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

**HAZELWOOD INTERIM STORAGE
SITE ENVIRONMENTAL
MONITORING SUMMARY**

Hazelwood, Missouri

Calendar Year 1984

July 1985



Property
of
ST LOUIS FUSRAP LIBRARY

Bechtel National, Inc.
Advanced Technology Division

HAZELWOOD INTERIM STORAGE SITE
ENVIRONMENTAL MONITORING SUMMARY
CALENDAR YEAR 1984

JULY 1985

Prepared for

UNITED STATES DEPARTMENT OF ENERGY
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By

Bechtel National, Inc.
Advanced Technology Division
Oak Ridge, Tennessee

Bechtel Job No. 14501

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1.0 INTRODUCTION

The Hazelwood Interim Storage Site (HISS) is located at 9200 Latty Avenue, Hazelwood, Missouri (Figure 1). The property on which the HISS is situated is owned by the Jarboe Realty & Investment Company and is leased to Futura Coatings, Inc. The HISS is surrounded by commercial, light industrial, and transportation facilities. Recent data indicate approximately 2500-3000 people live within one mile of the site (Ref. 1).

In 1966 ore residues and uranium- and radium-bearing process wastes were moved to this property from the St. Louis Airport Storage Site (SLAPSS). Some of the residues were dried in two buildings on-site before being shipped to a Colorado mill. The earthen floors of these buildings became contaminated during these operations. The remaining residues and wastes were removed from the property in 1973 to terminate a Nuclear Regulatory Commission license for storage, and the property was later sold to the current owner. Jarboe Realty & Investment Company excavated the western part of the property to decontaminate the floors of the two process buildings and to permit construction of new buildings. A third building was demolished. The excavated material was stored in a pile on the eastern part of the property.

Radiological surveys in 1977 and 1982 indicated uranium and thorium contamination and elevated radiation levels in the soil on this property and several others in the immediate vicinity (Refs. 2 and 3). As part of the research and development program authorized by Congress under the 1984 Energy and Water Appropriations Act, Bechtel National, Inc. (BNI) is conducting remedial action on-site and at the vicinity properties. The work is being performed as part of the U. S. Department of Energy (DOE) 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.

Jarboe Realty & Investment Company has agreed to permit DOE to store contaminated material from the FY 1984 and 1985 Latty Avenue cleanup on its property. The contaminated material will be added to the existing pile created during the earlier site cleanup. The pile will then be covered to prevent erosion or migration of contamination. The property will be maintained as the HISS by DOE until final disposition for these materials is determined.

BNI is conducting a surveillance monitoring program at the HISS during the interim storage period to detect potential migration of contaminants from the storage pile via air, water, and sediment. This summary provides these monitoring data for calendar year 1984.

2.0 ENVIRONMENTAL MONITORING SUMMARY

The routine environmental monitoring program for the HISS includes surface water, groundwater, and sediment sampling as well as radon gas and external radiation measurements to determine the site's compliance with DOE Concentration Guides (CGs) provided in DOE Order 5480.1A, Chapter XI (Ref. 4). 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.

This section summarizes the various environmental sampling, monitoring, and analytical procedures and the extent of conformance with the CGs. 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".

Monitoring locations are shown in Figures 2 and 3. Prior to initiation of remedial action work, BNI began baseline sampling of surface water in the vicinity of the site in April 1984. Sampling of groundwater from existing wells commenced in June 1984, and radon and external radiation sampling locations were installed in September 1984. All sampling is conducted quarterly.

SURFACE WATER

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. Total uranium is determined by a fluorometric method. Radium-226 concentrations are determined by precipitating radium-226 as the sulfate, transferring the sulfate to a radon bubbler where the radon-222 daughter is allowed to come to equilibrium, and then counting the radon-222 by alpha spectrometry to determine the amount of parent radium-226 activity originally present. Thorium-230 is eluted in solution, electrodeposited on stainless steel discs, and counted by alpha spectrometry.

During baseline sampling, samples were also analyzed for actinium and protactinium; results for all sampling locations were below the detection limit. Surface water samples were not collected at Location 8, an intermittent drainageway, which was dry during the three quarterly sampling periods.

