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Bechtel National, Inc.
Engineers — Constructors

Jackson Plaza Tower
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37830

Mail Address: P.O. Box 350, Oak Ridge, TN 37831-0350
Telex: 3785873

FEB 2 3 1987

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U.S. Department of Energy
Oak Ridge Operations
Post Office Box E
Oak Ridge, Tennessee 37831

Attention: S. W. Ahrends, Director
Technical Services Division

Subject: Bechtel Job No. 14501, FUSRAP Project
DOE Contract No. DE-AC05-81OR20722
Radiological Characterization Report for
Bergen Cable in Lodi, New Jersey
Code: 7310/WBS: 138

Dear Mr. Ahrends:

In August and September 1986, Bechtel National, Inc. (BNI) performed a radiological characterization of Bergen Cable located at 170 Gregg Street in Lodi, New Jersey. The objective of this survey was to establish the horizontal and vertical limits of radioactive contamination on the property. No chemical characterization was performed. The results of this characterization will be used to provide data for a pathways analysis to evaluate the potential exposure to the public from the materials on the property. This letter describes the methods used in the characterization and presents the results of the radiological survey.

SITE DESCRIPTION AND BACKGROUND

The Bergen Cable property (Figure 1) was shown to be radioactively contaminated during a radiological survey conducted in August 1984 by the Oak Ridge National Laboratory (ORNL) at the request of the United States Department of Energy (DOE) (Ref. 1). The contamination probably originated from the processing of thorium ores by the Maywood Chemical Works (later

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purchased by the Stepan Company) during the years 1916 to 1956 (Ref. 2). The contamination is known to consist primarily of thorium-232 and its daughters with some elevated concentrations of uranium-238 and its daughters.

The property measures approximately 130,000 ft^2. One industrial building (measuring 300 ft by 225 ft) is located on the property, and an adjacent asphalt area covers the southern section of the property bordering on Gregg Street.

RADIOLOGICAL CHARACTERIZATION

To provide sufficiently detailed information regarding the limits of radioactive contamination and to provide data for the development of cost-effective measures for potential remedial action, both surface and subsurface investigations were performed.

To facilitate the collection of data in a systematic manner, a 50-ft grid was established over the area to be characterized. The grid was correlated with the New Jersey state grid system to ensure that it could be reestablished if remedial action is undertaken. All data correspond to coordinates on the characterization grid.

Surface Characterization

Surface characterization was conducted with a shielded gamma scintillation detector. Near-surface gamma radiation measurements were taken 12 in. from the ground at the grid line intersections spaced 10 ft apart. The shielded detector was used to ensure that radiation detected by the probe originated from the ground directly beneath the unit. By shielding against lateral gamma flux, the shielded detector minimized possible sources of error in the measurements. Furthermore, this detector was calibrated at the Technical Measurements Center (TMC) in Grand Junction, Colorado, to provide a correlation of counts per minute (cpm) to picocuries per gram (pCi/g). Based on this relationship, locations with measurements of more than 11,000 cpm were noted as exceeding the DOE guideline of 5 pCi/g for thorium-232 in surface soils. To better define the limits of contamination, 22 soil samples were taken at locations chosen systematically by evaluating locations with measurements of more than 11,000 cpm, and locations with measurements at or near 11,000 cpm. The sampling locations are shown in Figure 2.

The data in Table 1 show the concentrations of thorium-232 in the surface soil samples. Concentrations ranged from 0.7 to 72.0 pCi/g. Only three soil samples were found to exceed the guideline. The area of surface contamination having a concentration slightly in excess of 11,000 cpm is shown in Figure 3. Surface contamination is believed to have resulted from fill emplacement.

Eleven external exposure measurements were taken in and around the southeastern corner of the property (Figure 4) where surface soil samples exhibited concentrations in excess of the DOE guideline. Exposure rates ranged from 4.8 μR/h (including background) to 7.7 μR/h. In all cases, these measurements are considered background level. The specific results of these measurements are listed in Table 2.

Subsurface Investigation

After surface characterization was completed, the subsurface investigation was conducted to determine the depth of previously identified surface contamination and to locate possible subsurface contamination with no surface manifestation. The subsurface investigation was conducted using downhole gamma logging of the drill holes. This technique is significantly more cost-effective than collecting and analyzing soil samples, because the logging procedure can be completed more quickly and eliminates the need for laboratory analysis. A 2-in. by 2-in. sodium iodide gamma scintillation detector was used to perform the downhole logging. The instrument was calibrated at TMC where it was determined that a rate of approximately 40,000 cpm corresponds to the 15 pCi/g guideline for thorium-232 in subsurface soils. This relationship has been corroborated in results from previous characterizations where thorium-232 was found.

During the course of the subsurface investigation, 41 boreholes were drilled (Figure 5) and gamma logged to determine the depth of radioactive contamination. The boreholes were as deep as 8 ft. Gamma logging data for the boreholes are given in Table 3. The geologic drill logs are being prepared and will be available in the near future. The borehole logs were reviewed to identify trends, regardless of whether concentrations exceeded the DOE guideline. On the basis of the evaluation of the vertical gamma logging data, no instrument readings indicate the presence of soil in which contamination exceeds 15 pCi/g.

For every surface soil sample taken in this survey, subsurface soil samples (6 to 12 in.) were also obtained. The results of these samples (Table 4) indicated that no soil exceeded the subsurface guideline of 15 pCi/g.

