

**RESULTS OF
ENVIRONMENTAL RADIATION SURVEY
AT BRANDEIS-BARDIN INSTITUTE
BRANDEIS, CALIFORNIA**

by

**JOEL I. CEHN, C.H.P.
1036 HUBERT ROAD
OAKLAND, CALIFORNIA**

JULY 1991

Results of Environmental Radiation Survey
at Brandeis-Bardin Institute

A. INTRODUCTION

The Brandeis-Bardin Institute is located on 3000 acres in Brandeis (Simi Valley), California. The property borders the Rockwell Rocketdyne Field Laboratory, to the south. The Rockwell property has been contaminated with radioactive materials. The goal of this survey is to determine whether or not these materials have migrated onto the Institute property.

Rockwell has published data indicating the approximate location and composition of the contaminants. At least four of these are along the border with the Institute. They consist of contaminated soils and near-surface water. These could migrate as airborne and waterborne soils, and as surface water runoff or groundwater. The approach used is to detect any migrating material, near or below the property line. This was done by collecting samples of soil, spring water and vegetation, and analyzing it in the laboratory for radioactivity. Most of the locations sampled are the ravines that carry precipitation runoff from the Rockwell property, and the springs in that area. Several samples were taken in the high-use areas of the Camp.

The survey was conducted on May 28 and 29, 1991. Figures 1 and 2 show where the samples were collected. Appendix A provides more detail on sample locations. Table 1 shows what media were sampled at each location. The collected samples were shipped to the Teledyne Isotopes Laboratory, Westwood, NJ on May 30. The samples were analyzed during the period June 24 to July 20. Laboratory reports of analyses are included in Appendix B.

B. SUMMARY OF RESULTS

The results allow us to conclude that large areas of Institute property are not contaminated with radioactivity from the Rockwell property. However, one soil sample, taken near the property line, may contain radioactivity that

could be attributed to Rockwell's activities. This is discussed below. Additional testing would better determine the source of this radioactivity.

Because of the small number of samples collected, relative to the large size of the Institute's property, this study has limited statistical power. It is possible that a contaminated area exists, but was not sampled. The study was designed to prevent this from happening, to the extent possible.

C. SOILS

Twelve soil samples were collected from the locations given in Table 1. They are typically a sandy clay, deposited on the floor of ravines and washes. Samples were taken from the surface to a depth of 5 cm. Analysis showed natural radioactivity in the soils, from minerals containing potassium, radium and thorium. The levels of natural radioactivity are on the order of 25,000 pCi/kgm.¹ In addition, five samples contained traces of radioactive cesium (see Table 2). This radioactivity has two possible sources: fallout from world-wide atomic weapons testing in the 1950's; and the Rockwell property.

Four of the five samples contain cesium levels consistent with weapons' test fallout. When atomic weapons were tested above ground, fallout containing cesium settled onto all parts of the U.S. As a result, the average cesium-137 concentration in soil is about 300 pCi/kgm. Four of the soil samples analyzed are at or below this level.² The fifth sample (from CR4) contains cesium at 671 pCi/kgm. This is somewhat higher than fallout levels, and may be due, in part, to Rockwell's activities. Rockwell has measured cesium contamination near this location, on their side of the property line, at over 1,000

¹The basic unit of radioactivity is the Curie (Ci). The fraction of a Curie used here is the picoCurie (pCi). One pCi equates to one atom, within the sample, undergoing radioactive decay (and emitting radiation) about once every 27 seconds. This is usually normalized to one kilogram (or one liter) of material, with the units of pCi/kgm (or pCi/l).

²Samples from locations: WR2, WR3, ER7A, and CA2.

near this location, on their side of the property line, at over 1,000 pCi/kgm.³ There is no hazard at these levels, but additional sampling of the area around CR4 is indicated.

D. VEGETATION

Vegetation samples consist of weeds, grasses and annual plants growing in ravines and washes. These can scavenge airborne radioactivity, and absorb radioactivity through the root system. Nearly all samples contained expected levels of natural radioactivity (potassium-40; see Table 3). One sample (from WR3) also contained a detectable level of tritium. The level (100 pCi/kgm) is consistent with natural background levels found elsewhere, in water. Perhaps coincidentally, Rockwell has detected elevated levels of tritium near this area. In a french drain, next to their Building 059, tritium was detected in water at 1,890 pCi/l.⁴

A vegetation sample was taken from location CR4, where elevated cesium was found in a soil sample. Neither cesium nor tritium was detected in the vegetation sample.