Table 1 shows the concentrations of total uranium, radium-226, and thorium-230 measured in the surface waters receiving runoff from the HISS. Total uranium concentrations ranged from less than 3 pCi/l to 334 pCi/l and are below the DOE CG of 600 pCi/l for release to uncontrolled areas (Ref. 4). Radium-226 concentrations ranged from less than 0.1 pCi/l to 0.8 pCi/l, which is below the CG of 30 pCi/l for release to uncontrolled areas (Ref. 4). Thorium-230 concentrations in surface water ranged from less than 0.1 pCi/l to 35 pCi/l, which is below the CG of 2000 pCi/l for release to uncontrolled areas (Ref. 4).

GROUNDWATER

Monitoring wells are sampled using a hand bailer. Before the samples are collected, wells are bailed dry or a minimum of one well volume is removed. Four-liter samples are then obtained and analyzed for total uranium, radium-226, and thorium-230 as described for surface water samples. Results of analyses are presented in Table 2. Total uranium concentrations ranged from 6 pCi/l to 100 pCi/l. Radium-226 concentrations ranged from less than 0.1 pCi/l to 6 pCi/l and thorium-230 concentrations ranged from less than 0.1 pCi/l to 320 pCi/l. All measured concentrations are below the respective DOE CGs noted above.

The wide range in surface water and groundwater results at individual monitoring locations is assumed to be the result of either remedial action activities or weather conditions at the HISS, although exact correlation with specific events is not possible. Baseline and second quarter samples were obtained before work started at the site, while the disturbance of radioactive materials during remedial action was occurring at the time of third and fourth quarter sampling. Heavy rainfall occurred at the HISS prior to the collection of third and fourth quarter samples. This could have diluted or increased the radionuclide concentrations in the water, depending on the proximity of the individual monitoring station to contaminated materials.

SEDIMENT

Sediment samples are approximately 500-gram composites obtained at surface water sampling locations where sediment is present. Sediment samples were obtained only during baseline sampling at Locations 7 and 8 and were analyzed for thorium-230. The results were 230 pCi/g (dry) and 540 pCi/g (dry), respectively.

There are no specific limits for uranium, radium, or thorium in sediments. However, decontamination of HISS is being conducted to the DOE FUSRAP proposed guidelines for radionuclides in soil. For comparative purposes, these proposed 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. 5).

No additional samples were obtained as part of the environmental monitoring program because of the absence of sediment at the sample locations. Future sampling along Coldwater Creek and its tributaries will be conducted as part of characterization and remedial action plans for the site.

RADON GAS

Radon gas is monitored using Terradex Type-F Track-Etch detectors. Terradex Corporation also provides analytical services. Radon results were available for the period September 21 to October 4 and the fourth quarter (October 4 to January 11, 1985) and are presented in Table 3. Average radon concentrations ranged from 0.31 pCi/l to 2.21 pCi/l. The DOE CG for radon released to uncontrolled areas is 3.0 pCi/l annual average (Ref. 4). The highest levels occurred during the initial 2-week sampling period.

EXTERNAL GAMMA RADIATION

External gamma exposure rates are obtained using lithium-fluoride thermoluminescent dosimeters (TLDs). Each dosimeter contains five individual chips, the responses of which are averaged. Eberline Analytical Corporation provides analytical services.

External radiation results were available for the period September 21 to October 4 and the fourth quarter (October 4 to January 11, 1985) and are presented in Table 4. Average external gamma radiation measurements ranged from 35.7 uR/h to 139.7 uR/h,

which is above the normal background level of 10 to 15 uR/h for the area (Ref. 6). The DOE Radiation Protection Standard (RPS) for external exposure to members of the public is 60 uR/h (Ref. 4).

The highest external radiation levels and radon concentrations occurred during the initial 2-week sampling period. Although exact correlation with specific remedial action activities is not possible, it is assumed that the lower readings during the fourth quarter resulted from the removal of contaminated materials from the vicinity of the monitoring locations.