On the basis of geological information gained as a result of the borehole drilling during this characterization, it was determined that the site is relatively flat (total measured relief of 4.8 ft) with the lowest elevation in the southeast section (36.4 ft m.s.l.) increasing gradually to the north (maximum elevation of 41.2 ft m.s.l.). A gravel stockpile to the north of the building accounts for 2 to 3 ft of the difference in relief. The asphalt and gravel areas of the property are underlain with a moderate brown, fine- to medium-grained, silty sand; black organic silt; and the red sandstone of the Brunswick Formation. The silty sand is found either as a native residual soil or as mechanically displaced soil used as fill. The entire property south of the gravel stockpile is covered by 1 to 2 ft of this brown, silty sand. The stockpile itself rests immediately upon Brunswick sandstone. The Brunswick sandstone was penetrated by all boreholes and is the radiologically clean marker bed. In one borehole location, brown, silty sand was found above an organic silt lens, which implies that adjacent brown soil is fill material used to bring the low-lying silty area up to the existing grade.

Surface runoff is channeled through metal drains and underground pipes southward to the municipal sewer system. There is a linear (north to south) drainage ditch east of the property, and local topography suggests a southward flow. This drainage ditch is the same ditch that exists immediately west of the 60 Trudy property where contaminated, black organic stream sediment exists at an elevation between 32 and 37 ft. Black organic silt at Bergen Cable exists at an elevation between 34 and 36 ft. Depending upon the drainage elevation between these two properties, the possibility exists that the drainage ditch may have been a pathway for contaminated sediment-laden waters from Lodi Brook. Further investigation of this potential pathway deserves consideration due to uncertainty as to whether or not the Bergen Cable property once belonged to the Lodi Brook watershed. To date, no indication of contamination has been found in this ditch.

Building Survey

As previously discussed, an industrial building approximately 330 ft by 225 ft stands on the property. No interior investigation was conducted due to the lack of evidence of any contaminated material in close proximity to the structure.

SUMMARY

- Surface contamination was found in only three samples. Areas of contamination are shown in Figure 3.
- No subsurface contamination was found.
- Further investigation of the drainage ditch (located on the east of the property) as a potential pathway of contamination from Lodi Brook floodwaters should be considered.

REFERENCES

1. Oak Ridge National Laboratory. Results of the Radiological Survey at 170 Gregg Street, Lodi, New Jersey, Oak Ridge, TN, August 1984.

2. Morton, Henry W. Natural Thorium in Maywood, New Jersey, Nuclear Safety Associates, Inc., MD, September 1982.

If additional information concerning this characterization is required, please call Nicke Ring at 576-5912.

Very truly yours,

James R. Kannard
Project Manager - FUSRAP

JRK/skl
Attachments: As Stated

cc: J. F. Wing
R. G. Atkin
J. Berger (ORAU)
B. A. Hughlett
J. F. Nemec

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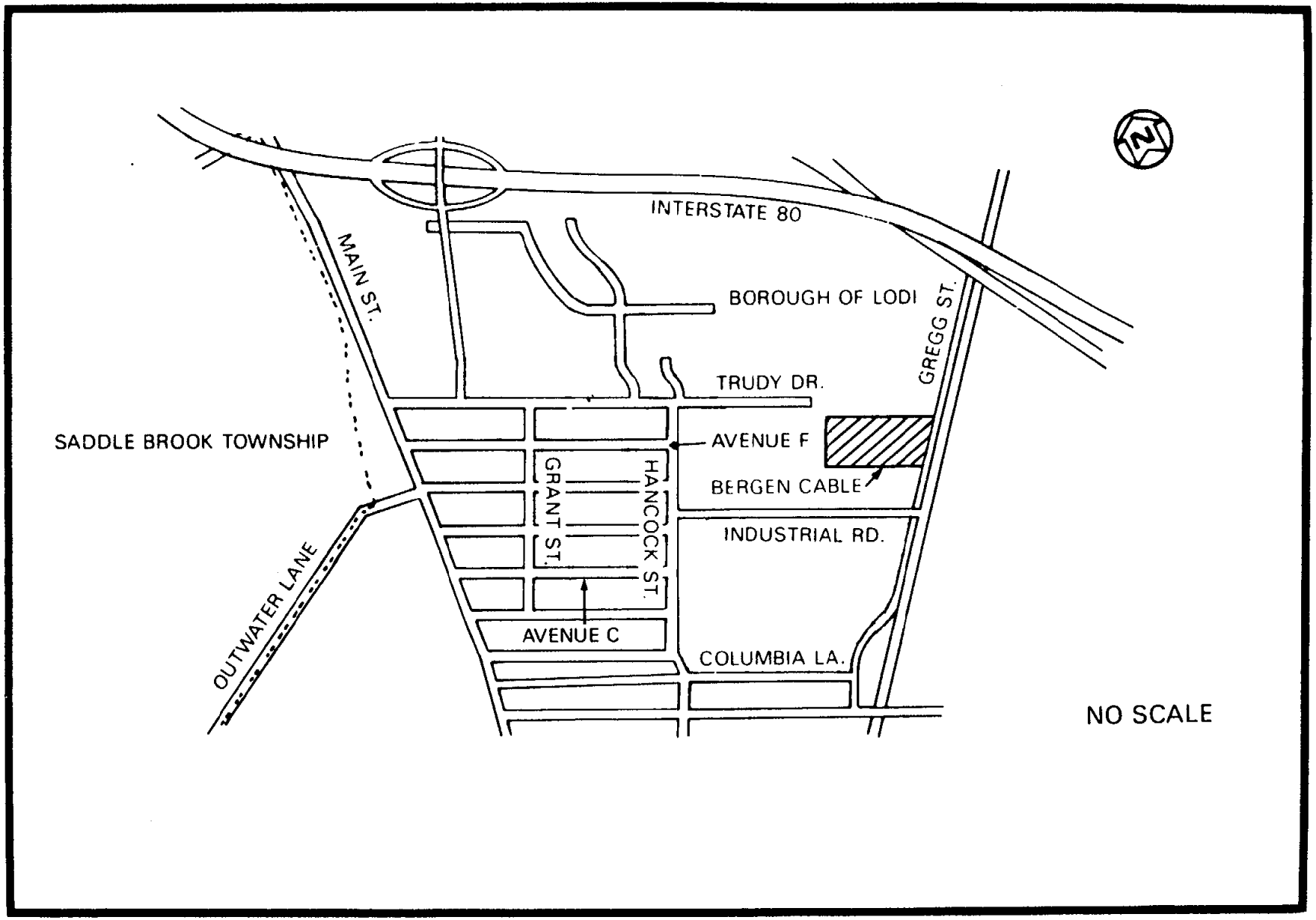

