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Formerly Utilized Sites Remedial Action Program (FUSRAP)  
Contract No. DE-AC05-81OR20722

# ST. LOUIS AIRPORT STORAGE SITE (SLAPSS) ENVIRONMENTAL MONITORING SUMMARY

St. Louis, Missouri

Calendar Year 1984

July 1985



Bechtel National, Inc.  
Advanced Technology Division

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ST. LOUIS AIRPORT STORAGE SITE (SLAPSS)  
ENVIRONMENTAL MONITORING SUMMARY  
CALENDAR YEAR 1984

JULY 1985

Prepared for

UNITED STATES DEPARTMENT OF ENERGY  
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By

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## TABLE OF CONTENTS

	<u>Page</u>
1.0 Introduction	1
2.0 Environmental Monitoring Summary	2
Figure 1 Location of the St. Louis Airport Storage Site (SLAPSS) and Environmental Monitoring Locations	6
Table 1 Total Uranium, Radium-226, and Thorium-230 Concentrations in Surface Water, Coldwater Creek, SLAPSS, 1984	7
Table 2 Uranium, Radium-226, and Thorium-230 Concentrations in Sediments, Coldwater Creek, SLAPSS, 1984	8
Table 3 Total Uranium, Radium-226, and Thorium-230 Concentrations in Monitoring Wells at SLAPSS, 1984	9
Table 4 Radon Concentrations and External Gamma Exposure Rates at SLAPSS, 4th Quarter 1984	10
References	11

## 1.0 INTRODUCTION

The St. Louis Airport Storage Site (SLAPSS) occupies 21.7-acres north of the St. Louis, Missouri airport. The site is shown in Figure 1. The site is located in an area of mixed industrial, transportation, commercial, and recreational uses. Approximately 3000 persons reside within one mile of the site (Ref. 1).

From 1948 to 1966, the site was used by the Atomic Energy Commission (AEC) for storage of radioactive materials, equipment, and residues. Most of these materials were removed in 1966 and 1967, and ownership of the site was transferred to the City of St. Louis Airport Authority in 1973. Currently the site is not occupied, contains no structures other than a security fence, and is used and maintained only for storage of buried contaminated rubble and other materials. The site is not currently controlled or regulated by the U.S. Department of Energy (DOE) or the Nuclear Regulatory Commission (NRC).

Radiological surveys conducted in 1976 and 1978 by Oak Ridge National Laboratory (ORNL) determined that SLAPSS and the drainage ditches north and south of McDonnell Boulevard (see Figure 1) were radioactively contaminated above remedial action program guidelines. The ditches have been designated for remedial action consideration under the Formerly Utilized Sites Remedial Action Program (FUSRAP), a DOE effort to identify, clean up, or otherwise control sites where low-level radioactive contamination (exceeding current guidelines) remains from the early years of the nation's atomic energy program. The SLAPSS property has not yet been designated for consideration for remedial action under FUSRAP. However, routine radiological monitoring of the site has been authorized. The monitoring program is conducted by Bechtel National, Inc. (BNI), Program Management Contractor for FUSRAP. The monitoring program and results are detailed in the following section.

## 2.0 ENVIRONMENTAL MONITORING SUMMARY

The routine environmental monitoring program for SLAPSS and the off-site ditches includes surface water and sediment sampling of Coldwater Creek, groundwater sampling of six monitoring wells within the site boundary, radon gas monitoring, and external gamma radiation measurements. Sampling locations are shown in Figure 1.

This section summarizes the various environmental sampling, monitoring, and analytical procedures. Environmental monitoring results listed in the individual tables are the arithmetic average of individual results. Individual sources of error (i.e., analytical error, sampling error, etc.) have not been estimated. In computing averages, where values are less than the limit of sensitivity of the analytical method, the average value is reported without the notation "less than".