E. WATER

Six area springs were sampled. Five were analyzed for tritium, and none was detected.⁵ Likewise, five were analyzed for a large group of nuclides, and none were detected. No indications of contamination from Rockwell activities were found.

F. RECOMMENDATIONS

As discussed in Section C, additional soil samples should be taken from

³Rockwell measured cesium-137 in soil at their "RMDF leach field" at 1,020 pCi/kgm. This is reported in their Annual Environmental Monitoring Report for 1989 (p. III-4).

⁴Reference: 1989 Annual Monitoring Report, page III-12.

⁵The analysis is capable of detecting tritium at or above 200 pCi/l.

location CR4. This is a large ravine below Rockwell's RMDF area--where contamination has been detected. If this contamination has spread to Institute property, then radioactivity concentrations should increase when moving up the ravine. If this is found not to be the case, then the radioactivity detected in this survey can be attributed to ambient background.

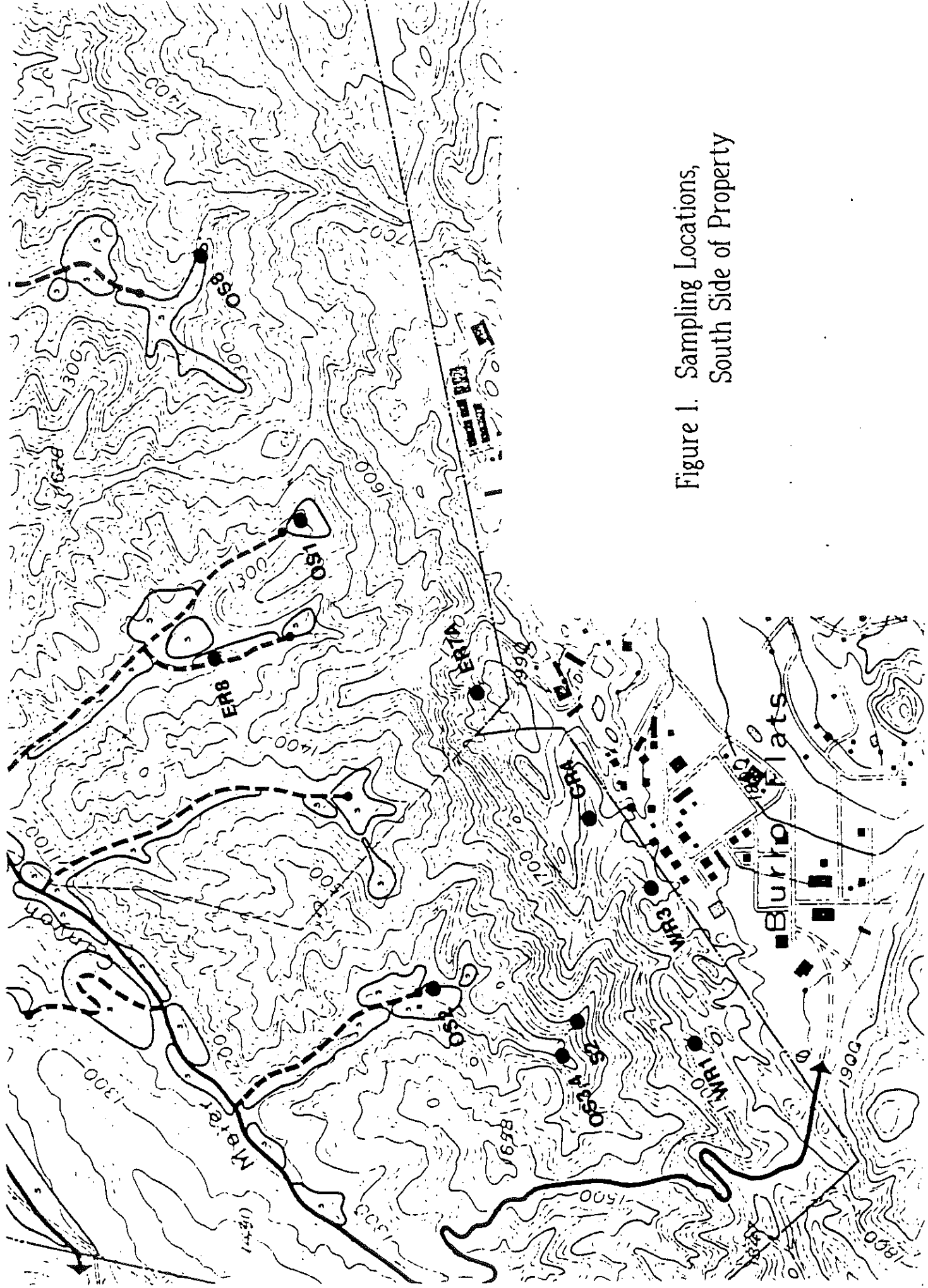


Figure 1. Sampling Locations,
South Side of Property

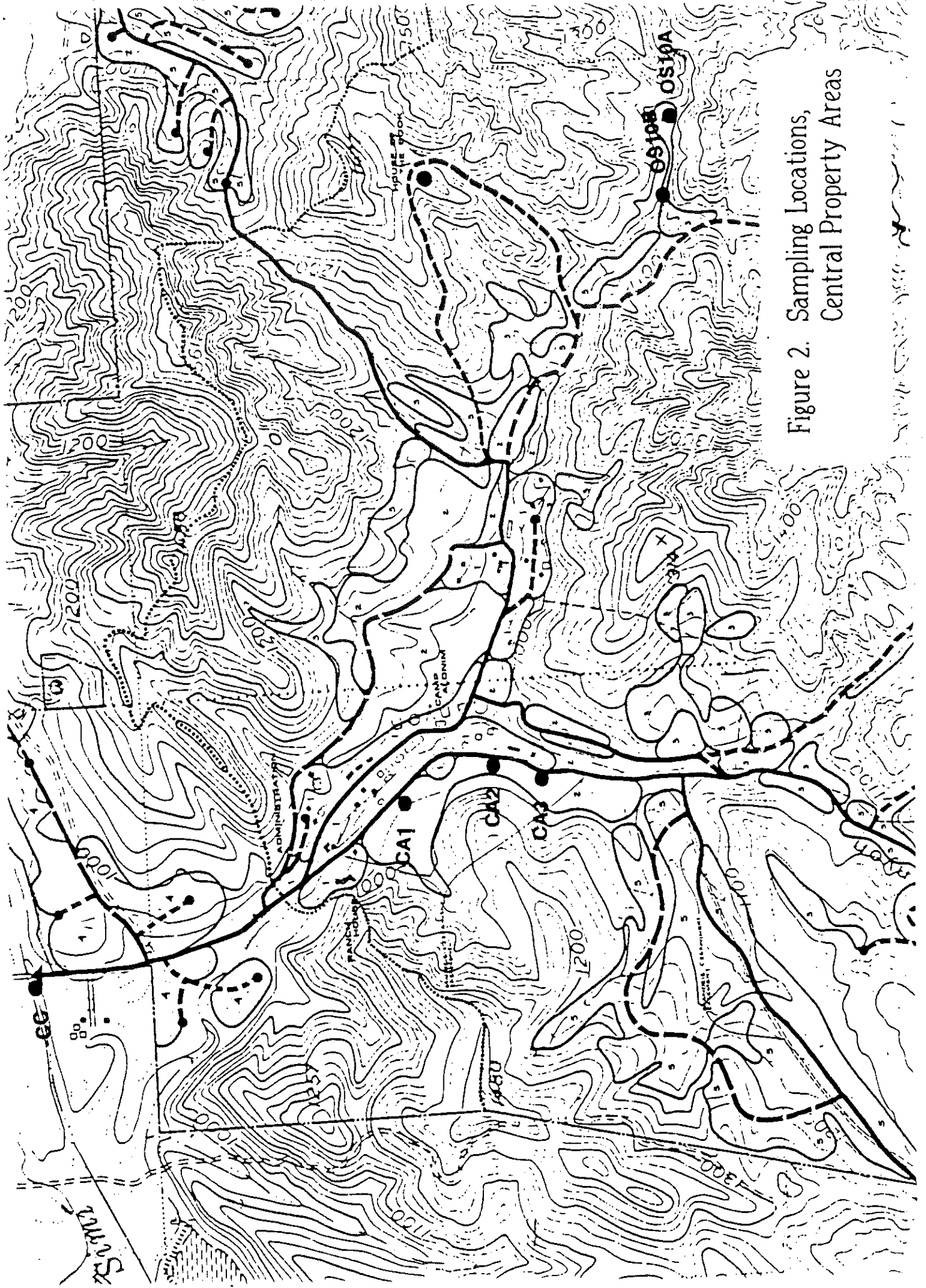


Figure 2. Sampling Locations,
Central Property Areas

Soil	Vegetation	Water
OS3,4	OS3,4	OS1
OS8	OS10B	OS2
OS10B	CA3	OS3
CA1	WR1	OS4
CA2	WR3	OS8
CA3	CR4	OS10A
S2	ER7A	
WR3	ER8	
CR4		
ER7A		
ER8		
CC		

Table 1. Locations Sampled for Soil, Vegetation and Spring water
(Locations are shown in Figures 1 & 2)