FIGURE 1 LOCATION OF BERGEN CABLE

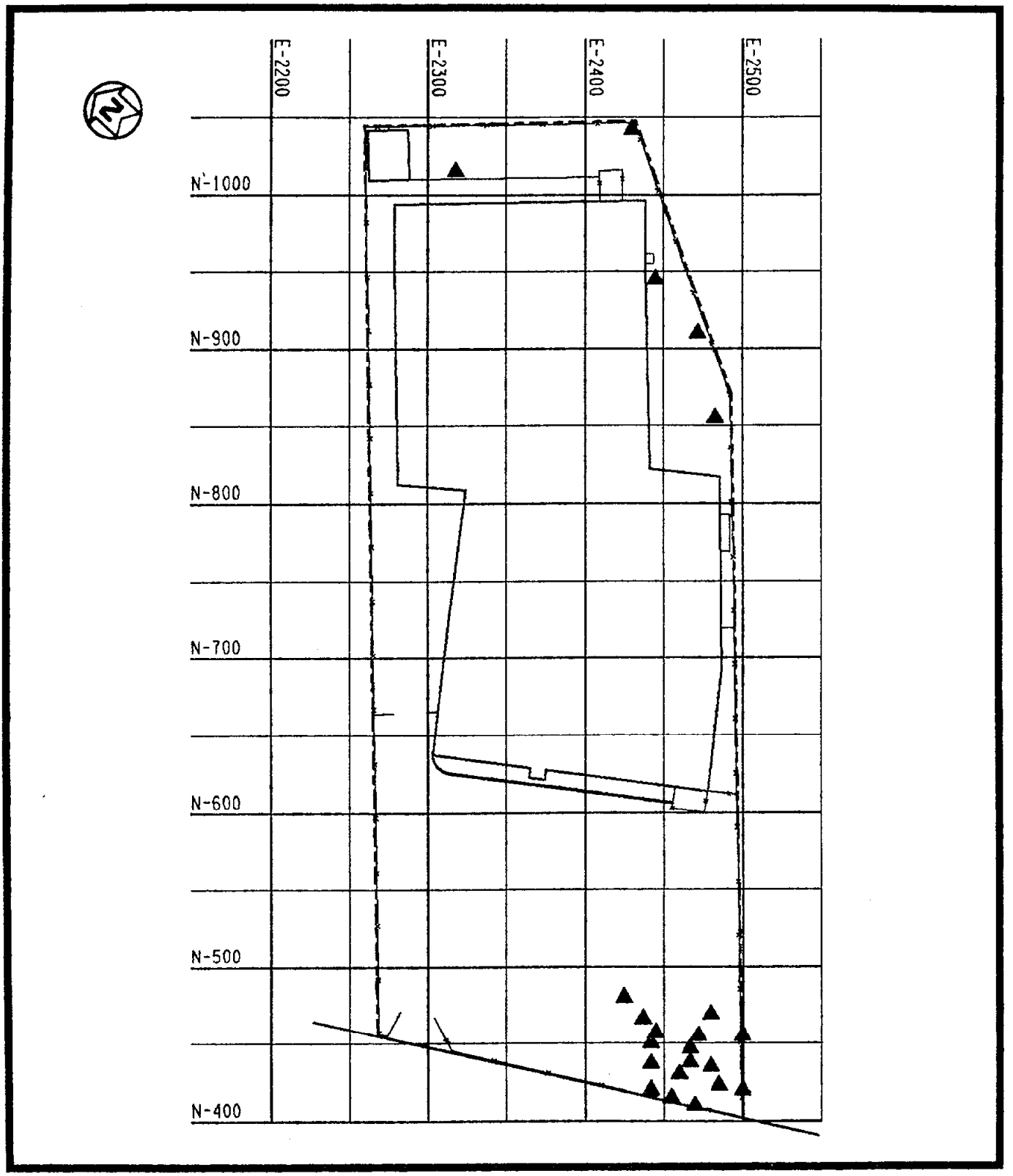

FIGURE 2 SURFACE SOIL SAMPLING LOCATIONS AT BERGEN CABLE

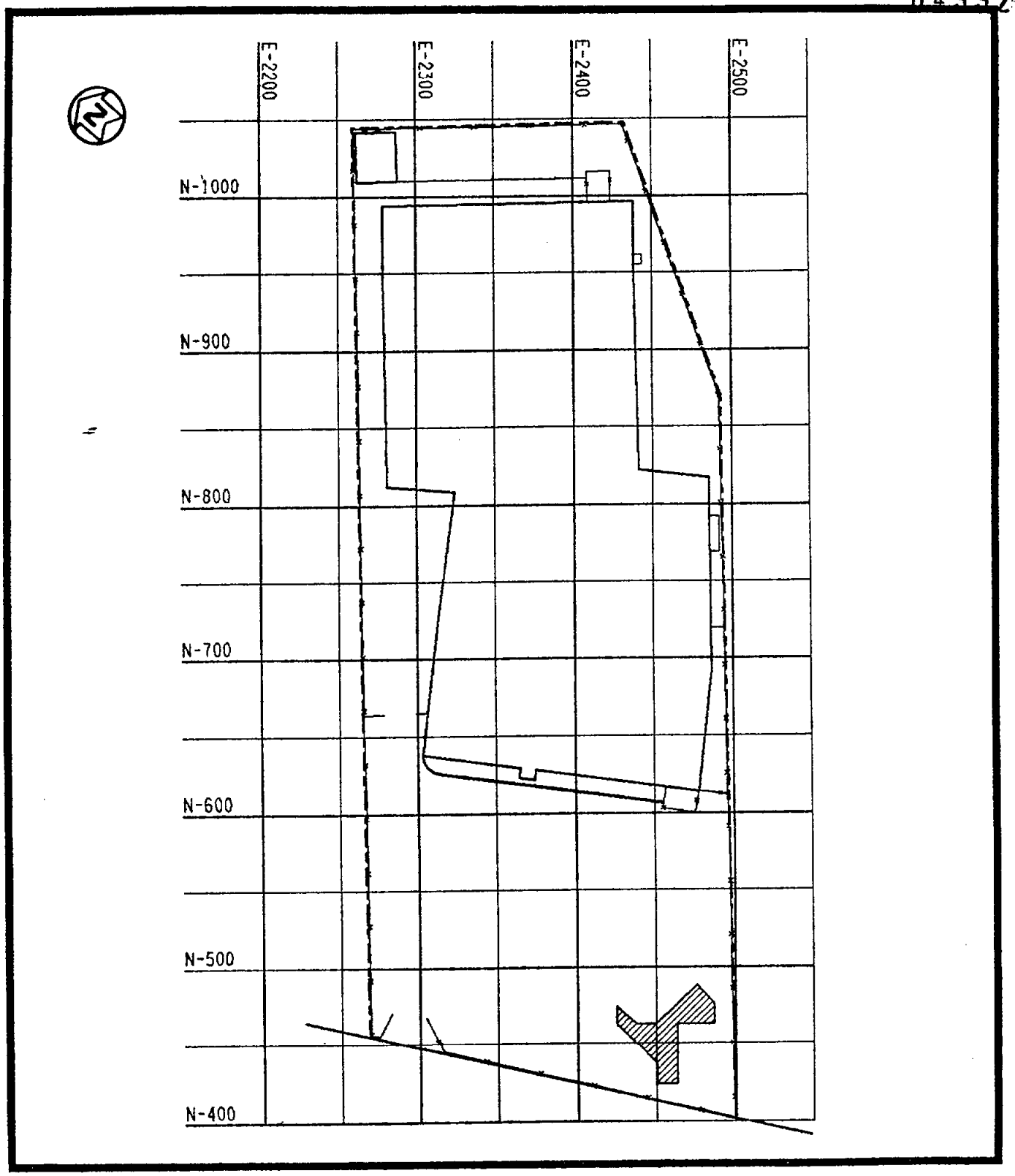

FIGURE 3 AREA OF SURFACE CONTAMINATION AT BERGEN CABLE

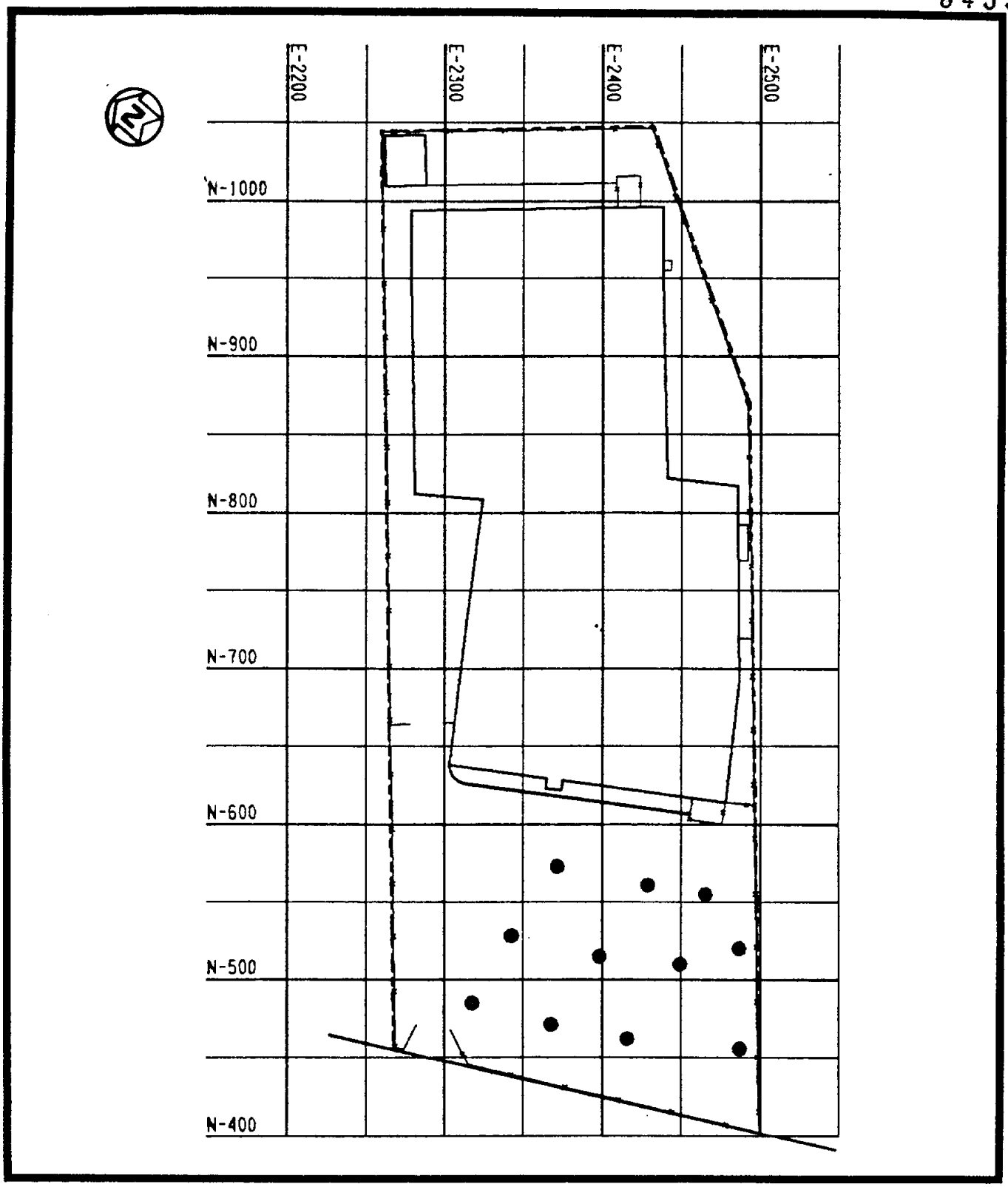

FIGURE 4 EXTERNAL EXPOSURE RATE MEASUREMENT LOCATIONS AT BERGEN CABLE

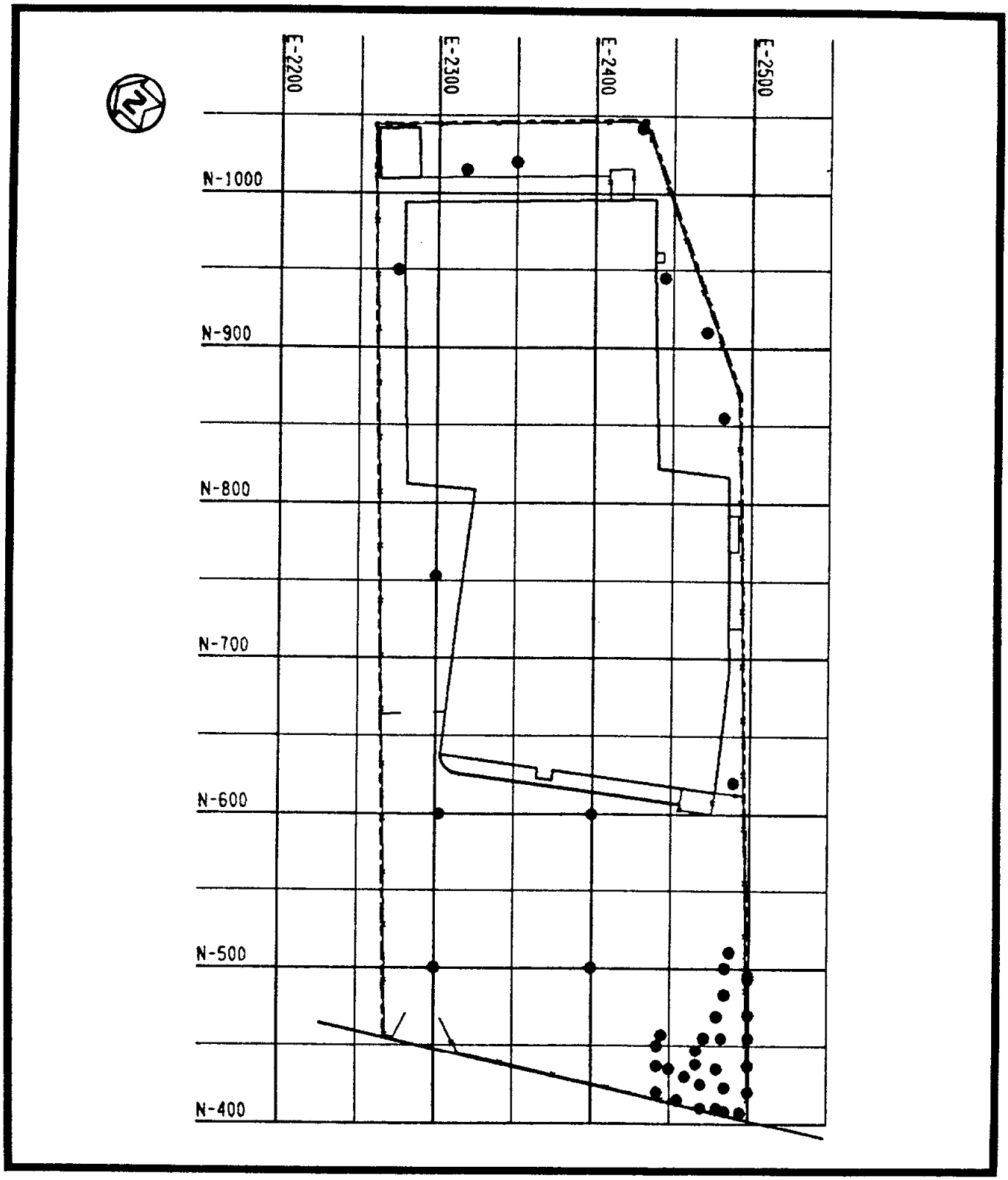

FIGURE 5 BOREHOLE LOCATIONS AT BERGEN CABLE

TABLE 1

SURFACE SOIL SAMPLING RESULTS

FOR BERGEN CABLE

Grid Coordinates N,S	Grid Coordinates E,W	Concentrations (pCi/g +/- 2 sigma) Uranium-238	Radium-226	Thorium-232
N0410	E2470	<8.5	2.6 ± 0.4	2.3 ± 0.5
N0415	E2455	<5.8	2.3 ± 0.1	2.6 ± 0.1