Because SLAPSS is not controlled or regulated by DOE or NRC, no specific guidelines for radionuclides are applicable to the site. For comparative purposes, guidelines or limits from both DOE and NRC are provided as footnotes in the various tables. In addition, as the various monitoring results are reported in the sections below, DOE Concentration Guidelines (CGs) are provided to show how the monitoring results would have compared had the site been owned by DOE. The CGs represent the concentration of a radionuclide in air or water that would limit the dose to the most highly exposed individual to equal to or less than accepted radiation protection standards (Ref. 2).

### SURFACE WATER

Off-site surface water sampling frequency was increased to quarterly in 1984 instead of semi-annually as in 1983 (Ref. 3). Water (and sediment) samples are taken from Coldwater Creek approximately 50 feet downstream of the ditch that runs along McDonnell Boulevard (Location 1) and at the intersection of the creek and Interstate 70 (Location 2). Location 2 is upstream of SLAPSS and provides the background concentrations.

Once each quarter, surface water samples are collected, consisting of nominal 1-liter grab samples to fill a 4-liter container. Eberline Analytical Corporation (EAC) analyzes the samples for total uranium, radium-226, and thorium-230. Radium-226

concentrations are determined by precipitating with barium sulfate, dissolving the resulting Ba-Ra sulfate, and transferring it to an emanation tube where radon-222 is allowed to come to equilibrium. The radon-222 is then counted by alpha scintillation. Total uranium is determined by a fluorometric method. Thorium-230 is eluted in solution, electrodeposited on stainless steel discs, and counted by alpha spectrometry.

Table 1 shows the concentrations of total uranium, radium-226, and thorium-230 measured in the water in Coldwater Creek. Total uranium concentrations ranged from 1 pCi/l to 27 pCi/l, with the higher values occurring downstream. Radium-226 concentrations ranged from less than 0.1 to 0.3 pCi/l, with the higher value occurring downstream. Analysis for thorium-230 showed results that ranged from less than 0.1 pCi/l to less than 0.4 pCi/l, with the higher value occurring in the upstream sample. Were SLAPSS a DOE site, these monitoring results could be compared to the DOE CGs for water released to uncontrolled areas, which are: 600 pCi/l for uranium, 30 pCi/l for radium, and 2000 pCi/l for thorium.

#### SEDIMENTS

Sediments in Coldwater Creek were sampled during the third quarter of 1984. Samples were 500 g composites and were analyzed for radium-226, thorium-230, total uranium, and isotopic uranium. The results of the analyses are reported in Table 2. The higher concentrations in sediments occurred downstream of SLAPSS.

Again, SLAPSS is not controlled or regulated by NRC or DOE, and there are no specific DOE guidelines for radionuclides in sediments. However, DOE FUSRAP sites are being decontaminated to meet proposed guidelines for radionuclides in soil. For comparative purposes, these guidelines are 5 pCi/g in the upper 6 in. and 15 pCi/g below 6 in. for radium and thorium, and 75 pCi/g for uranium (Ref. 4).

#### GROUNDWATER

In 1984, monitoring wells were sampled using a bailer after results obtained using bailed samples had proven comparable to samples obtained with the peristaltic pump and procedures previously used by ORNL (Ref. 5). Before samples are collected, wells are

bailed dry or one well volume is removed. Four-liter samples are obtained and then are analyzed by EAC for radium-226, thorium-230, and total uranium using the same methods as for surface water samples.

The results of analyses for uranium, radium-226, and thorium-230 in the groundwater beneath SLAPSS are presented in Table 3. Total uranium concentrations in groundwater ranged from 17 pCi/l to 7337 pCi/l. Radium-226 concentrations ranged from less than 0.1 pCi/l to 1 pCi/l. Thorium-230 concentrations in the groundwater ranged from less than 0.1 pCi/l to 27 pCi/l. Radium-226 concentrations are within the range of concentrations (less than 0.03 to 9 pCi/l) measured in the past (Refs. 3 and 5). Uranium concentrations appear to be increasing, with the maximum level (Well B) twice as large as the maximum level measured in 1983 (Ref. 3). Thorium-230 concentrations are near the range of values (less than 0.03 to 18 pCi/l) measured previously (Ref. 3). Had SLAPSS been a DOE site in 1984, the uranium concentrations in water from Well A would have been twice the DOE CG of 600 pCi/l for uranium released to uncontrolled areas. Uranium concentrations in water from Well B would have been almost 10 times the CG. Radium and thorium concentrations would have been below the DOE CGs of 30 pCi/l and 2000 pCi/l, respectively, for water released to uncontrolled areas.

