TECHNICAL MEMORANDUM:

RADIOLOGICAL HUMAN HEALTH ASSESSMENT FOR THE E' VICINITY PROPERTY OF THE NIAGARA FALLS STORAGE SITE

LEWISTON, NEW YORK

MARCH 1999

prepared by
U.S. Army Corps of Engineers, Buffalo District Office, Formerly Utilized Sites Remedial Action Program

with technical assistance from
Science Applications International Corporation ESC-FUSRAP

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ACRONYMS AND ABBREVIATIONS

AEC	Atomic Energy Commission
ARAR	Applicable or Relevant and Appropriate Requirement
BNI	Bechtel National, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWM	Chemical Waste Management
DAC	Derived Air Concentration
DCH	Data Collection Handbook
DOE	U.S. Department of Energy
EFH	Exposure Factors Handbook
EPC	Exposure Point Concentration
EPA	U.S. Environmental Protection Agency
FUSRAP	Formerly Utilized Sites Remedial Action Program
LOOW	Lake Ontario Ordnance Works
MED	Manhattan Engineer District
N/A	Not Applicable)
NFSS	Niagara Falls Storage Site
ORAU	Oak Ridge Associated Universities
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RESRAD	Residual Radioactivity
TCLP	toxicity characteristic leaching procedure
TSCA	Toxic Substances Control Act
UCL_{95}	upper 95 percent confidence level
VP	vicinity property
WL	Working Level

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1. INTRODUCTION

In 1974, the Atomic Energy Commission (AEC), a predecessor to the U.S. Department of Energy (DOE), instituted the Formerly Utilized Sites Remedial Action Program (FUSRAP). FUSRAP was transferred from DOE to the U.S. Army Corps of Engineers in 1997. This program was created to identify and remediate or control sites where residual radioactivity remains from the early years of the nation's atomic energy program, or from commercial operations causing conditions that Congress has authorized FUSRAP to remedy. The E' Vicinity Property (VP) is one of the sites being managed by the Buffalo District Corps of Engineers under FUSRAP. This document provides an assessment of cancer risk and radiological dose attributable to the radiological contamination at the E' site.

The radioactively contaminated soil within the E' VP is also contaminated with polychlorinated biphenyl compounds (PCBs). Consequently, soil within the bermed area must be handled in accordance with the Toxic Substances Control Act (TSCA) even if no radioactive contamination were present. The results of this radiological human health assessment will serve as the basis for determining whether any action is warranted to address the radiological contamination within the E' property, considering that management of the material as PCB contaminated soil may provide adequate protection from the radiological contamination, and evaluating remediation and disposal of the impacted soils by the property owner, Chemical Waste Management (CWM), in their on-site disposal facility.

1.1 SITE BACKGROUND

The Niagara Falls Storage Site (NFSS) and VPs illustrated in Figure 1 were originally a part of the Lake Ontario Ordnance Works (LOOW). In 1944, the site was assigned to the Manhattan Engineer District (MED), which used portions of the LOOW (presently referred to as NFSS) from 1944 to 1947 to store uranium ore processing residues (BNI 1992). By 1948, most of the original LOOW was sold to commercial interests by the War Assets Administration. The 603 hectares (ha) (1,490 acres) that remained of the LOOW were transferred to the AEC which used it as a storage site for radioactive and nonradioactive waste until 1953 (ORAU 1990).

Waste stored at LOOW originated from many sources. Historical records indicate that major contributors included Linde Air Products Division, Mallinckrodt Chemical Plant, Knolls Atomic Power Laboratory, Union Carbide's Electrometallurgical Operation, Middlesex Sampling Plant, Oak Ridge National Laboratory, Eldorado Mining and Refining Company, and Brookhaven National Laboratory. Records indicate that although most of the waste received was radioactive, nonradioactive waste was also received.

In the late 1950s, a major cleanup of the NFSS occurred, which included removing and consolidating surface debris, and moving this waste to Oak Ridge, Tennessee. Deeper radioactive residues and soils were left in place (BNI 1992). From 1955 to 1975, more than 526 ha (1,300 acres) of land certified to be clean under then existing standards was sold to private concerns, leaving the current 77 ha (191 acre)-NFSS. As a result of site operations, in combination with surface water

