avenue Vicinity Properties Numbers 1 through 6, were included in this characterization survey. Because the railroad used for shipping wastes borders the Latty Avenue Vicinity Property Number 3 (VP 3L), it is probable that some contaminated residues spilled from the rail cars onto the property. BNI recently completed remediation of VP 3L. Remedial activities included excavation of soil from the north and south ends of the warehouse, as well as along the railroad spur on the east side of the property, and the removal of a contaminated soil pile. Previously, the property owner had conducted remedial activities on portions of the property to remove soil contaminated with oil. Some of the excavated soil was also contaminated with radioactive material, specifically Th-230, and had been stockpiled.

It is the policy of the DOE to perform independent verification of remedial actions conducted under FUSRAP. The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) has been designated as the independent verification contractor (IVC) for the St. Louis sites.

SITE DESCRIPTION

SLAPS is located north of the Lambert-St. Louis International Airport in St. Louis County, Missouri approximately 24 kilometers (km [15 miles]) west of downtown St. Louis. VP 3L is located approximately 1 km northeast of SLAPS and 200 meters (m) east of the Latty Avenue storage site (Figures 1 and 2). VP 3L consists of a large warehouse building with an asphalt driveway and parking area on the west and north side of the property, and open land in the southern section (Figure 3). The property is bordered by Latty Avenue on the north, by the Norfolk and Western Railroad property to the south and east, and Latty Avenue Vicinity Property Number 2 to the west. A chain link fence remains in place along the west and south borders. Two oil-contaminated soil piles remain on the site (Figure 5). A below-grade excavation

(footprint), where the soil stockpile formerly existed, is located in the southern end of the property.

OBJECTIVES

The objectives of the verification process were to ensure that the survey, sample analysis, and supporting documentation provided by BNI give an accurate and complete description of the radiological condition of the remediated vicinity property and confirm that both generic and site-specific DOE guidelines for release to unrestricted use have been met.

DOCUMENT REVIEW

ESSAP reviewed BNI's field data results and supporting documentation concerning site remediation activities. Information was evaluated to assure that areas identified as exceeding site guidelines had undergone decontamination and that residual radioactive material and exposure rate levels satisfied the established guidelines.

SURVEY PROCEDURES

On three occasions between July 11 and October 12, 1995, ESSAP personnel visited the VP 3L site and performed visual inspections and independent measurements and sampling of remediated areas in accordance with the SLAPS vicinity property survey plan previously submitted to and approved by the DOE (ORISE 1994). Verification activities included gamma surface scans, exposure rate measurements, and surface soil sampling.

REFERENCE GRID

Measurement and sampling locations in the radiation/oil contaminated soil pile area were referenced to a 10 m × 10 m grid established by BNI. Measurement and sampling locations in

north and east remediated areas were referenced to BNI designated sampling units, each having an area of approximately 100 m².

SURFACE SCANS

Surface scans for gamma activity were conducted over 100 percent of the remediated areas using NaI scintillation detectors coupled to ratemeters with audible indicators.

EXPOSURE RATE MEASUREMENTS

Exposure rate measurements were performed at each soil sampling location at 1 m above the surface using a microrem meter (Figures 4, 5, and 6). Background exposure rate measurements, performed during previous SLAPS vicinity property surveys, were used for comparison (Figure 7).

SOIL SAMPLING

Soil samples were collected at the center and at four locations equidistant from the center and corners of ten grid blocks or sampling units, including four grid blocks beneath the former contaminated soil pile (Figures 4 through 6). One additional sample was collected, based on surface scan results, in grid block 160 (location F on Figure 6) on the north end of the warehouse. Background soil samples, collected during previous SLAPS vicinity property surveys, were used for comparison of results (Figure 7).

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and data were returned to ORISE's ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Soil samples were initially analyzed by solid state gamma spectrometry. The primary radionuclide of interest was Th-230, however, spectra were also reviewed for uranium, Ra-226, and Th-232, and any other identifiable photopeaks. After gamma

spectrometry analyses were completed, the five samples collected from individual grid blocks were composited for isotopic thorium analysis by alpha spectrometry. Analytical results for soil were reported in units of picocuries per gram (pCi/g). Exposure rates were reported in microroentgens per hour (μ R/h).

FINDINGS AND RESULTS

SURFACE SCANS

Surface scans identified areas of elevated direct gamma radiation in grid 160 on the north end of the property in an area immediately adjacent to Latty Avenue.

EXPOSURE RATES

Exposure rates for the remediated portions of VP 3L are summarized in Table 1. Exposure rates at 1 m above the surface ranged from 4 to 10 μ R/h. Area background exposure rates ranged from 9 to 10 μ R/h (Table 2).

RADIONUCLIDE CONCENTRATIONS IN SOIL

Radionuclide concentrations in soil samples are summarized in Table 1. The radionuclide concentration ranges in the individual samples analyzed by gamma spectrometry are as follows: Ra-226, 0.8 to 3.3 pCi/g; Th-230, less than 2.7 to 116.9 pCi/g; Th-232, 0.4 to 1.2 pCi/g; and U-238, 0.6 to 3.3 pCi/g. The Th-230 and Th-232 activity levels, determined by alpha spectrometry in composite samples from each grid block, ranged from 1.71 to 22.52 pCi/g and 0.69 to 1.22, respectively. Background concentrations, presented in Table 2, were: 0.7 to 1.0 pCi/g for Ra-226, 1.31 pCi/g for Th-230 (determined from alpha spectrometry analysis on the composite sample), 1.0 to 1.1 pCi/g for Th-232, and 0.9 to 1.3 pCi/g for U-238.