#### RADON GAS

Radon gas monitoring was initiated during the fourth quarter of 1984. Radon monitoring was conducted using Terradex Type-F Track-Etch detectors, which also are analyzed by Terradex Corporation. The Terradex detectors were initially installed at 5 locations on September 19, 1984 and provided results only for the 4th quarter. A sixth location (Location 5) could not be installed at that time because the planned location was inaccessible due to mounds of debris covered with vegetation.

The results of the measurements for radon are presented in Table 4. Radon concentrations measured at the site ranged from 0.14 pCi/l to 0.62 pCi/l. Had SLAPSS been a DOE site in 1984, these concentrations would have compared to the DOE CG of 3.0 pCi/l for radon released to uncontrolled areas.

#### EXTERNAL GAMMA RADIATION

External gamma exposure rate measurements were initiated during the fourth quarter of 1984. External gamma exposure rates were obtained using lithium-fluoride

thermoluminescent dosimeters (TLDs). Each dosimeter contains five individual chips, the responses of which are averaged. Analytical services are provided by EAC. The TLDs were initially installed at 5 locations on September 19, 1984 and provided results only for the 4th quarter. A sixth location (Location 5) could not be installed at that time because the planned location was inaccessible due to mounds of debris covered with vegetation.

The results of the measurements for external gamma are presented in Table 4. External gamma radiation measurements ranged from 15.7 uR/h to 260.4 uR/h at the sampling locations. All results include the normal background level of 10 to 15 uR/h for the area (Ref. 6). Though SLAPSS was not owned or regulated by NRC or DOE, for comparison purposes, the DOE Radiation Protection Standard for external gamma radiation exposure to members of the public is 60 uR/h.