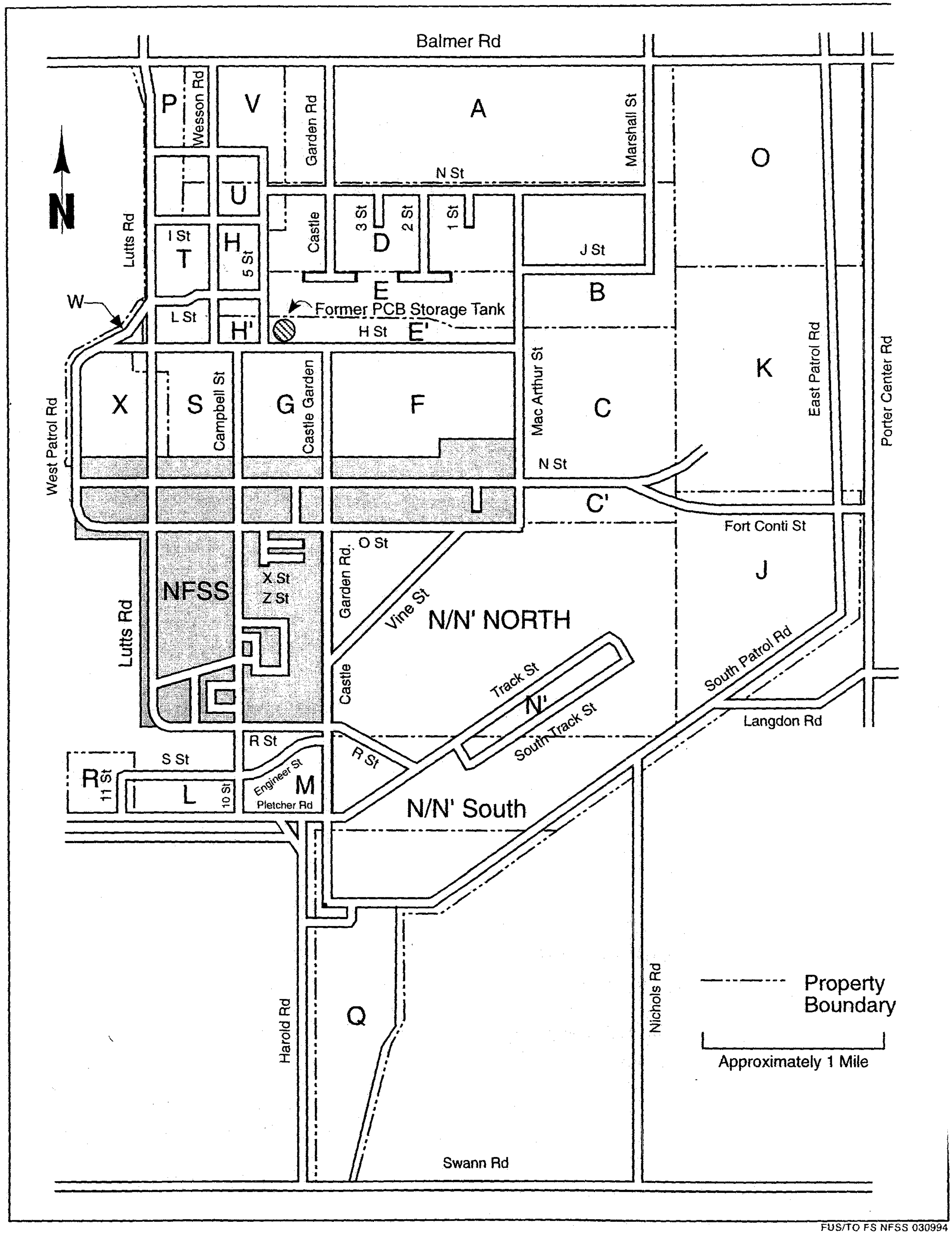

Figure 1. Niagara Falls Storage Site and Vicinity Properties, Lewiston, New York

transport, some surrounding properties and areas of the LOOW outside of the NFSS boundaries contained soil with elevated radiological activity (BNI 1992).

1.1.1 VP Remediation

Bechtel National, Inc. (BNI), under contract with DOE, began consolidating radioactive waste and soil above DOE guidelines from the VPs on the NFSS in 1981. From 1981 to 1984, Oak Ridge Associated Universities (ORAU) conducted radiological surveys, which determined that 11 VPs exceeded DOE Order 5400.5 guidelines for residual radioactivity. In 1983, BNI undertook decontamination efforts on the VPs for DOE. Additional surveys were performed by BNI at the direction of DOE to more accurately define the boundaries of soil containing radioactivity on the VPs from 1985 to 1986 (ORAU 1990). Cleanup consisted of excavating surface and subsurface materials exceeding DOE Order 5400.5 guidelines and placing it in an on-site waste containment structure on NFSS. The majority of the remedial action was completed in 1991, with 195,000 cubic meters (m^3) [255,000 cubic yards (yd^3)] of material placed in the waste containment structure (SAIC 1995).

At the time of characterization and remediation of the VPs, operations at the Chemical Waste Management's Model City facility prevented access to soil at the E' VP. Soil inside a bermed area beneath two PCB storage tanks (T-64 and T-65) could not be investigated or remediated at the time the other VPs were being addressed. Characterization of the E' area was deferred to a later date subsequent to Chemical Waste Management's action to close the PCB storage tanks, which occurred early in 1994.

1.1.2 Model City

Chemical Waste Management's Model City Facility is an active treatment, storage, and disposal facility permitted to accept Resource Conservation and Recovery Act (RCRA) and TSCA regulated wastes. The PCB storage tanks were part of this operation. Tanks T-64 and T-65 shared the same secondary containment system which consisted of a compacted soil layer and berm. The top of the berm rises approximately 1 m [3.3 feet (ft)] above the surrounding grade to prevent surface water from entering the contained area. A drainage ditch surrounding the outside of the secondary containment system directs run-off away from the outside slope of the containment system berm (GAI 1994). The tanks were used for PCB liquid phase separation. Both tanks stood vertically on a sand sub-base over natural ground, supported by a flat-bottomed concrete ring wall foundation and were constructed of carbon steel. Tank dimensions were 6.1 m (20 ft) (straight side) in height with diameters of 7.5 m (24.5 ft) (GAI 1994). Tank closure activities began in December 1993. Both tanks were emptied and cleaned, then dismantled and disposed at the Model City facility in Landfill SLF-12. Other operations at the Model City Facility are ongoing.

TMA Eberline performed a gamma walkover survey of the E' area for DOE in October 1993. All areas were found to be near background levels except in the bermed secondary containment system under the PCB tanks. In 1995, DOE directed BNI to conduct a characterization study concentrating on areas that TMA Eberline's gamma survey had identified as above background to determine whether the E' soil contained radioactive or hazardous constituents. The results of this characterization are discussed in Section 1.3.

Currently, the bermed area is no longer in use, although the Model City Facility continues to be owned and operated by Chemical Waste Management. The E' property is within the confines of the facility. The entire facility is surrounded by a fence and access is restricted by security guards at the gates. The E' bermed area has been covered with a geotextile material by CWM because of the presence of PCBs.

1.2 SCOPE

The purpose of this document is to provide an assessment of dose equivalent rates and excess lifetime cancer risks associated with the radioactive contamination in the E' VP in order to provide information on compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) risk criteria as well as potential legal requirements that may be found to be applicable or relevant and appropriate in subsequent documentation. In order to achieve this objective, radiological dose and risk will be evaluated for all exposure scenarios that may need to be assessed in order to satisfy CERCLA (40 CFR 300), the Uranium Mill Tailings Radiation Control Act (40 CFR 292), or the Nuclear Regulatory Commission (NRC) Radiological Criteria for License Termination (10 CFR 20). Even though there are limits placed on the disposal of this soil by the TSCA (40 CFR 761), potential future uses that are prohibited by TSCA are considered in the assessment to test compliance of potential remedial alternatives with radiological criteria.