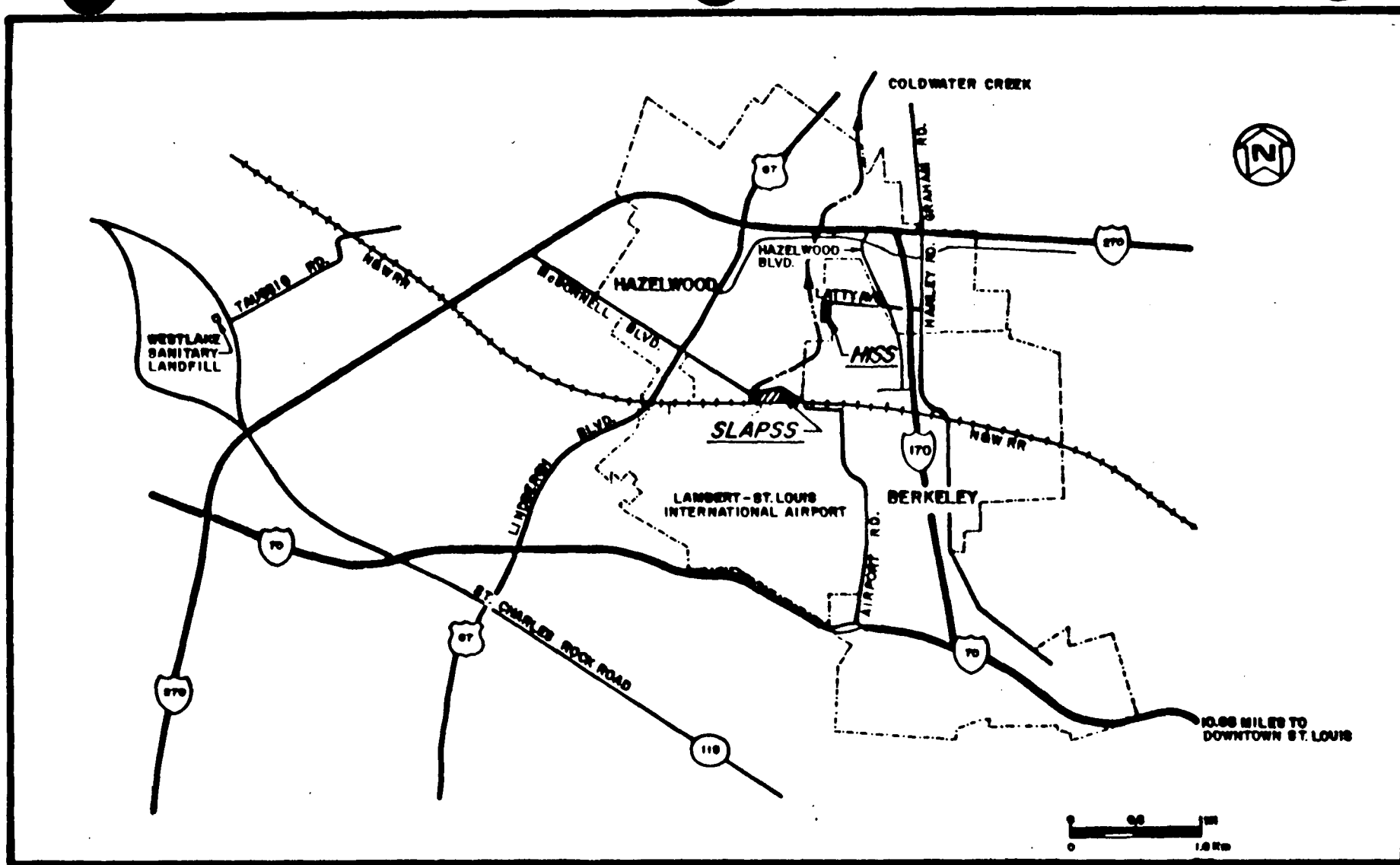


FIGURE 1 LOCATION OF THE HISS