N0420	E2442	<8.8	2.3 ± 0.1	5.0 ± 0.8
N0420	E2500	<7.3	2.2 ± 0.1	1.7 ± 0.7
N0423	E2485	<7.3	1.7 ± 0.1	2.4 ± 0.5
N0430	E2460	<9.2	1.9 ± 0.1	4.0 ± 0.1
N0435	E2480	<7.3	0.7 ± 0.4	2.0 ± 0.1
N0437	E2442	<6.0	0.9 ± 0.2	1.2 ± 0.1
N0438	E2467	<7.6	1.1 ± 0.2	4.8 ± 0.2
N0447	E2467	<4.3	0.9 ± 0.1	1.6 ± 0.5
N0450	E2442	<7.3	1.6 ± 0.3	4.5 ± 0.5
N0455	E2472	<7.2	1.9 ± 0.6	3.9 ± 0.3
N0455	E2500	<5.1	0.6 ± 0.1	0.7 ± 0.6
N0457	E2445	6.2 ± 2.2	1.6 ± 0.2	7.1 ± 0.7
N0466	E2437	<19.0	11.0 ± 2.0	72.0 ± 5.0
N0469	E2480	<5.6	1.6 ± 0.3	3.3 ± 1.0
N0480	E2425	<10.0	3.4 ± 0.9	11.0 ± 2.0
N0855	E2483	<5.5	0.7 ± 0.2	0.8 ± 0.3
N0910	E2472	<5.2	0.9 ± 0.3	2.4 ± 0.1
N0945	E2445	<6.5	0.7 ± 0.1	2.4 ± 0.9
N1015	E2348	<4.5	0.9 ± 0.1	<1.0