While this document attempts to provide sufficient information to determine compliance with radiological criteria for a number of remedial options, it is not the purpose of this document to determine which applicable or relevant and appropriate requirements (ARARs) standards apply to the material at E'.

1.3 CHARACTERIZATION RESULTS

Results from the TMA Eberline study for E' are shown in Figure 2. Average background gamma radiation levels were determined to be 9,000 counts per minute (cpm). Readings above background on and within the bermed area ranged from 20,000 to 90,000 cpm. The locations of the samples collected by BNI corresponded to elevated readings obtained during the gamma walkover.

Sampling locations from the June 1995 BNI E' investigation are shown in Figure 3. Two samples were collected from each borehole. The first sample from each location was collected from the surface interval [0 to 15 cm (0 to 6 inches)]. The second sample was collected from the subsurface interval having the highest activity level based on a downhole gamma survey and direct beta-gamma measurements. Each sample was analyzed for PCBs and radionuclides, and six samples were also analyzed for RCRA toxicity characteristic leaching procedure (TCLP) constituents.

Table 1 presents radiological data from the BNI characterization. The complete radiological data set, including detection limits and counting error as well as TCLP and PCB data are provided in Appendix A. None of the TCLP samples exceeded TCLP concentration limits (40 CFR 261.24).

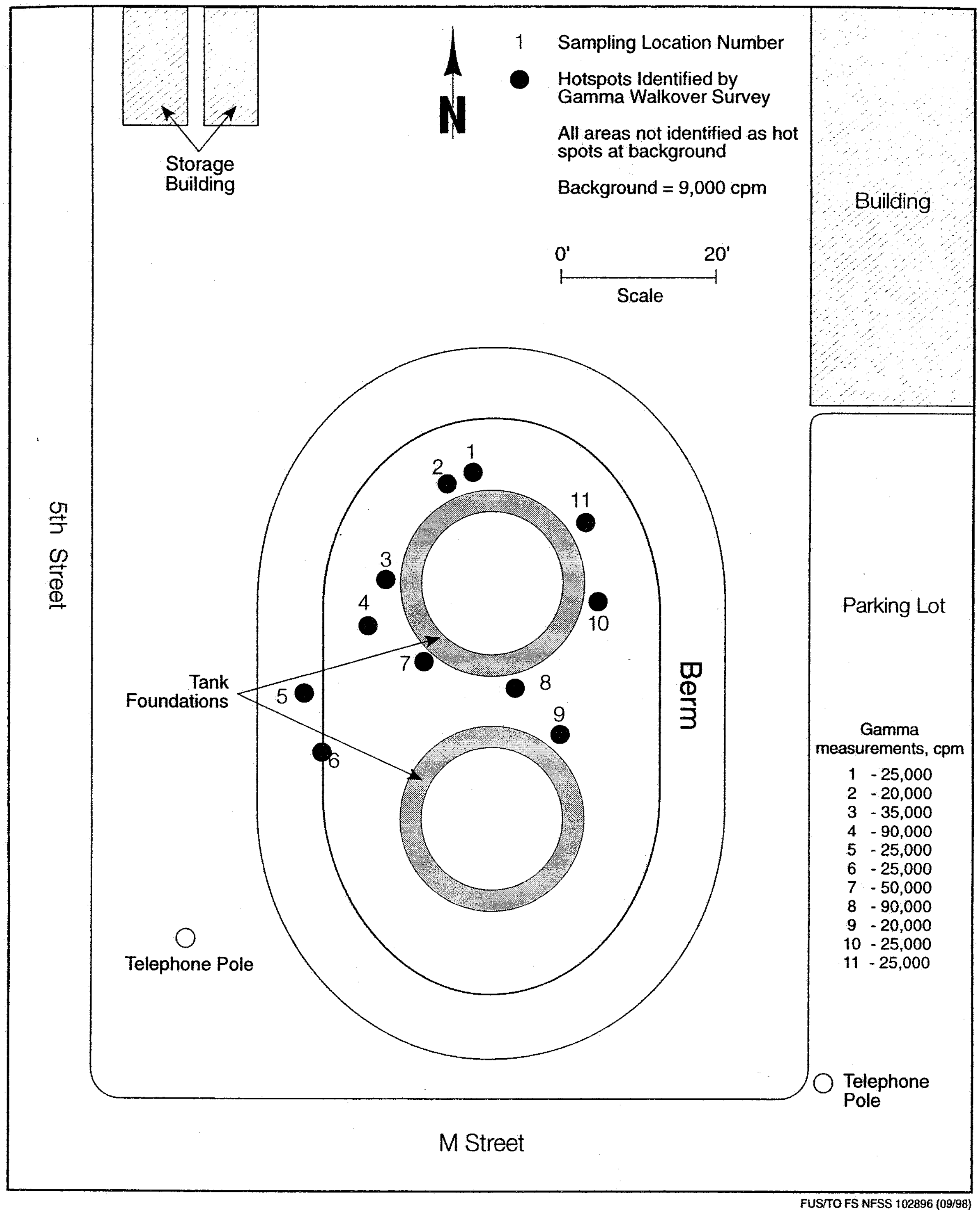

Figure 2. Radiological Hotspots Identified by TMA Gamma Walkover Survey

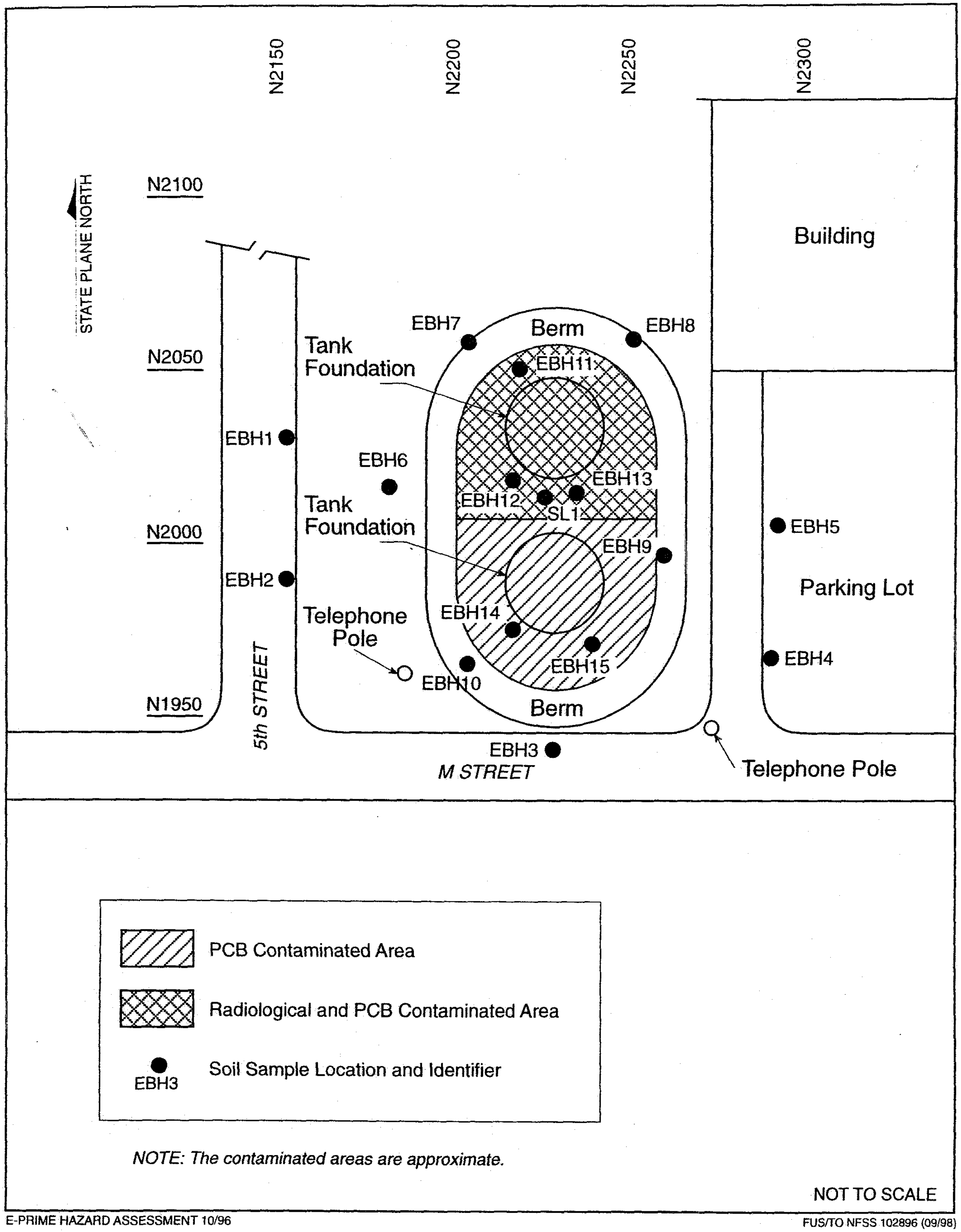

Figure 3. E' Soil Sampling Locations

Table 1. E' Analytical Results (pCi/g)