Location	Potassium -40	Radium -226	Thorium -228	Cesium -137	Other
OS3,4	21,800	2,240	1,340	ND	ND
OS8	21,100	1,850	1,750	ND	ND
OS10B	22,900	1,200	793	ND	ND
CA1	20,300	1,810	1,290	ND	ND
CA2	21,700	2,060	1,590	147	ND
CA3	23,200	1,320	886	ND	ND
S2	20,100	1,160	735	73	ND
WR3	21,300	ND	1,290	95	ND
CR4	22,800	2,210	1,680	671	ND
ER7A	21,100	1,270	1,060	296	ND
ER8	23,600	1,720	1,280	ND	ND
CC	20,100	2,290	1,050	ND	ND

Table 2. Results of Soil Analyses (pCi/kgm-dry)
(ND = not detected; gamma spec. analysis)

Location	Potassium-40	Tritium	Other
OS3,4	16,000	ND*	ND
OS10B	7,680	NA	ND
CA3	16,800	NA	ND
WR1	9,430	NA	ND
WR3	ND	100	ND
CR4	7,190	ND*	ND
ER7A	7,030	NA	ND
ER8	5,920	NA	ND

Table 3. Results of Vegetation Analyses (pCi/kgm-wet)
 (ND = not detected; NA = not analyzed;
 tritium & gamma spec. analyses)
 *The lab is capable of detecting tritium at or above
 100 pCi/kgm.

APPENDIX A

ADDITIONAL INFORMATION

ON SAMPLING LOCATIONS

ADDITIONAL INFORMATION
ON SAMPLING LOCATIONS

OS2

Located on left side of dirt road, at end of road, beyond large red abandoned water tank.

OS3, OS4 & OS5

These 3 springs are located close to each other. OS3 and OS5 are labeled on a steel pipe, and are within a few yards from each other. OS4 is up the hill about 50 meters. Soil and vegetation samples from this area were taken about 15 meters up the ravine from OS3. These are labeled "WRO."

S2

This site is at an abandoned water tank. Take the trail southeast of OS4, uphill. The tank is several hundred meters up this trail. The soil sample (WR2S2) was taken just below the tank.