COMPARISON OF RESULTS WITH GUIDELINES

Verification survey results were compared to the generic and site-specific DOE guidelines (DOE 1990a; DOE 1990b). The applicable soil guidelines for SLAPS Vicinity Properties are those for Ra-226, Th-230, Th-232, and U-238 which are:

<u>Radionuclide</u>	<u>Soil Concentration Above Background</u>
Ra-226, Th-230, Th-232	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g, averaged over 15 cm thick layers of soil greater than 15 cm below the surface.
U-238	50 pCi/g

Radionuclide concentrations in individual soil samples collected from the ten grid blocks or sampling units were below the guidelines for Ra-226, Th-232, and U-238. All samples were collected from areas that were 15 cm or greater in depth prior to excavation. The area is to be backfilled to original grade; therefore, the subsurface guidelines are applicable. One sample, collected from grid block 2, point C (Figure 4), exceeds the 15 pCi/g subsurface Th-230 guideline with a Th-230 concentration of 17.4 pCi/g. However, the soil concentration guidelines permit averaging soil concentrations over an area of 100 m². The average Th-230 concentration including the contiguous area was 7.44 pCi/g, which satisfies the guideline. The soil sample collected from sampling unit 152, point E, on the northeast side of the property also exceeded the 15 pCi/g guideline, with a Th-230 activity concentration of 116.9 pCi/g. The composite sample, representing the five samples collected from the 100 m² area, also exceeded the guideline with an activity of 22.52 pCi/g. Because scan sensitivities are not adequate to detect Th-230 at the guideline levels, a conclusion could not be reached in the field as to the total area of the hot spot.

ESSAP notified BNI of the presence of the hot spot following sample analysis and requested that additional samples be collected to permit bounding the area of the hot spot. BNI collected and analyzed four-five point composite samples from a 16 m² area, with each composite representing a 4 m² area. The Th-230 concentration in these samples ranged from 1.88 to 5.13 pCi/g and indicate that the hot spot was contained in an area measuring less than 1 m² and therefore satisfies both the hot spot criteria (defined as the guideline value times $100/A^{1/2}$, where A equals the area of the hot spot in m²) and the 100 m² average guideline. The Th-230 levels in all other samples satisfied the guideline.

The exposure rate guideline is 20 μ R/h above background (DOE 1990a). All verification exposure rate measurements were below the guideline level.

SUMMARY

Between July 11 and October 12, 1995, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed verification activities for Latty Avenue Vicinity Property Number 3. Verification activities included document and data reviews, gamma surface scans, exposure rate measurements, and soil sampling.

The results of the verification survey support BNI's conclusion that the radiological conditions of the property satisfy the requirements for release to unrestricted use.