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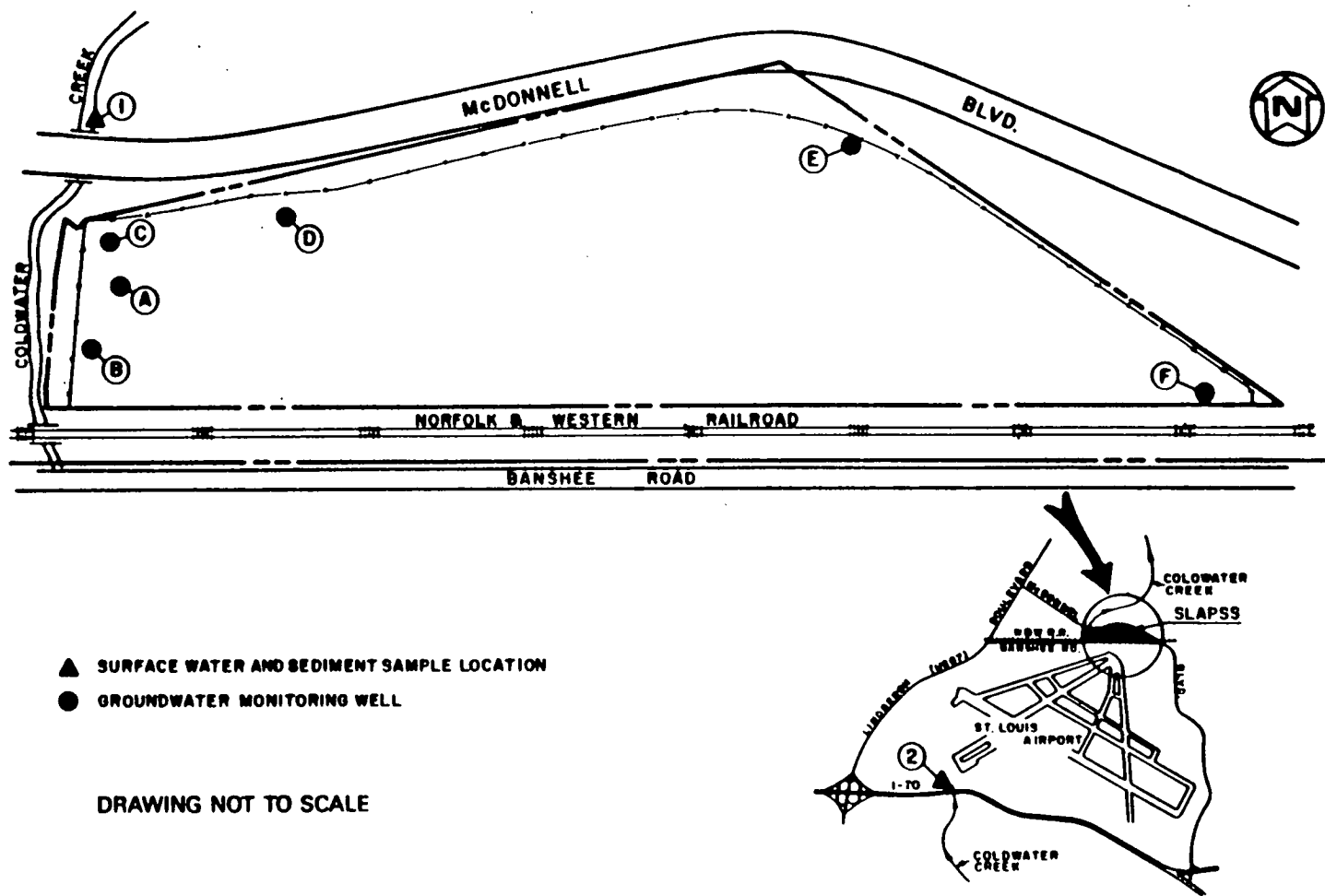


FIGURE 1 LOCATION OF THE ST. LOUIS AIRPORT STORAGE SITE (SLAPSS) AND THE ENVIRONMENTAL MONITORING LOCATIONS

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TABLE 1  
TOTAL URANIUM, RADIUM-226, AND THORIUM-230 CONCENTRATIONS  
IN SURFACE WATER, COLDWATER CREEK, SLAPSS, 1984<sup>a</sup>

Sampling Location <sup>b</sup>	Number of Samples <sup>c</sup>	Radionuclide Concentrations (pCi/l)		
		Minimum	Maximum	Average <sup>d</sup>
<u>Total Uranium</u>				
1	3	6	27	14
2	3	1	11	4
<u>Radium-226</u>				
1	3	0.1	0.3	0.2
2	3	0.1	0.2	0.1
<u>Thorium-230</u>				
1	3	0.1	0.1	0.1
2	3	0.3	0.4	0.36

<sup>a</sup>Neither SLAPSS nor the ditches are currently being radiologically controlled or regulated by DOE or NRC. However, for purposes of general orientation, the radium and uranium concentrations reported above might be compared to the following regulatory limits or guidelines:

1. DOE Order 5480.1A off-site guidelines for dissolved radium and uranium are 30 pCi/l and 600 pCi/l, respectively. (For conversions, 1 mg uranium equals 667 pCi of total activity). The thorium limit is 2000 pCi/l.
2. NRC's 10 CFR 20 regulations for licensees specify off-site limits for radium, uranium, and thorium at 30 pCi/l, 20,000 pCi/l, and 2000 pCi/l, respectively.
3. EPA's interim drinking water standard for radium is 5 pCi/l.

<sup>b</sup>Locations are shown in Figure 1. Location 1 is downstream and Location 2 is upstream of SLAPSS.