N1042	E2430	<5.0	0.7 ± 0.2	1.7 ± 0.2

TABLE 2

GAMMA RADIATION EXPOSURE RATE MEASUREMENTS

FOR BERGEN CABLE

Grid Coordinates E,W	Grid Coordinates N,S	Exposure Rate (μR/h)
E2325	N0490	4.9
E2345	N0530	5.0
E2370	N0575	5.3
E2375	N0475	4.9
E2400	N0520	4.8
E2425	N0465	7.7
E2430	N0565	5.4
E2449	N0510	6.1
E2465	N0557	5.6
E2480	N0520	6.2
E2490	N0455	7.0

TABLE 3

DOWNHOLE GAMMA LOGGING RESULTS

FOR BERGEN CABLE

Grid Coordinates E,W	Grid Coordinates N,S	Depth (ft)	Counts per Minute
E2275	N0950	0.5	6,000
E2275	N0950	1.0	7,000
E2275	N0950	1.5	10,000
E2275	N0950	2.0	10,000
E2275	N0950	2.5	10,000
E2275	N0950	3.0	10,000
E2275	N0950	3.5	10,000
E2275	N0950	4.0	12,000
E2275	N0950	4.5	12,000
E2275	N0950	5.0	12,000
E2300	N0500	0.5	10,000
E2300	N0500	1.0	11,000
E2300	N0500	1.5	13,000
E2300	N0500	2.0	13,000
E2300	N0500	2.5	12,000
E2300	N0500	3.0	13,000
E2300	N0500	3.5	12,000
E2300	N0500	4.0	13,000
E2300	N0500	4.5	12,000
E2300	N0500	5.0	13,000
E2300	N0753	0.5	10,000
E2300	N0753	1.0	9,000
E2300	N0753	1.5	11,000
E2300	N0753	2.0	12,000
E2300	N0753	2.5	10,000
E2300	N0753	3.0	10,000
E2300	N0753	3.5	10,000
E2300	N0753	4.0	11,000
E2300	N0753	4.5	11,000
E2300	N0753	5.0	10,000
E2303	N0600	0.5	8,000
E2303	N0600	1.0	9,000
E2303	N0600	1.5	13,000
E2303	N0600	2.0	12,000
E2303	N0600	2.5	11,000
E2303	N0600	3.0	13,000
E2303	N0600	3.5	13,000
E2303	N0600	4.0	12,000
E2303	N0600	4.5	10,000
E2318	N1015	0.5	8,000