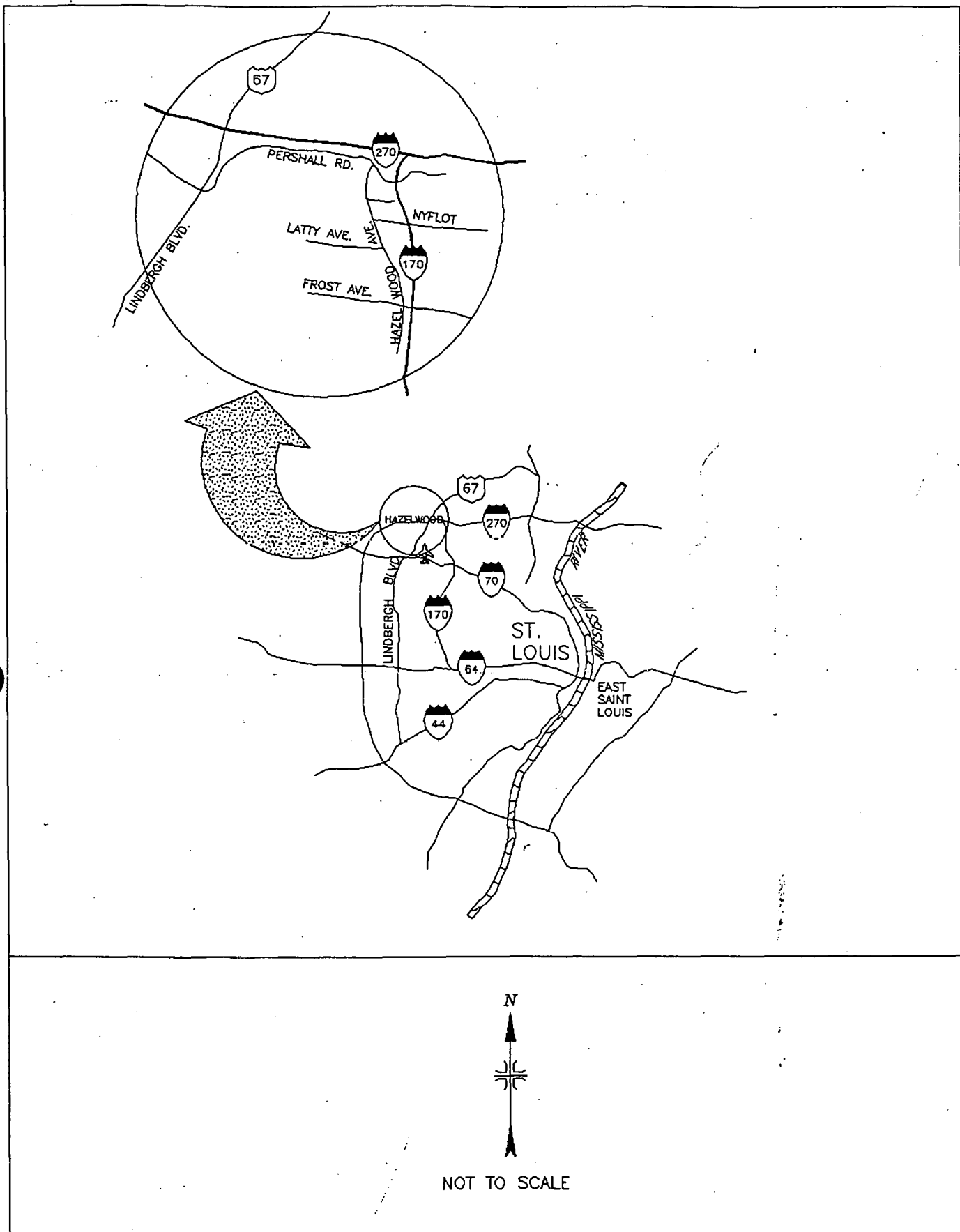


FIGURE 1: St. Louis, Missouri Area – Location of Haul Roads

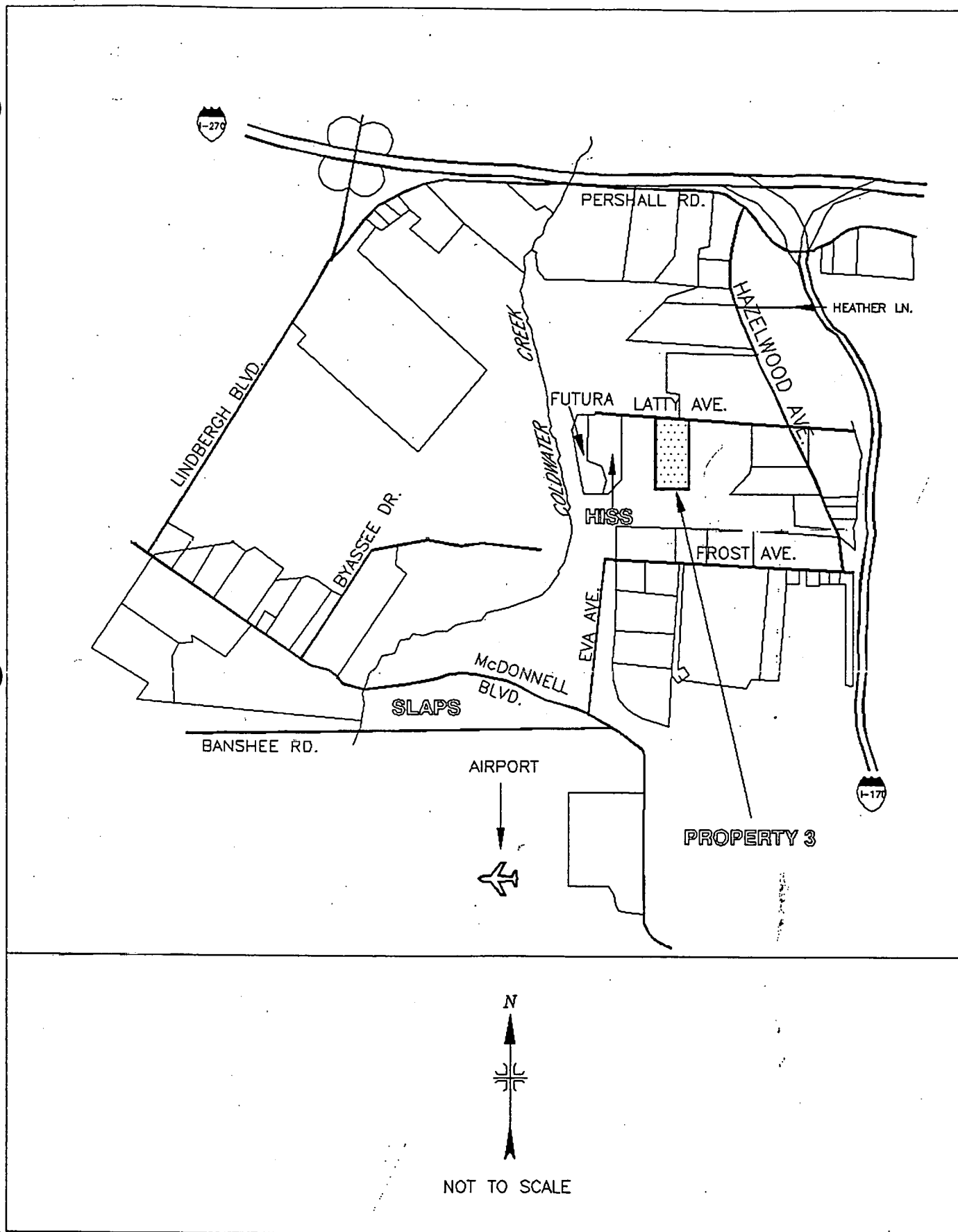


FIGURE 2: Location of Latty Avenue Vicinity Property Number 3

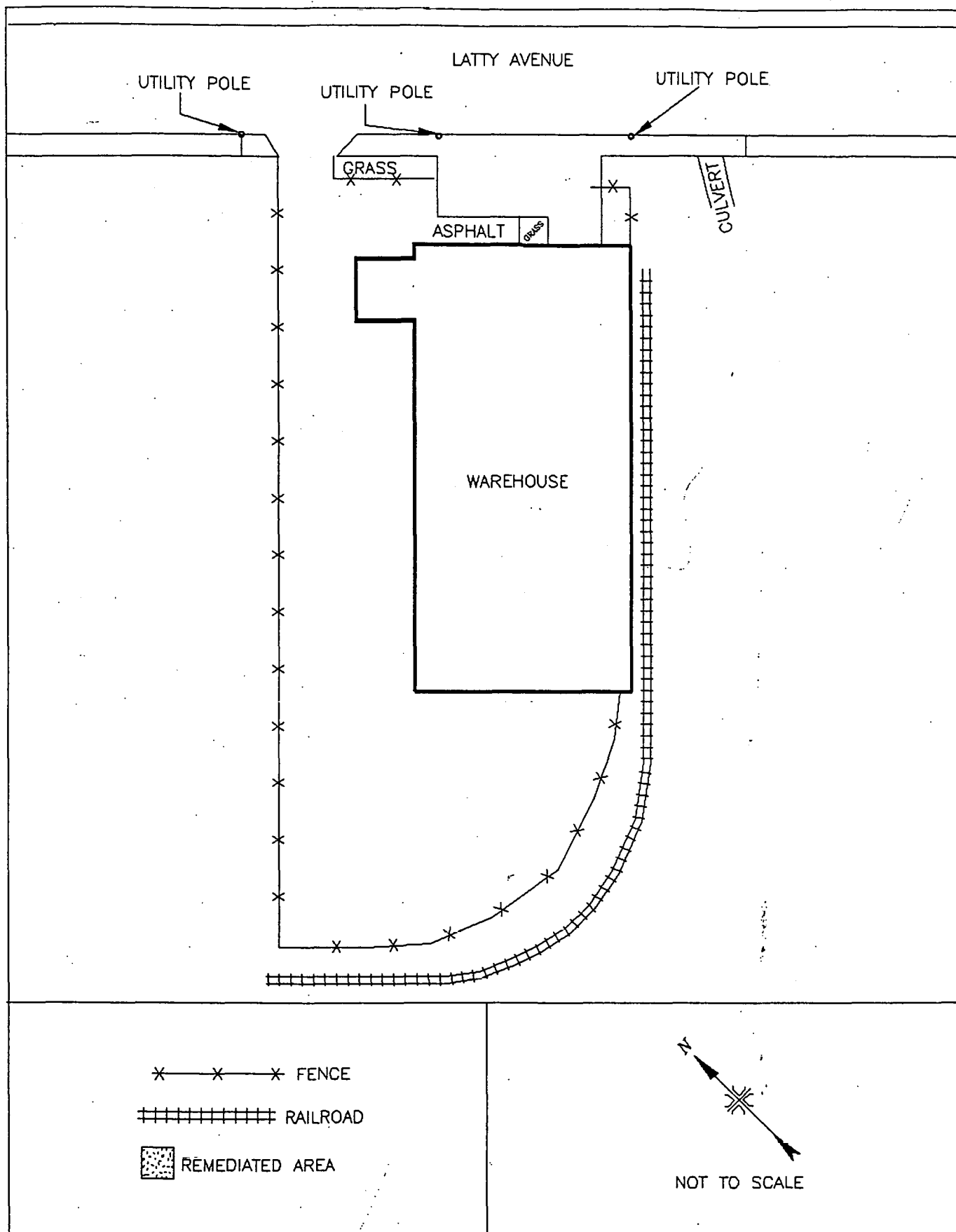