Area	Station	Depth (ft)	Ra-226	Th-228	Th-230	U-234	U-235	U-238
Outside berm	EBH01	0 - 0.5	0.81	0.172	0.664	0.622	0.05	0.655
Outside berm	EBH01	1 - 2	6	0.564	2.2	1.71	0.113	1.61
Outside berm	EBH02	0 - 0.5	0.52	0.115	0.673	0.566	0.031	0.529
Outside berm	EBH02	2 - 3	7.4	0.998	2.31	4.01	0.189	3.91
Outside berm	EBH03	0 - 0.5	1.8	0.747	1.18	1.34	0.131	1.27
Outside berm	EBH03	2 - 3	0.79	0.552	0.933	0.683	0.03	0.692
Outside berm	EBH04	0 - 0.5	3	0.734	1.69	2	0.096	1.84
Outside berm	EBH04	2 - 3	1.6	0.815	0.917	1.1	0.098	1.1
Outside berm	EBH05	0 - 0.5	1.3	0.341	0.69	0.886	0.064	0.863
Outside berm	EBH05	5 - 6	1.7	0.863	0.926	1.29	0.176	0.795
Outside berm	EBH06	0 - 0.5	1.2	0.77	1.1	0.86	0.063	0.775
Outside berm	EBH06	1.5 - 2.5	2.8	0.92	1.4	1.16	0.05	1.07
On berm	EBH07	0 - 0.5	0.74	0.274	0.729	0.889	0.053	0.824
On berm	EBH07	4 - 5	3.9	0.934	1.6	1.73	0.117	1.7
On berm	EBH08	0 - 0.5	2.1	0.827	1.13	0.94	0.068	0.986
On berm	EBH08	7 - 8	3.3	0.864	0.97	3.67	0.235	3.28
On berm	EBH09	0 - 0.5	0.89	0.488	0.866	0.668	0.043	0.544
On berm	EBH09	3 - 4	1.1	0.871	1.04	1.74	0.139	1.59
On berm	EBH10	0 - 0.5	1	0.638	1.13	0.87	0.048	0.692
On berm	EBH10	4 - 5	3.6	0.864	2.08	1.88	0.111	1.76
Inside berm	EBH11	0 - 0	5.4	0.779	3.24	2.07	0.176	2.15
Inside berm	EBH11	0 - 0.5	5	0.77	2.08	2.03	0.121	2.15
Inside berm	EBH11	0.5 - 1	4.5	0.78	1.48	2.21	0.106	2.02
Inside berm	EBH12	0 - 0.5	45	0.844	9.79	3.85	0.256	3.75
Inside berm	EBH12	0.5 - 1	230	0.855	38.1	6.49	0.377	6.36
Inside berm	EBH13	0 - 0.5	63	0.66	21.2	3.13	0.197	3.14
Inside berm	EBH13	0.5 - 1	19	0.718	4.26	2.87	0.171	2.69
Inside berm	EBH14	0 - 0.5	1.7	0.738	0.991	0.878	0.036	1.11
Inside berm	EBH14	1 - 2	0.91	0.473	0.845	0.729	0.037	0.637
Inside berm	EBH15	0 - 0.5	1.1	0.769	0.88	0.795	0.057	0.83
Inside berm	EBH15	1 - 2	0.69	0.603	0.803	0.617	0.025	0.534