TABLE 3

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Depth (ft)	Counts per Minute
E2318	N1015	1.0	9,000
E2318	N1015	1.5	11,000
E2318	N1015	2.0	9,000
E2318	N1015	2.5	8,000
E2350	N1020	0.5	11,000
E2350	N1020	1.0	10,000
E2350	N1020	1.5	11,000
E2350	N1020	2.0	11,000
E2350	N1020	2.5	10,000
E2350	N1020	3.0	12,000
E2350	N1020	3.5	13,000
E2350	N1020	4.0	12,000
E2350	N1020	4.5	13,000
E2350	N1020	5.0	12,000
E2350	N1020	5.5	12,000
E2350	N1020	6.0	11,000
E2350	N1020	6.5	12,000
E2350	N1020	7.0	13,000
E2350	N1020	7.5	12,000
E2350	N1020	8.0	12,000
E2400	N0500	0.5	6,000
E2400	N0500	1.0	9,000
E2400	N0500	1.5	11,000
E2400	N0500	2.0	12,000
E2400	N0500	2.5	13,000
E2400	N0500	3.0	13,000
E2400	N0500	3.5	13,000
E2400	N0500	4.0	13,000
E2400	N0500	4.5	14,000
E2400	N0500	5.0	12,000
E2400	N0600	0.5	9,000
E2400	N0600	1.0	14,000
E2400	N0600	1.5	13,000
E2400	N0600	2.0	10,000
E2400	N0600	2.5	10,000
E2400	N0600	3.0	11,000
E2400	N0600	3.5	10,000
E2400	N0600	4.0	11,000
E2400	N0600	4.5	11,000
E2400	N0600	5.0	11,000

TABLE 3

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Depth (ft)	Counts per Minute
E2400	N0600	5.5	11,000
E2400	N0600	6.0	11,000
E2400	N0600	6.5	12,000
E2430	N1042	0.5	10,000
E2430	N1042	1.0	10,000
E2430	N1042	1.5	10,000
E2442	N0420	0.5	11,000
E2442	N0420	1.0	14,000
E2442	N0420	1.5	12,000
E2442	N0420	2.0	13,000
E2442	N0437	0.5	8,000
E2442	N0437	1.0	10,000
E2442	N0437	1.5	11,000
E2442	N0437	2.0	13,000
E2442	N0437	2.5	13,000
E2442	N0450	0.5	11,000
E2445	N0457	0.5	17,000
E2445	N0945	0.5	10,000
E2445	N0945	1.0	13,000
E2445	N0945	1.5	13,000
E2450	N0435	0.5	17,000
E2450	N0435	1.0	12,000
E2450	N0435	1.5	12,000
E2450	N0435	2.0	12,000
E2450	N0435	2.5	12,000
E2450	N0435	3.0	12,000
E2450	N0435	3.5	12,000
E2450	N0435	4.0	12,000
E2450	N0435	4.5	12,000
E2450	N0435	5.0	11,000
E2455	N0415	0.5	8,000
E2455	N0415	1.0	9,000
E2455	N0415	1.5	11,000
E2455	N0415	2.0	12,000
E2455	N0415	2.5	13,000

TABLE 3

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Depth (ft)	Counts per Minute
E2460	N0430	0.5	12,000
E2460	N0430	1.0	14,000
E2460	N0430	1.5	12,000
E2460	N0430	2.0	13,000
E2460	N0430	2.5	10,000
E2467	N0438	0.5	13,000
E2467	N0438	1.0	12,000
E2467	N0438	1.5	14,000
E2467	N0438	2.0	20,000
E2467	N0438	2.5	15,000
E2467	N0447	0.5	15,000
E2467	N0447	1.0	16,000
E2467	N0447	1.5	12,000
E2467	N0447	2.0	11,000
E2467	N0447	2.5	12,000
E2470	N0410	0.5	11,000
E2470	N0410	1.0	10,000
E2470	N0410	1.5	10,000
E2470	N0425	0.5	14,000
E2470	N0425	1.0	14,000
E2472	N0455	0.5	12,000
E2472	N0455	1.0	16,000
E2472	N0455	1.5	14,000
E2472	N0910	0.5	7,000
E2472	N0910	1.0	9,000
E2472	N0910	1.5	10,000
E2472	N0910	2.0	10,000
E2472	N0910	2.5	10,000
E2480	N0410	0.5	13,000
E2480	N0410	1.0	14,000
E2480	N0410	1.5	15,000
E2480	N0410	2.0	14,000
E2480	N0410	2.5	13,000
E2480	N0410	3.0	14,000
E2480	N0410	3.5	14,000
E2480	N0410	4.0	11,000

TABLE 3

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Depth (ft)	Counts per Minute
E2480	N0410	4.5	11,000
E2480	N0410	5.0	11,000
E2480	N0435	0.5	13,000
E2480	N0435	1.0	12,000
E2480	N0435	1.5	12,000
E2480	N0435	2.0	13,000
E2480	N0435	2.5	12,000
E2480	N0435	3.0	12,000
E2480	N0455	0.5	12,000
E2480	N0455	1.0	11,000
E2480	N0455	1.5	12,000
E2480	N0455	2.0	13,000
E2480	N0455	2.5	15,000
E2480	N0469	0.5	10,000
E2480	N0469	1.0	8,000
E2480	N0469	1.5	9,000
E2483	N0855	0.5	9,000
E2483	N0855	1.0	10,000
E2483	N0855	1.5	10,000
E2483	N0855	2.0	9,000
E2483	N0855	2.5	9,000
E2485	N0408	0.5	9,000
E2485	N0408	1.0	11,000
E2485	N0408	1.5	13,000
E2485	N0408	2.0	13,000
E2485	N0408	2.5	12,000
E2485	N0423	0.5	9,000
E2485	N0423	1.0	11,000
E2485	N0423	1.5	11,000
E2485	N0423	2.0	10,000
E2485	N0423	2.5	12,000
E2485	N0483	0.5	10,000
E2485	N0483	1.0	12,000
E2485	N0483	1.5	13,000
E2485	N0500	0.5	12,000