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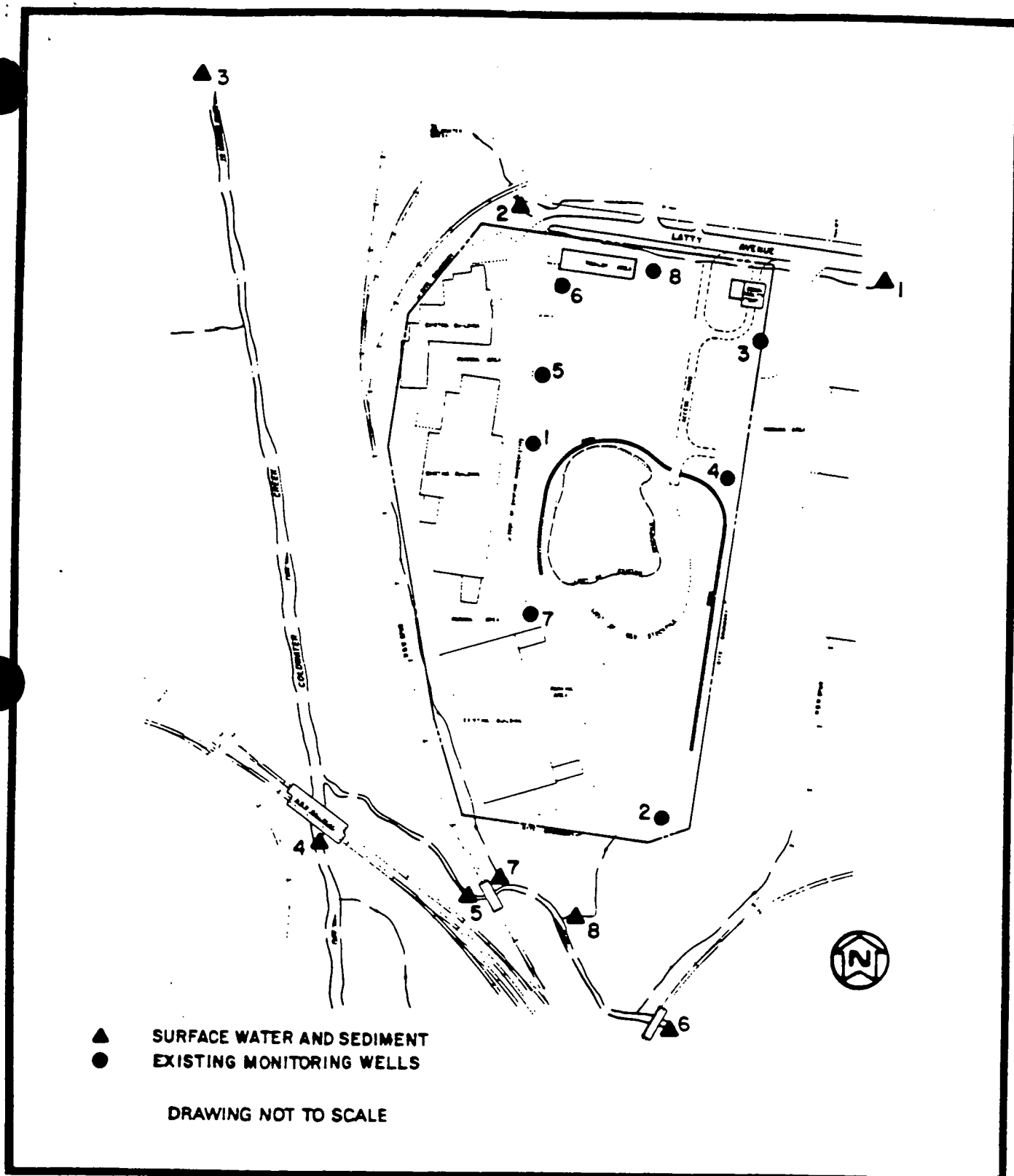