Only one sample location inside the bermed area, EBH14, was below the PCB TSCA criteria. All other borings contained PCBs in excess of the regulatory threshold of 25 parts per million (ppm) (BNI 1995). A total of five borings were sampled inside the bermed area. An additional surface sample, SL01, was taken near the center of the bermed area. Two of the borings, EBH 12 and EBH 13, contained Ra-226 10 to 40 times higher than any of the other samples. Both of these borings are located near the center of the bermed area (see Figure 3), suggesting the radioactive material may be highly localized. The source of these radionuclides is uncertain, as no pathway has been demonstrated from the NFSS to the bermed area, however, because of the proximity of the NFSS, it is possible the radioactive material originated from NFSS.

The eight samples taken from four boreholes on the berm had radionuclide concentrations that were low, but generally above background. The highest reading on the berm was 3.9 pCi/g of Ra-226, which is well above the 0.66 pCi/g reported as background in this area (Berger 1983). PCBs were detected in all but one of the borings in the berm. No PCBs were detected in Boring EBH 08, and all the rest of the borings had PCBs detected at concentrations below 2 ppm.

Samples collected from the area outside the berm were taken in an area near the berm. The area outside of the berm contained radionuclides at concentrations that were generally low (maximum detection 7.4 pCi/g Ra-226), but each of the six borings outside of the berm contained at least one sample that was greater than twice background in Ra-226. PCBs were detected in at least one of the samples in each of the six borings. The highest concentrations were found in Borings EBH04 and EBH05 in the parking lot across the street from the bermed area (Figure 3). EBH04 contained 1.4 ppm Aroclor-1016 and 0.53 ppm Aroclor-1260 and EBH05 contained 1.8 ppm Aroclor-1016 and 1.0 ppm Aroclor-1260 in the surface (0–0.5 ft) intervals. PCBs were not detected in the second deeper samples in either borehole.

2. HUMAN HEALTH ASSESSMENT

This assessment was performed to evaluate the dose and risk associated with the radioactive material in its current state as well as after the material is remediated under potential future use conditions. Minimal exposure to the residual materials occurs under present conditions, due to restricted public access, the geotextile cover in place over the contaminated area, and infrequent worker access for inspections and maintenance. The exposure scenarios considered in this analysis for current conditions, therefore, include the current worker and the remedial worker. For the purposes of this assessment, the remedial worker may be a worker excavating the contaminated material, placing a cover over the contaminated area, or performing both excavation and cover in sequence, i.e., first excavating the material then placing cover material over the site.

Current conditions do not provide any credible opportunities for significant exposures to the radioactive material. Potential future uses, including residential and industrial use, are considered to provide evaluations of the consequences of loss of control. It is more likely, however, that the restricted access to the facility will be maintained into the foreseeable future.

2.1 DATA EVALUATION

Analytical results for the E' samples were available for 16 isotopes, however, the data for many of these isotopes were suspect (Appendix B). The data were rejected by BNI, who collected the data, for all isotopes except Th-228, Th-230, U-234, U-235, U-238, and Ra-226, as discussed in Appendix B. Two sets of analyses were available for U-235. U-235 was analyzed by both alpha and gamma spectrometry. The alpha spectrometry results were used in this assessment because the alpha spectrometry results for the E' samples had less uncertainty than the gamma spectrometry results.

Three source terms were identified for use in the evaluations. The first is the area inside the berm. The second is the berm and the area outside the berm. The berm and the area outside the berm are below regulatory limits for PCBs and have relatively low concentrations of radionuclides as compared to inside the berm, thus the berm and the area outside the berm were combined to provide a data set representing the E' area outside the bermed area. It should be noted that the samples were taken a short distance from the bermed area and actually represent an area that is only a small fraction of the entire E' VP (see Figures 1 and 2). A third potential source term was developed in response to a CWM proposal that a likely remedy in the bermed area would be to push the berm into the contaminated area and then place a 1 foot clay cap and 6 inches of topsoil over the area. Thus, the third source term will consist of the samples inside the berm combined with the samples taken from the berm.

Background concentrations of naturally occurring radioactive material in soil for the NFSS are determined for U-238, U-234, U-235, Th-230, Ra-226, Th-232, and Th-228. The U-238 background concentration is determined from samples collected approximately 15 miles from NFSS in Tonawanda, New York, and reported in Myrick, et al. (1981). U-234 and U-235 background concentrations are assumed to be present at their naturally occurring ratios to U-238 of 1 and 0.046, respectively. The Ra-226 and Th-232 background concentrations are determined from 20 soil samples collected in the Lewiston, New York area as reported by Berger (1983). Th-230 is assumed to be in activity equilibrium with Ra-226. Th-228 is assumed to be in activity equilibrium with Th-232. The radionuclides and their respective background concentrations are illustrated in Table 2.

Table 2. Background Radionuclide Concentrations

Radionuclide	Background Concentration (pCi/g)
U-234	0.98
U-235	0.045
U-238	0.98
Th-228	0.73
Th-230	0.66
Th-232	0.73
Ra-226	0.66

The analytical results for the grouped samples were used to determine the maximum, minimum, mean, and upper 95 percent confidence level (UCL_{95}) on the mean. The UCL_{95} represents a concentration that will exceed the mean concentration of a randomly drawn set of samples 95 percent of the time. This value, after subtracting background, was used as the exposure point concentration (EPC) for the remediation worker, unless the UCL_{95} exceeded the maximum detected concentration. When there is great variability in measured concentration values, the UCL_{95} may exceed the maximum detected value due to a high standard deviation. In such cases, the maximum detected value is used as the EPC instead of the UCL_{95} (EPA 1989). The results of this evaluation are presented in Table 3.