<sup>c</sup>Second quarter samples lost in transit.

<sup>d</sup>In computing the average, quarterly values that are less than the limit of sensitivity are considered as being equal to the limit of sensitivity. Average values are reported without the notation "less than."

TABLE 2  
 URANIUM, RADIUM-226, AND THORIUM-230  
 CONCENTRATIONS IN SEDIMENTS,  
 COLDWATER CREEK, SLAPSS, 1984<sup>a</sup>

Radionuclide	Concentration (pCi/g dry) <sup>b</sup>	
	Location 1	Location 2
U-234	1.6	0.6
U-235	0.07	0.04
U-238	1.5	0.6
Ra-226	0.1	0.3
Th-230	1.5	1.2

<sup>a</sup>Locations are shown in Figure 1. Location 1 is downstream and Location 2 is upstream. Sample obtained 9/20/84.

<sup>b</sup>There are no specific limits for the listed radionuclides in sediment. For comparative purposes, the DOE FUSRAP proposed guidelines for radionuclides in soil are 5 pCi/g in the upper 6 in. and 15 pCi/g below 6 in. for radium and thorium, and 75 pCi/g for uranium (Ref. 4).

TABLE 3  
TOTAL URANIUM, RADIUM-226, AND THORIUM-230  
CONCENTRATIONS IN MONITORING WELLS AT SLAPSS, 1984

Sampling Location <sup>a</sup>	Number of Samples	Concentration (pCi/l) <sup>b</sup>		
		Minimum	Maximum	Average
<u>Total Uranium</u>				
Well A	4	967	1668	1287
Well B	4	4600	7337	5700
Well C	4	17	91	40
Well D	4	97	348	233
Well E	4	93	183	129
Well F	4	67	233	141
<u>Radium-226</u>				
Well A	4	0.2	0.4	0.3
Well B	4	0.2	0.5	0.3
Well C	4	0.1	0.5	0.3
Well D	4	0.1	0.3	0.2
Well E	4	0.1	1.0	0.6
Well F	4	0.1	0.3	0.2
<u>Thorium-230</u>				
Well A	3	0.1	27	9.5
Well B	4	0.1	0.5	0.3
Well C	4	0.1	0.4	0.2
Well D	4	0.1	2.8	0.9
Well E	4	0.1	0.6	0.3
Well F	4	0.1	1.0	0.4

<sup>a</sup>Locations are shown in Figure 1.

<sup>b</sup>Neither SLAPSS nor the ditches are currently being radiologically controlled or regulated by DOE or NRC. However, for purposes of general orientation, the radium and uranium concentrations reported above might be compared to the following regulatory limits or guidelines:

1. DOE Order 5480.1A off-site guidelines for dissolved radium and uranium are 30 pCi/l and 600 pCi/l (or approximately 1 mg/l), respectively. (For conversions, 1 mg uranium equals 667 pCi of total activity.) The thorium limit is 2000 pCi/l.
2. NRC's 10 CFR 20 regulations for licensees specify off-site limits for radium, uranium, and thorium, at 30 pCi/l, 20,000 pCi/l, and 2000 pCi/l, respectively.
3. EPA's interim drinking water standard for radium is 5 pCi/l.

TABLE 4  
RADON CONCENTRATIONS AND EXTERNAL GAMMA EXPOSURE  
RATES AT SLAPSS, 4TH QUARTER 1984

Sampling Location <sup>a</sup>	Radon Concentration (pCi/l)	Average Gamma Exposure Rate <sup>b</sup> (uR/h)
1	0.14	19.2
2	0.48	260.4
3	0.28	25.7
4	0.62	18.3
5	c	c
6	0.37	15.7

<sup>a</sup>Sample locations are shown in Figure 1.

<sup>b</sup>All results include background gamma rate, which is 10-15 uR/h (Ref. 6).

<sup>c</sup>Planned location inaccessible at time of installation.

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