FIGURE 3: Plot Plan of Latty Avenue Vicinity Property 3

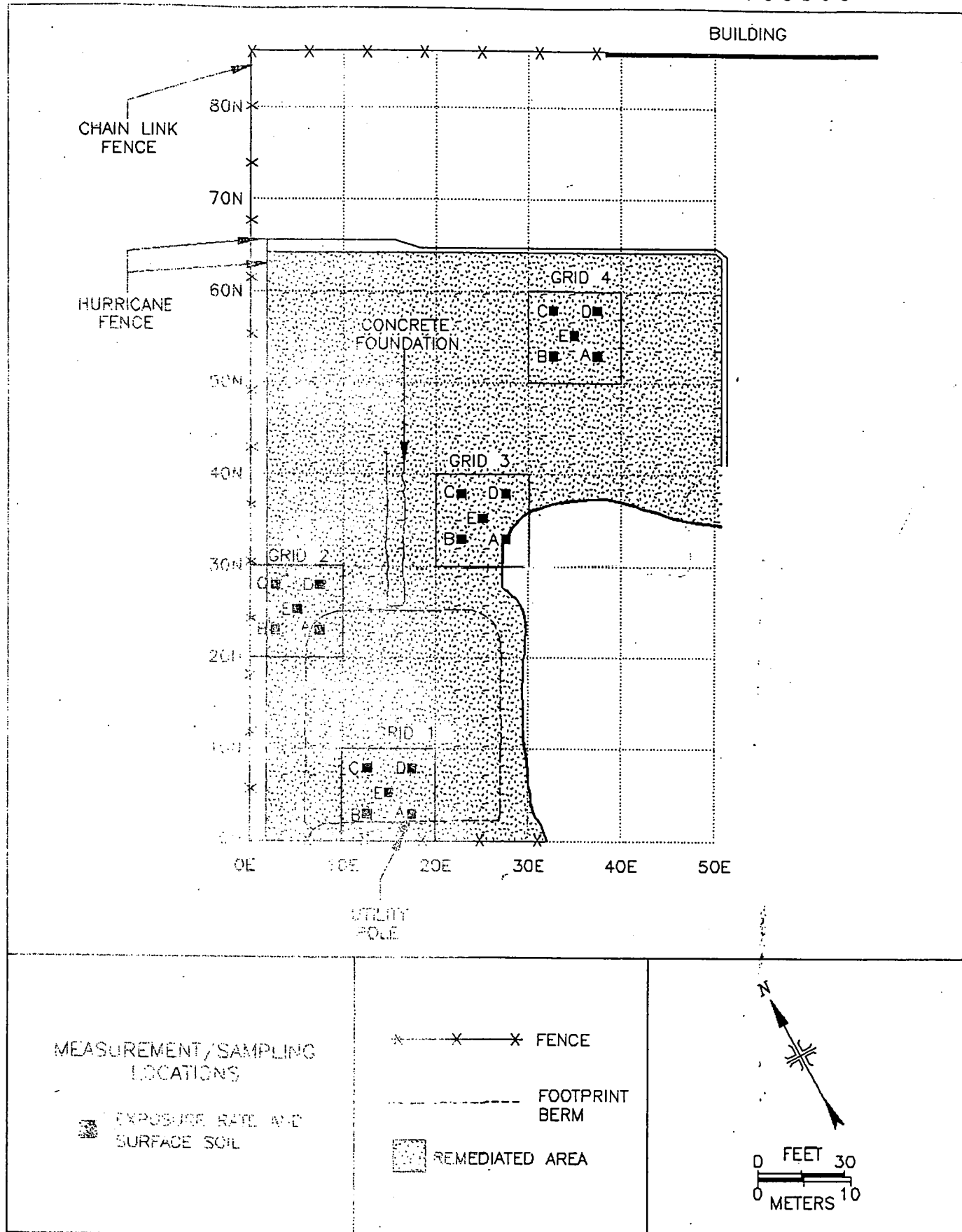


FIGURE 4- Latty Avenue Vicinity Property Number 3, Radiation/Oil Contaminated Soil Pile Area - Measurement and Sampling Locations