OS8

This spring is at the end of the dirt road, past the picnic tables. Samples were taken at first pool under trees.

OS10A

This spring is at the end of the dirt road, past the cemetery. Spring empties into bath tub. Rockwell's "OS10" appears to be mis-mapped, if this is the same spring.

OS10B

This is where the dirt road crosses the dry creek, before the cemetery. There is no spring here, just a dry wash.

WR1

Drive along the ridge east of the Arness/Rockwell gate, to end. Hike down trail to where ravine narrows (about 200m.) A bush was tagged on right side of trail with a silver marker.

WR3

This location is directly below Rockwell's Bldg. 059. A large bush was tagged with a silver marker.

CR4

Located in large ravine between Rockwell's RMDF and Bldg. 059. Tagged bush on north wall of ravine (tag reads, "CR3").

ER7A

Located behind Rockwell's SRE building. From cleared area located on property "point," hike east around large boulders. Samples taken from ravine below boulders.

ER8

Located in ravine about 100m east of road to OS1. Tagged by fallen tree.

CA1

Located below paved creek crossing, under water pipe, across from pool and tennis court.

CA2

Located under footbridge to Curland Chapel.

CA3

Located under bridge by "Bettie's Snack Bar" and playground.

CC

Control sample for soil, located under bridge on Peppertree Lane, in dry riverbed.