FIGURE 2 SURFACE WATER AND GROUNDWATER MONITORING LOCATIONS AT THE HISS

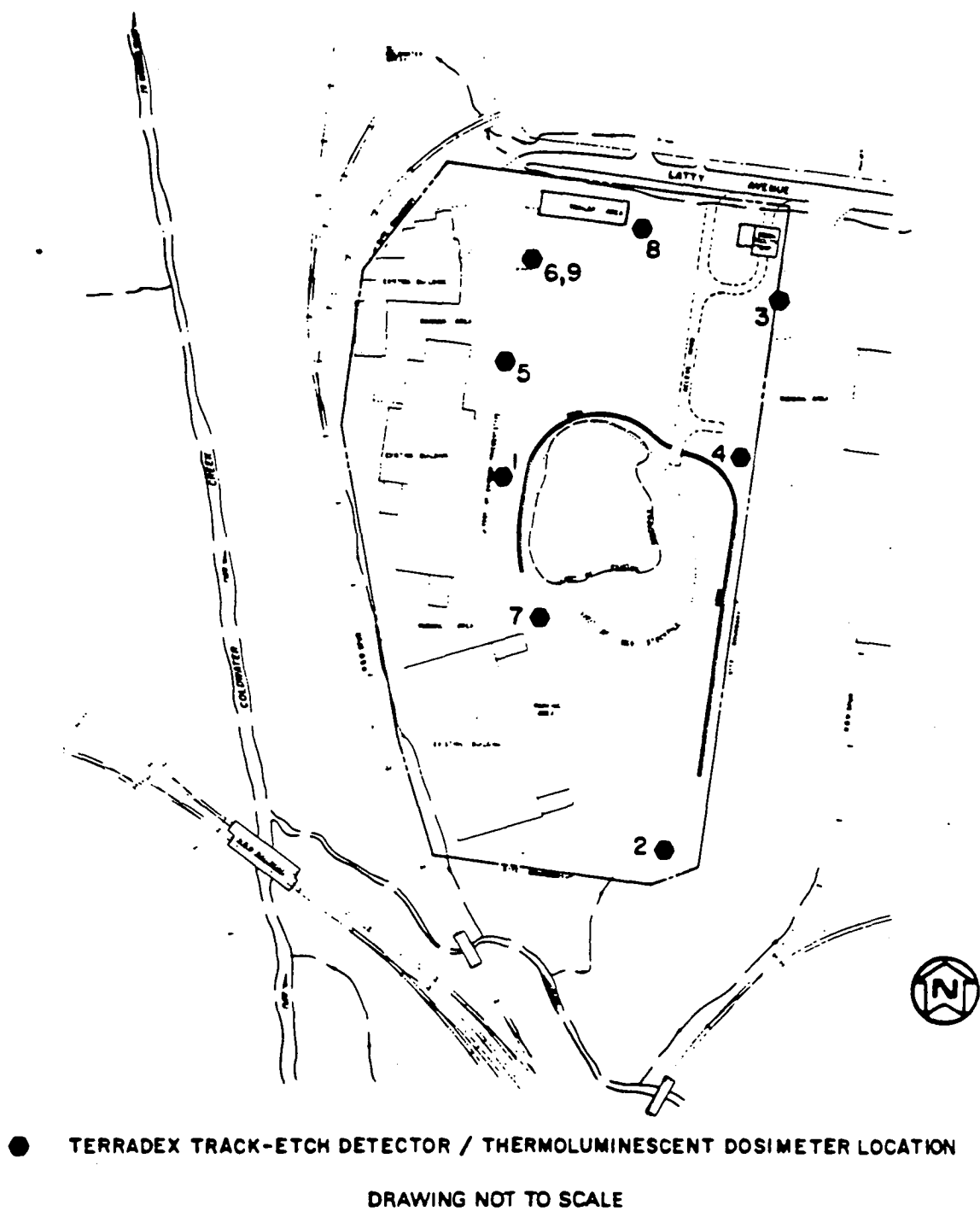


FIGURE 3 RADON AND EXTERNAL GAMMA RADIATION
MONITORING LOCATIONS AT THE HISS

TABLE I
TOTAL URANIUM, RADIUM-226, AND THORIUM-230 CONCENTRATIONS
IN SURFACE WATER AT THE HISS, 1984^a

Sampling Location ^b	Number of Samples ^c	Concentrations (pCi/l)				Percent of Standard ^d
		Baseline	Minimum	Maximum	Average	
<u>Total Uranium</u>						
1	3	<3	3	133	67	11
2	4	5	4	173	69	11
3	4	9	<3	280	97	16
4	4	9	<3	334	116	19
5	3	e	<3	193	67	11
6	4	<3	<3	200	69	11
7	2	10	<3	<3	3	1
8	1 ^f	207	207	207	207	34
<u>Radium-226</u>						
1	3	<0.1	<0.1	0.4	0.3	0.8
2	4	0.4	<0.1	0.8	0.3	1.0
3	4	<0.1	<0.1	0.2	0.1	0.3
4	4	0.2	<0.1	<0.1	0.1	0.3
5	3	e	<0.1	0.3	0.2	0.7
6	4	<0.1	<0.1	<0.3	0.2	0.2
7	2	0.8	0.4	0.4	0.4	1.0
8	1 ^f	0.6	0.6	0.6	0.6	2.0
<u>Thorium-230</u>						
1	3	0.3	0.2	0.2	0.2	0.01
2	4	0.4	1.2	35.0	15.4	0.80
3	4	<0.1	<0.1	0.7	0.4	0.02
4	4	<0.1	<0.1	0.9	0.5	0.03
5	3	e	<0.1	0.9	0.5	0.03
6	4	<0.1	<0.1	0.4	0.5	0.03
7	2	10.2	0.4	0.4	0.4	0.02
8	1 ^f	1.0	1.0	1.0	1.0	0.05

^aAll results include background. In computing the averages, 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."