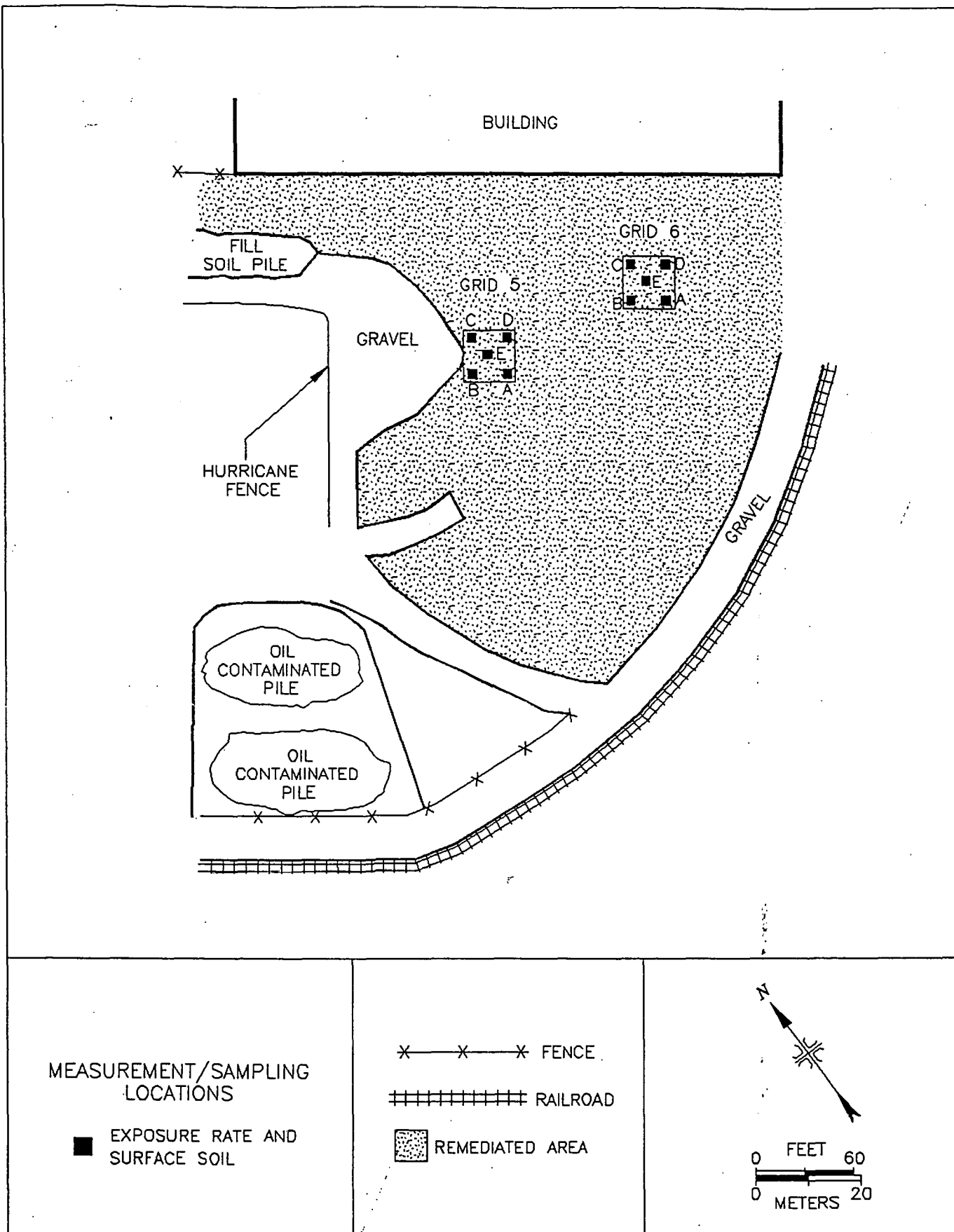


FIGURE 5: Latty Avenue Vicinity Property Number 3, Previously Remediated Area — Measurement and Sampling Locations