TABLE 3

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Depth (ft)	Counts per Minute
E2485	N0500	1.0	11,000
E2485	N0500	1.5	10,000
E2485	N0500	2.0	11,000
E2485	N0500	2.5	12,000
E2485	N0500	3.0	13,000
E2485	N0500	3.5	13,000
E2485	N0500	4.0	12,000
E2485	N0500	4.5	12,000
E2485	N0500	5.0	12,000
E2485	N0500	5.5	11,000
E2485	N0500	6.0	11,000
E2485	N0500	6.5	11,000
E2485	N0500	7.0	10,000
E2485	N0500	7.5	11,000
E2488	N0510	0.5	10,000
E2488	N0510	1.0	12,000
E2488	N0510	1.5	12,000
E2488	N0510	2.0	12,000
E2488	N0510	2.5	11,000
E2490	N0620	0.5	12,000
E2490	N0620	1.0	14,000
E2490	N0620	1.5	14,000
E2490	N0620	2.0	16,000
E2490	N0620	2.5	17,000
E2490	N0620	3.0	16,000
E2490	N0620	3.5	16,000
E2490	N0620	4.0	16,000
E2490	N0620	4.5	19,000
E2490	N0620	5.0	12,000
E2495	N0407	0.5	9,000
E2495	N0407	1.0	10,000
E2495	N0407	1.5	11,000
E2495	N0407	2.0	12,000
E2495	N0407	2.5	12,000
E2500	N0420	0.5	8,000
E2500	N0420	1.0	10,000
E2500	N0420	1.5	13,000
E2500	N0420	2.0	15,000
E2500	N0420	2.5	13,000

TABLE 3

(continued)

Grid Coordinates E,W	Grid Coordinates N,S	Depth (ft)	Counts per Minute
E2500	N0437	0.5	5,000
E2500	N0437	1.0	9,000
E2500	N0437	1.5	9,000
E2500	N0437	2.0	11,000
E2500	N0437	2.5	10,000
E2500	N0455	0.5	7,000
E2500	N0455	1.0	9,000
E2500	N0455	1.5	11,000
E2500	N0455	2.0	11,000
E2500	N0455	2.5	11,000
E2500	N0455	3.0	10,000
E2500	N0470	0.5	10,000
E2500	N0470	1.0	11,000
E2500	N0470	1.5	11,000
E2500	N0470	2.0	11,000
E2500	N0470	2.5	12,000
E2500	N0493	0.5	10,000
E2500	N0493	1.0	11,000
E2500	N0493	1.5	11,000
E2500	N0493	2.0	11,000
E2500	N0493	2.5	10,000
E2500	N0495	0.5	11,000
E2500	N0495	1.0	11,000
E2500	N0495	1.5	11,000
E2500	N0495	2.0	11,000

TABLE 4

SUBSURFACE SOIL SAMPLING RESULTS

FOR BERGEN CABLE

Grid Coordinates N,S	Grid Coordinates E,W	Depth (in.)	Concentrations (pCi/g +/- 2 sigma) Uranium-238	Radium-226	Thorium-232
N0410	E2470	6-12	<5.4	2.4 ± 0.1	3.1 ± 0.4
N0415	E2455	6-12	<5.7	2.5 ± 0.5	4.0 ± 1.0
N0420	E2442	6-12	<6.1	<1.4	<2.4
N0420	E2500	6-12	<7.0	1.6 ± 0.1	1.9 ± 0.6
N0423	E2485	6-12	<7.2	1.3 ± 0.4	2.8 ± 0.1
N0430	E2460	6-12	<6.1	0.9 ± 0.1	2.4 ± 0.6
N0435	E2480	6-12	<8.1	1.6 ± 0.4	3.3 ± 0.9
N0437	E2442	6-12	<7.0	1.1 ± 0.3	1.6 ± 1.5
N0438	E2467	6-12	<8.2	1.2 ± 0.1	2.3 ± 0.4
N0447	E2467	6-12	<7.0	1.0 ± 0.4	3.0 ± 0.7
N0450	E2442	6-12	<9.6	2.0 ± 0.8	12.3 ± 3.4
N0455	E2472	6-12	<6.6	1.6 ± 0.3	2.7 ± 0.1
N0455	E2500	6-12	<5.2	1.0 ± 0.6	1.4 ± 0.3
N0457	E2445	6-12	<8.0	2.1 ± 0.5	3.4 ± 0.3
N0466	E2437	6-12	<9.0	0.5 ± 0.4	1.6 ± 0.8
N0469	E2480	6-12	<5.1	0.6 ± 0.2	1.6 ± 1.4
N0480	E2425	6-12	<10.0	3.0 ± 0.9	7.0 ± 2.0
N0855	E2483	6-12	<4.9	0.9 ± 0.1	1.4 ± 0.5
N0910	E2472	6-12	<4.7	0.9 ± 0.3	1.1 ± 0.5
N0945	E2445	6-12	<7.2	0.8 ± 0.1	2.5 ± 1.0
N1015	E2318	6-12	<5.1	0.6 ± 0.1	<2.2
N1042	E2430	6-12	<5.8	<1.0	1.1 ± 0.5