Background concentrations are subtracted from the UCL_{95} as it is appropriate to evaluate dose and risk for site contaminants and not include natural background concentrations of radioactive material (EPA 1997a).

Table 3. Summary of Radionuclide Concentrations within the E' Vicinity Property

Analyte	Results > Detection Limit	Minimum Detection	Maximum Detection	Estimate of the Mean	Standard Deviation	UCL_{95}	EPC[1]
Source Term 1 - Borings Inside Berm							
Ra-226	11/11	0.69	230	30.9	68.2	1150	229
Th-228	11/11	0.47	0.86	0.73	0.11	0.79	0.057
Th-230	7/11	1.48	38.1	6.7	11.8	46.8	37.4
U-234	11/11	0.62	6.49	2.35	1.75	4.71	3.73
U-235	9/11	0.037	0.38	0.15	0.11	0.35	0.31
U-238	11/11	0.53	6.36	2.34	1.70	4.72	3.74
Source Term 2 - Borings Outside Berm + Borings On Berm							
Ra-226	20/20	0.52	7.4	2.25	1.84	3.46	2.8
Th-228	19/20	0.17	1.00	0.67	0.26	0.77	0.04
Th-230	7/20	0.93	2.3	1.21	0.51	1.41	0.75
U-234	20/20	0.57	4.01	1.41	0.94	1.87	0.89
U-235	17/20	0.043	0.24	0.095	0.057	0.13	0.085
U-238	20/20	0.53	3.91	1.30	0.89	1.73	0.75
Source Term 3 - Borings Inside Berm + Borings On Berm							
Ra-226	19/19	0.69	230	20.7	53.4	41.9	41.2
Th-228	19/19	0.27	0.93	0.72	0.17	0.79	0.06
Th-230	9/19	1.48	38.1	4.91	9.4	8.65	7.99
U-234	19/19	0.62	6.49	1.99	1.5	2.94	1.96
U-235	17/19	0.037	0.38	0.13	0.093	0.20	0.16
U-238	19/19	0.534	6.36	1.93	1.46	2.96	1.98

[1] The EPC concentration is the UCL_{95} less background unless the UCL_{95} exceeds the maximum detected concentration, in which case the EPC is the maximum detected concentration less background (EPA 1989)

Concentrations of decay products for which no valid analytical data were available were set equal to the concentrations of the parent radionuclides assuming secular equilibrium. Secular equilibrium is a term used to describe the process by which radionuclides with much shorter half lives than the parent atoms reach essentially the same activity as the parent after 7 half lives of the progeny. All isotopes in Table 3 have valid analytical data.

2.2 EXPOSURE ASSESSMENT

Potential receptors for this assessment were chosen to provide information needed to assess compliance with various potential ARARs that may be imposed upon the final disposition of the E' VP. These receptors include the remedial worker (either excavation or cover construction), future industrial use, and future residential use. The conditions under which these receptors may be exposed include no action (inside and outside the bermed area), placement of 1 foot of clay and 6 inches of topsoil over the area (inside and outside the bermed area), excavation of the radioactive materials (inside the bermed area), and placement of the cover following excavation of the radioactive materials. Table 4 provides an exposure matrix showing the combinations and indicating which source terms from Table 3 were used to represent exposure point concentrations for each receptor. It is assumed that the exposure concentration inside the berm following excavation will be the same as the exposure concentration currently outside the berm.

Table 4. Source Terms Data Sets[1] Used To Estimate Exposure Point Concentrations

Remedy	Remedial Worker	Industrial Worker	Current Employee	Resident
Inside Bermed Area				
No Action	N/A	1	1	1
Cover	3	3	3	3
Excavate	1	2	2	2
Excavate and cover	1/2	2	2	2
Outside Bermed Area				
No Action	N/A	2	N/A	2
Cover	2	2	N/A	2

[1] Numbers in columns refer to source term data sets identified in Table 3.
N/A = Not Applicable

Risk and dose were calculated using Residual Radioactivity (RESRAD) computer software (Yu et al. 1993a) version 5.82. Site specific parameters changed from RESRAD default values are shown in Table 5. Parameters used to represent each receptor are shown in Table 6. The underlying assumptions used to describe exposure conditions for each receptor are described below.

Table 5. Site Specific Parameters Changed from RESRAD Default Values

Parameter	Bermed Area	E'	Basis
Area of contaminated zone (m^2)	246	482,000	Computed from scale on Figures 1 and 2.
Thickness of contaminated Zone (m)	1	1	Few hits greater than twice background below 3 foot depth.
Depth of soil mixing layer (m)	0.05	0.05	Default value based on agricultural scenario assuming tilling to 6 in. depth. 5 cm reasonable for nonagricultural setting.
Cover depth, (m)	0, 0.46	0, 0.46	Most scenarios considered with and without cover. CWM has proposed 1 foot of clay and 6 inches of topsoil. as a likely cover for the bermed area.

2.2.1 Remedial Worker

The two scenarios for the remedial worker are cover construction and excavation. To develop an exposure duration, productivity rates were obtained from Means *Environmental Restoration Unit Cost Book* (Martin 1999).