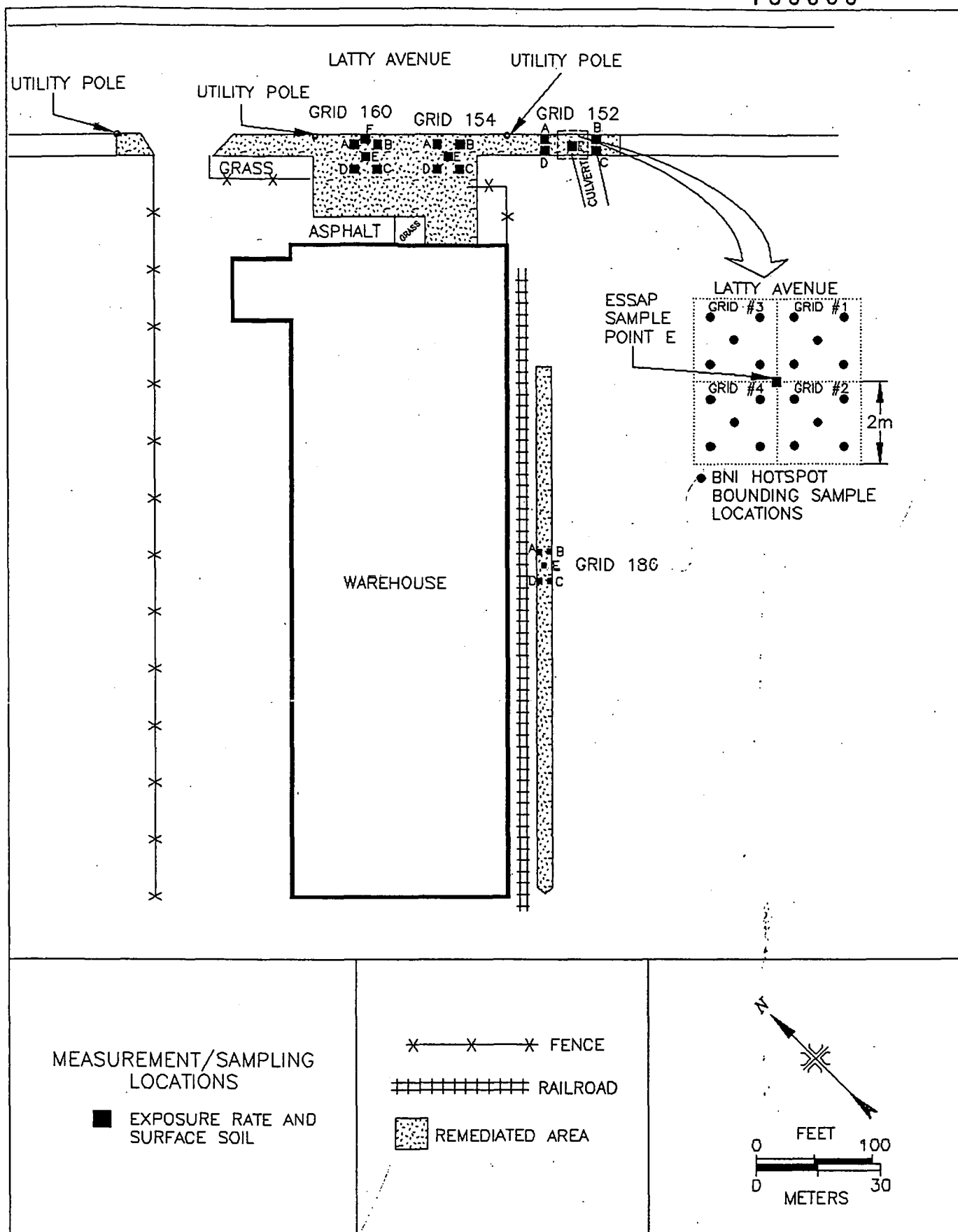


FIGURE 6: Latty Avenue Vicinity Property Number 3 – Measurement and Sampling Locations