^bSampling locations shown in Figure 2.

^cSampling included baseline and 2nd, 3rd, and 4th quarters.

^dDoes not include baseline sample. DOE CG for release to uncontrolled areas is 600 pCi/l for uranium, 30 pCi/l for radium-226, and 2000 pCi/l for thorium-230.

^eBaseline sample not collected.

^fSampling location dry each of the three sampling periods after baseline sampling.

TABLE 2
TOTAL URANIUM, RADIUM-226, AND THORIUM-230 CONCENTRATIONS
IN GROUNDWATER AT THE HISS, 1984^a

Sampling Location ^b	Number of Samples ^c	Concentrations (pCi/l)				Percent of Standard ^d
		Baseline	Minimum	Maximum	Average	
<u>Total Uranium</u>						
1	4	13	11	13	12	2
2	4	6	6	13	10	2
3	4	38	9	31	19	3
4	3	e	22	43	30	5
5	4	9	7	9	8	1
6	4	64	31	100	67	11
7	4	64	9	15	13	2
8	4	33	27	32	29	5
<u>Radium-226</u>						
1	4	0.2	0.1	1.8	0.7	2
2	4	0.7	0.2	0.7	0.4	1
3	4	6.0	1.0	5.0	2.7	9
4	3	e	<0.2	6.0	3.2	11
5	4	0.5	<0.1	0.5	0.3	1
6	4	1.7	0.6	2.0	1.5	5
7	4	1.2	0.1	3.8	1.6	5
8	4	0.5	<0.1	0.3	0.2	1
<u>Thorium-230</u>						
1	4	1.0	0.2	1.8	0.9	0.0
2	4	0.4	<0.1	25.0	8.7	0.4
3	4	71.0	2.0	5.0	3.4	0.2
4	3	e	0.2	1.2	0.8	0.0
5	4	0.6	0.1	320.0	106.8	5.3
6	4	0.3	0.5	5.0	2.2	0.1
7	4	<2.0	<0.2	4.0	1.6	0.1
8	4	0.6	<0.3	1.2	0.8	0.0

^aAll results include background. In computing the averages, 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."

^bSampling locations shown in Figure 2.

^cSampling included baseline and 2nd, 3rd, and 4th quarters.

^dDoes not include baseline sample. DOE CG for release to uncontrolled areas is 600 pCi/l for uranium, 30 pCi/l for radium-226, and 2000 pCi/l for thorium-230.

^eWell not located at time of baseline sampling.

TABLE 3
RADON CONCENTRATIONS AT THE HISS, 1984^a

Sampling Location ^c	Concentrations (pCi/l) ^b			Percent of Standard ^d
	09/21/84-10/04/84	10/04/84-01/11/85	Average	
1	4.12	0.30	2.21	74
2	0.77	0.35	0.56	19
3	0.37	0.25	0.31	10
4	1.16	0.50	0.83	28
5	0.49	0.30	0.40	13
6	0.42	0.37	0.40	13
7	0.93	0.14	0.54	18
8	3.59	0.37	1.98	66
9	e	0.42	0.42	14

^aSampling program initiated on September 21, 1984.

^bAll results include background.

^cSampling locations shown in Figure 3.

^dDOE CG for radon-222 is 3 pCi/l (annual average above background) for uncontrolled areas.

^eDetector installed 10/04/84 at Location 6 for quality control purposes.

TABLE 4
EXTERNAL GAMMA EXPOSURES RATES AT THE HISS, 1984^a

Sampling Location ^c	Exposure Rates (uR/h) ^b		
	09/21/84-10/04/84	10/04/84-01/11/85	Average
1	112.2	28.0	70.1
2	72.0	28.6	50.3
3	58.8	16.6	37.7
4	240.0	29.1	134.6
5	97.8	34.4	66.1
6	222.0	57.3	139.7
7	130.8	35.2	83.0
8	81.0	14.6	47.8
9	d	35.7	35.7

^aSampling program was initiated on September 21, 1984.

^bAll results include background, which is estimated to be 10 to 15 uR/h (Ref. 6). The DOE standard for external exposure to members of the public is 60 uR/h.

^cSampling locations shown in Figure 3.

^dTLD installed 10/04/84 at Location 6 for quality control purposes.

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