Table 6. Scenario Specific Parameters Changed from RESRAD Default Values

Parameter	Remedial worker	Resident	Industrial	Current Employee	Basis
Inhalation Rate, m^3/yr	11,400	5,500	5,500	5,500	Resident, current and industrial employees; Exposure Factors Handbook (EFH) 15.2 m^3/day average for men; Remedial Worker, average outdoor worker inhalation rate of 1.3 m^3/hr
Mass Loading for Inhalation, g/m^3	0.00018	0.00003	0.00003	0.00003	Data Collection Handbook (DCH), adjusted for 30% respirable fraction. Construction activities value is used for the remedial worker, average ambient conditions for all others.
Exposure Duration, years	Calculated	30	7	7	EFH resident upper 95 percentile, industrial and current employee, median tenure for men and women over age 16. Remedial worker computed on basis of time required to complete job.
Time Fraction Indoors	0	0.68	0.20	0	EFH resident, 16.4 hrs/day, 50th percentile; industrial based on 7 hrs/day, 250 days/yr
Time Fraction Outdoors	Calculated	0.083	0.029	0.023	EFH resident, 2 hrs/day; industrial 1hr/day 250 days/yr; Current worker 4 hrs/wk, 50 weeks/yr
Soil Ingestion Rate g/yr	175	18.25	18.25	175	Current worker and remedial worker 480 mg/day for adults engaged in outdoor activities (EFH). Industrial and residential 50 mg/day as a reasonable central estimate of adult soil ingestion (EFH)
Erosion Rate	0	0.00006	0	0	Resident DCH, 2% slope, no garden. Industrial 0 due to high probability of paving and/or building slab over soil. Current employee 0 due to maintenance of cover. Remedial worker 0 because significant erosion would not occur during short duration of remedial activities.

References:
DCH *Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil*, Yu, et al. 1993b
EFH *Exposure Factors Handbook*, EPA 1997b

For the clay cover, Means (Martin 1999) gives a rate of 448.5 yd^2/hr to spread dumped clay fill in a 6 inch lift. From Figure 2, the major and minor axes of the elliptical bermed area can be estimated as approximately 23 meters (75 feet) and 14 meters (45 feet) respectively. The area within the berm is computed as 247 m^2 (295 yd^2). Similarly, the area for all of E' was computed after approximating the length and width from Figure 1 as approximately 482,000 m^2 (576,000 yd^2). The time required to install the 1 foot clay cover is then computed using Equation 1.

$$Time\ on\ site = \frac{2\text{-}6\ inch\ layers \times area}{448.5\ yd^2/hr \times 0.63 \times 0.91} \tag{1}$$

Equation 1 assumes an efficiency factor of 0.63 and a site constraint factor of 0.91. RESRAD requires the fraction of a year the receptor spends on site. This is computed by dividing the time on site by 365 days/year × 24 hrs/day. For the berm cover, the time fraction was computed at 0.0003. The computed dose for such a short period of exposure was sufficiently low that the additional dose to apply 6 inches of topsoil over the foot of clay was not computed. The time fraction for covering the area outside of the berm was 0.26 for a period of 2 years.

The time on site for excavation was computed using Means, production rate of 40 yd^3/hr for an excavator with a 1 yd^3 bucket. The volume to be excavated was estimated by assuming a depth of contamination of 3 feet and multiplying the depth by the area within the berm. The depth of 3 feet was chosen because the deepest samples taken inside the berm were at 2 feet and because the deepest samples were taken at the depth of highest radioactive contamination in each borehole as indicated by gamma logging. It is reasonable to assume that the radioactive contamination does not extend deeper than 3 feet. Thus, the volume of radioactively contaminated soil inside the berm is computed to be 226 m^3 (295 yd^3). Similar to equation (1), the time required to excavate the contaminated soil is given by the equation

$$Time\ on\ site = \frac{Volume}{40\ yd^3/hr \times 0.63 \times 0.91} \tag{2}$$

The excavation of radioactively contaminated soil inside the bermed area would require 13 hours, resulting in a time fraction of 0.0015.

Other remedial worker-specific parameters required for RESRAD were set to be consistent with recommendations of the Environmental Protection Agency's (EPA's) *Exposure Factors Handbook* (EPA 1997b) when a value was available from the handbook. Recommendations from the Data Collection Handbook (Yu et al. 1993b) for dust loading in air during construction activities were adopted. Values for the inhalation rate were adjusted for the respirable fraction of the particulate loading, 30% (Paustenbach 1989). The erosion rate was set to 0 because erosion would not be a significant factor in exposure during the short duration of the remedial activities.

2.2.2 Resident

The primary source of exposure parameters for the resident was EPA's *Exposure Factors Handbook* (EPA 1997b). The EFH recommends values for time spent indoors and outdoors at home of 16.4 and 2 hrs/day, respectively, based on the 50th percentile reported in the *National Human*

Activity Pattern Survey. The inhalation rate is based upon EPA's recommendation for the daily average inhalation rate of adult men, 15.2 m^3/day. The duration of exposure is based on the 95th percentile for length of time at a single residence (EPA 1997b). The soil ingestion rate (50 mg/day) is a reasonable central estimate of adult soil ingestion (EPA 1997b). The mass loading for inhalation is based on average ambient conditions (Yu et al. 1993b). The erosion rate assumes a 2% slope at the property and no garden (Yu et al. 1993b).

2.2.3 Current and Industrial Workers

The only differences between the current worker and the industrial worker are the time spent onsite and the soil ingestion rate. The current worker is modeled as someone who periodically inspects the site and makes repairs to the geotextile material currently covering the bermed area. This is conservatively estimated to require four hours per week. The soil ingestion rate was set to the *Exposure Factor Handbook* recommendation for construction activities because the repairs to the geotextile probably would closely approach construction activities. The industrial worker, on the other hand, is expected to spend 7 hours per day indoors on site and 1 hour per day outdoors for 250 days per year. EPA's central estimate recommendation for soil ingestion (50 mg/day) was used to represent the industrial employee's incidental soil ingestion. Erosion rates were set to 0 because of maintenance of the geomembrane cover in the current worker scenario and the likelihood that the area would be paved if developed as industrial in the future. The exposure duration, 7 years, is the median tenure at a job for men over the age of 16. Mass loading is derived from the *Data Collection Handbook* (Yu et al. 1993b) average ambient conditions with a 30% factor applied to account for the respirable fraction (Paustenbach 1989). The inhalation rate is based on the average male inhalation rate of 15.2 m^3/day.

2.3 RESULTS

The results of the assessment are shown in Table 7. The table presents both annual dose equivalent and incremental lifetime risk of a cancer occurring (i.e. morbidity rate) for each potential remedy and each potential receptor both inside and outside the bermed area in E'.