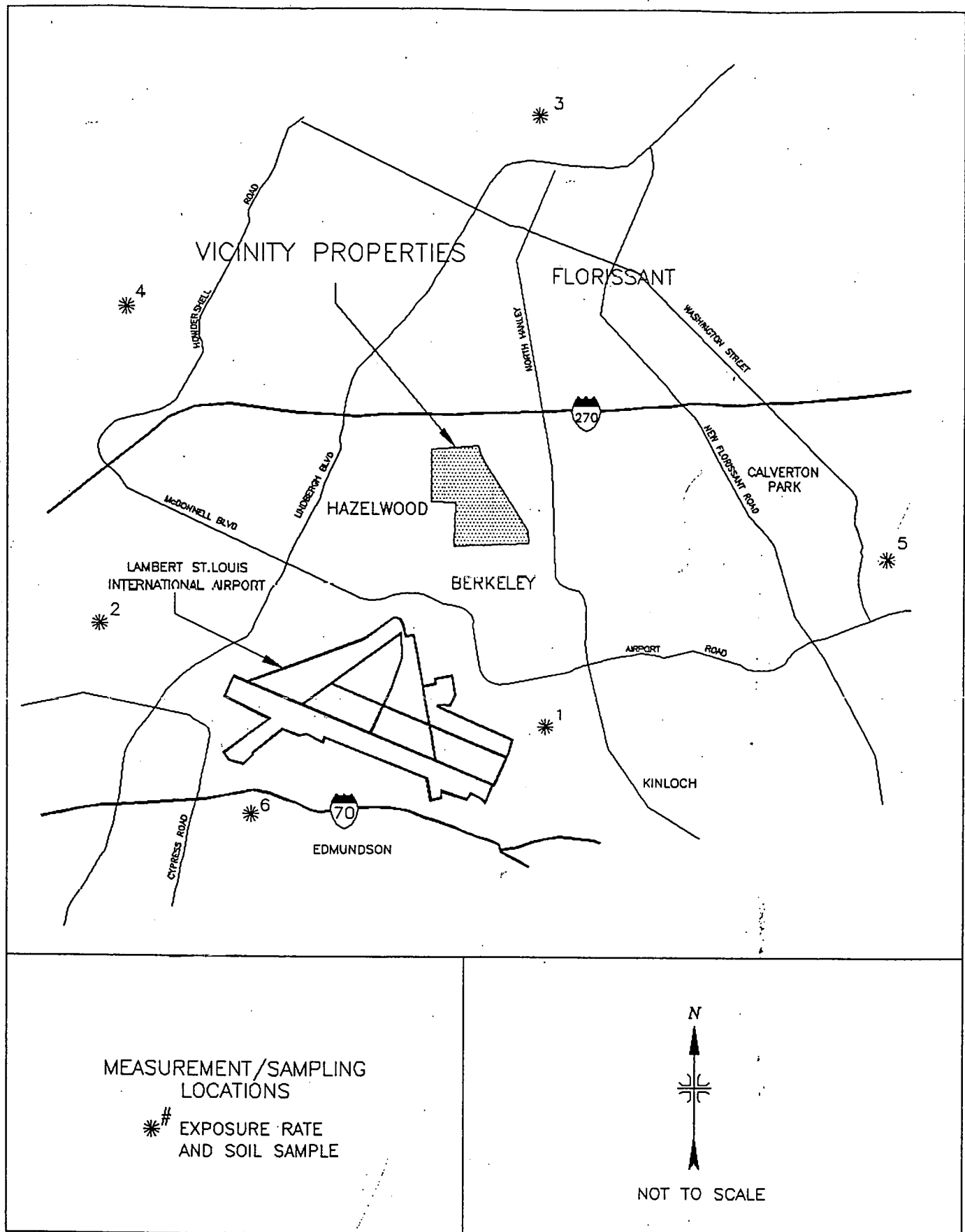


FIGURE 7: Hazelwood and Berkeley, Missouri Area Background Measurement and Sampling Locations

TABLE 1

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL
LATTY AVENUE PROPERTY NUMBER 3
ST. LOUIS AIRPORT SITE VICINITY PROPERTIES
ST. LOUIS, MISSOURI**

Location ^a	Exposure Rates at 1 m (μR/h)	Radionuclide Concentration (pCi/g)			
		Ra-226	Th-230	Th-232	U-238
GRID 1 ^c					
A	8	0.8 ± 0.1 ^c	<4.0	1.0 ± 0.1	1.1 ± 0.3
B	10	0.8 ± 0.1	<3.0	0.9 ± 0.1	1.1 ± 0.3
C	8	1.1 ± 0.1	<2.9	1.1 ± 0.1	1.0 ± 0.3
D	5	0.8 ± 0.1	<4.1	1.1 ± 0.1	0.9 ± 0.3
E	7	0.8 ± 0.1	<3.2	1.1 ± 0.1	1.2 ± 0.3
COMPOSITE ^d	NA ^e	--- ^f	1.71 ± 0.27	1.22 ± 0.21	---
GRID 2 ^b					
A	10	0.9 ± 0.1	<4.3	0.9 ± 0.1	1.1 ± 0.3
B	9	1.1 ± 0.1	15.0 ± 2.9	1.0 ± 0.1	1.2 ± 0.3
C	9	1.1 ± 0.1	17.4 ± 3.2	0.9 ± 0.1	1.4 ± 0.3
D	6	1.1 ± 0.1	<3.2	1.1 ± 0.1	0.8 ± 0.3
E	8	1.0 ± 0.1	2.4 ± 2.3	0.8 ± 0.1	0.9 ± 0.3
COMPOSITE	NA	---	7.44 ± 0.73	1.00 ± 0.17	---
GRID 3 ^b					
A	6	0.8 ± 0.1	<3.7	0.8 ± 0.1	1.1 ± 0.3
B	6	0.9 ± 0.1	<3.2	1.0 ± 0.1	0.8 ± 0.3
C	7	1.1 ± 0.1	3.1 ± 2.0	0.6 ± 0.1	0.9 ± 0.2
D	7	0.9 ± 0.1	<3.4	0.7 ± 0.1	0.9 ± 0.3
E	7	1.0 ± 0.1	<3.1	1.1 ± 0.1	1.1 ± 0.3
COMPOSITE	NA	---	2.22 ± 0.34	1.04 ± 0.20	---

TABLE 1 (Continued)

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL
LATTY AVENUE PROPERTY NUMBER 3
ST. LOUIS AIRPORT SITE VICINITY PROPERTIES
ST. LOUIS, MISSOURI**

Location ^a	Exposure Rates at 1 m (μR/h)	Radionuclide Concentration (pCi/g)			
		Ra-226	Th-230	Th-232	U-238
GRID 4 ^b					
A	7	0.9 ± 0.1	2.4 ± 1.8	0.6 ± 0.1	0.6 ± 0.2
B	5	0.9 ± 0.1	<3.6	0.7 ± 0.1	0.9 ± 0.3
C	4	0.8 ± 0.1	<2.7	0.6 ± 0.1	0.8 ± 0.3
D	7	0.9 ± 0.1	2.2 ± 1.8	0.7 ± 0.1	1.0 ± 0.3
E	9	0.9 ± 0.1	<3.6	0.7 ± 0.1	0.8 ± 0.2
COMPOSITE	NA	---	3.19 ± 0.42	1.01 ± 0.20	---
GRID 5 ^b					
A	6	1.3 ± 0.1	<3.5	1.0 ± 0.1	1.1 ± 0.3
B	8	1.1 ± 0.1	<2.9	1.0 ± 0.1	1.0 ± 0.3
C	7	1.0 ± 0.1	<4.1	1.0 ± 0.1	0.9 ± 0.3
D	6	1.1 ± 0.1	<3.4	1.1 ± 0.1	0.8 ± 0.2
E	6	1.1 ± 0.1	<2.9	1.1 ± 0.1	0.9 ± 0.3
COMPOSITE	NA	---	2.63 ± 0.38	0.91 ± 0.19	---
GRID 6 ^b					
A	9	1.0 ± 0.1	<4.2	1.1 ± 0.1	1.2 ± 0.4
B	8	1.0 ± 0.1	<2.8	0.7 ± 0.1	0.9 ± 0.3
C	9	1.1 ± 0.1	<2.9	1.0 ± 0.1	0.9 ± 0.2
D	8	1.1 ± 0.1	<4.2	1.2 ± 0.1	0.9 ± 0.3
E	8	1.1 ± 0.1	<3.3	1.0 ± 0.1	1.0 ± 0.3
COMPOSITE	NA	---	2.33 ± 0.33	1.16 ± 0.21	---

TABLE 1 (Continued)

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL
LATTY AVENUE PROPERTY NUMBER 3
ST. LOUIS AIRPORT SITE VICINITY PROPERTIES
ST. LOUIS, MISSOURI**

Location ^a	Exposure Rates at 1 m ($\mu\text{R/h}$)	Radionuclide Concentration (pCi/g)			
		Ra-226	Th-230	Th-232	U-238
GRID 152 ^e					
A	6	1.2 \pm 0.0	8.3 \pm 3.3	1.0 \pm 0.1	1.4 \pm 0.3
B	6	1.0 \pm 0.1	<4.5	1.0 \pm 0.1	1.4 \pm 0.4
C	5	1.1 \pm 0.0	3.9 \pm 1.7	0.9 \pm 0.1	1.1 \pm 0.3
D	6	1.1 \pm 0.0	<3.3	1.1 \pm 0.1	1.2 \pm 0.3
E	6	3.3 \pm 0.1	116.9 \pm 4.7 ^b	0.9 \pm 0.1	3.3 \pm 0.3
COMPOSITE	NA	---	22.52 \pm 1.97 ^b	1.14 \pm 0.19	---
GRID 154 ^e					
A	7	0.9 \pm 0.0	<4.2	1.0 \pm 0.1	1.9 \pm 0.4
B	6	0.9 \pm 0.0	<3.4	1.0 \pm 0.1	0.9 \pm 0.4
C	6	1.3 \pm 0.0	8.2 \pm 2.7	0.5 \pm 0.1	1.4 \pm 0.3
D	5	1.0 \pm 0.0	3.0 \pm 2.2	0.4 \pm 0.1	1.5 \pm 0.3
E	6	1.0 \pm 0.0	5.0 \pm 2.6	0.7 \pm 0.1	1.1 \pm 0.3
COMPOSITE	NA	---	4.34 \pm 0.49	0.69 \pm 0.14	---
GRID 160 ^e					
A	6	0.9 \pm 0.0	2.2 \pm 1.5	1.0 \pm 0.1	1.3 \pm 0.3
B	5	0.9 \pm 0.0	<3.9	0.9 \pm 0.1	1.0 \pm 0.3
C	6	1.2 \pm 0.0	3.9 \pm 2.6	0.6 \pm 0.1	1.3 \pm 0.3
D	4	1.0 \pm 0.0	9.4 \pm 2.6	0.5 \pm 0.1	1.2 \pm 0.3
E	6	0.9 \pm 0.0	5.4 \pm 2.3	1.0 \pm 0.1	1.1 \pm 0.3
F	6	1.2 \pm 0.0	<3.3	1.0 \pm 0.1	1.3 \pm 0.3
COMPOSITE	NA	---	3.31 \pm 0.41	0.89 \pm 0.17	---

TABLE 1 (Continued)

**EXPOSURE RATES AND RADIONUCLIDE CONCENTRATIONS IN SOIL
LATTY AVENUE PROPERTY NUMBER 3
ST. LOUIS AIRPORT SITE VICINITY PROPERTIES
ST. LOUIS, MISSOURI**

Location ^a	Exposure Rates at 1 m (μR/h)	Radionuclide Concentration (pCi/g)			
		Ra-226	Th-230	Th-232	U-238
GRID 186 ^b					
A	5	0.8 ± 0.0	<2.7	0.6 ± 0.1	0.8 ± 0.3
B	5	0.9 ± 0.0	<3.9	1.0 ± 0.1	1.0 ± 0.2
C	6	0.9 ± 0.0	<2.6	0.9 ± 0.1	0.8 ± 0.3
D	6	0.8 ± 0.0	<3.3	0.5 ± 0.1	0.8 ± 0.3
E	5	0.9 ± 0.0	<2.8	1.0 ± 0.1	0.8 ± 0.2

^aRefer to Figures 4-6.

^bORISE grid identification numbers.

^cUncertainties represent the 95% confidence level, based only on counting statistics.

^dComposite sample analyzed by alpha spectrometry.

^eNA = not applicable

^f--- = analysis not performed.

^gBNI grid identification numbers.

^hAdditional BNI sampling showed contamination confined to an area $\leq 1 \text{ m}^2$. Weighted grid block average =

$$5.0 \left[1 - \frac{1}{100} \right] + 116.9 \left[\frac{1}{100} \right] = 6.1 \text{ pCi/g}$$

TABLE 2

**BACKGROUND EXPOSURE RATES
AND RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES
ST. LOUIS AIRPORT SITE VICINITY PROPERTIES
HAZELWOOD AND BERKELEY, MISSOURI**

Sample No.	Location ^a	Exposure Rates at 1 m (μ R/h)	Radionuclide Concentration (pCi/g)			
			Ra-226	Th-230	Th-232	U-238
1	School Access Road and Harmond Road	10	1.0 ± 0.1^b	1.31 ± 0.2^c	1.1 ± 0.1	1.1 ± 0.5
2	Fee Fee Road and Duncombe Drive	10	0.7 ± 0.1		1.0 ± 0.1	0.9 ± 0.5
3	St. Ferdinand Park at St. Pierre Street	9	0.9 ± 0.1		1.1 ± 0.1	1.3 ± 0.4
4	White Birch Park	9	0.8 ± 0.1		1.1 ± 0.1	1.1 ± 0.4
5	Robert Superior Park	9	0.9 ± 0.1		1.1 ± 0.1	1.2 ± 0.4
6	St. Ann Park at St. Ambrose Lane	9	0.8 ± 0.1		1.0 ± 0.1	0.9 ± 0.3

^aRefer to Figure 4.

^bUncertainties represent the 95% confidence level, based only on counting statistics.

^cComposite of samples 1 through 6. Alpha spectrometry results.

REFERENCES

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00-1849

Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the St. Louis Site, Missouri



U.S. Department of Energy

Property
of
ST LOUIS FUSRAP LIBRARY