2.3.1 Current Risks

The dose to the current worker was estimated to be 52 mrem/yr with no cover and <1 mrem/yr if the clay and topsoil cover are placed over the site. With no clay cover in place, inspection and repair of the current cover would increase the current employee's lifetime risk of cancer by an estimated 2×10^{-4}, near the top of the CERCLA risk range. If the clay cover is placed over the material, the cancer risk due to the radioactive materials beneath the cover becomes only 1×10^{-7}. Residual concentrations expected to remain following excavation present low residual dose and risk regardless of whether the area receives a clay cover following excavation.

Outside of the bermed area, the current worker scenario (as defined to assess the risk to the employee inspecting and maintaining the cover over the bermed area) is not meaningful because routine inspection and maintenance outside the bermed area is not necessary. The industrial worker better represents the current employee outside of the bermed area. The assessment estimated the dose to the industrial worker at 6 mrem/yr, increasing the worker's cancer risk by an estimated 2×10^{-5}.

2.3.2 Future Use

The assessment indicates that the area inside the berm is unsuitable for either industrial or residential future use in its current state due to the radioactive material in the soil. However, due to the high variability of the data set, the exposure point concentration was likely too high and actual doses and risks would be much lower than reported here. Placement of the clay and topsoil cover would provide sufficient protection to future users so long as the cover is not breached (see Table 7). Excavation without placement of a cover would result in doses and cancer risk from the residual material higher than placement of a cover without excavation, but still within CERCLA risk limits. Excavation, followed by placement of the clay and topsoil cover, essentially removes risk from the radioactive materials unless the cover is breached. In addition, restrictions placed on the soil as TSCA regulated material would be protective of human health and the environment for both the radiological and chemical constituents in the soil.

Table 7. Results

Remedy	Remedial Worker		Industrial Worker		Current Employee		Resident	
	Dose (mrem)	Risk	Dose (mrem/yr)	Risk	Dose (mrem/yr)	Risk	Dose (mrem/yr)	Risk
Inside Bermed Area								
No action	N/A	N/A	371	2×10^{-3}	52	2×10^{-4}	1,230	2×10^{-2}
Cover	<1	$<10^{-7}$	<1	1×10^{-6}	<1	1×10^{-7}	<1	1×10^{-5}
Excavate	3	2×10^{-6}	5	2×10^{-5}	<1	3×10^{-6}	15	3×10^{-4}
dig and cover	3	2×10^{-6}	<1	$<10^{-7}$	<1	$<10^{-7}$	<1	9×10^{-7}
Outside Bermed Area								
No action	N/A	N/A	6	2×10^{-5}	N/A	N/A	18	3×10^{-4}
Cover	19[1]	1×10^{-5}	<1	$<10^{-7}$	N/A	N/A	<1	9×10^{-7}

[1] Sum of year 0 and year 1

N/A = Not Applicable. Remedial worker not applicable to No Action because no remediation is done under the No Action Scenario. Current worker was defined in terms of maintenance requirements within the bermed area. This receptor not a reasonable maximum exposure scenario outside of the bermed area.

Excess risks and doses due to radionuclides outside the bermed area were predicted to be 3×10^{-4} (18 mrem/yr) for the resident under current (no action) conditions or 9×10^{-7} (<1 mrem/yr) if 18 inches cover is placed over all of the E' VP.

2.3.3 Remedial Worker

The annual doses and excess lifetime cancer risks to the remedial worker inside the bermed area are low due to the short duration of exposure. Although the doses and risks are low, they are probably overstated due to the sparse data set and high variability of the data within the bermed area.

Use of the maximum detected concentration as representative of the exposure point concentration likely results in an overestimate of the dose.

A dose of less than 1 mrem is predicted by RESRAD from the dust inhalation pathway during excavation. The remedial worker was modeled with no respiratory protection and the results indicate that the dose received from inhalation during excavation of the soil inside the berm is low. Based on the dust loading used in the model of 1.8×10^{-4} g/m^3 and the EPCs, the occupational derived air concentrations (DAC) were not exceeded for any of the radionuclides. The occupational DAC is the concentration in air that if breathed by a person for a working year of 2,000 hours under conditions of light work, would result in an intake equivalent to the annual limit. Respiratory protection and/or dust suppression measures should therefore not be necessary for protection from the radiological contaminants. However, air monitoring should be a part of remedial actions to document occupational exposures and to ensure that the concentrations in air are as low as predicted.

To cover the entire area outside of the bermed area would require about 2 years with the remedial worker receiving about 10 mrem/yr. This would result in an excess lifetime cancer risk estimated at 1×10^{-5}.

2.3.4 Radon Results

Table 8 presents the modeled estimates of the radon flux and concentration for the various alternatives. Placement of the cover over the area would reduce the radon to 10% of the levels without cover. According to the modeling results, placement of a cover over the material would reduce radon emissions more than excavation without cover. Excavation followed by placement of cover would reduce radon to about 1% of its no action level.

Table 8. Radon Results[1]

Condition	Outdoor Flux (pCi/m^2/s)	Indoor Concentration (pCi/L)	Indoor Working Levels (WL)
No Action, inside Berm	164	45	0.24
1.5 ft cover, inside berm	17	4.9	0.026
Excavate, no cover, inside berm	29	0.68	0.0036
Excavate, cover, inside berm	1.4	0.41	0.0021
No Action, outside berm	29	0.86	0.0045

[1]All radon results include background concentrations.

2.4 UNCERTAINTIES

2.4.1 Parameter Assumptions

Exposure parameters were selected to provide conservative, yet reasonable estimates of potential radiological dose and risk to each receptor. Site-specific measurements and data were used, where available, to describe site conditions as accurately as possible. Where site-specific data were not available, parameter values were chosen to provide reasonably conservative estimates of exposure or standard default values recommended by EPA or other authorities.

2.4.2 Weighted Average Assumptions

An additional uncertainty in the sample data relates to the volumetric distribution of the residual radioactive materials. Each data point is given equal weight in calculating the concentration statistics, although each data point does not necessarily represent a fixed volume of soil nor are sampling locations uniformly distributed throughout the site. Since the E' sample locations were biased toward locations of increased direct gamma activity, the sample statistics are likely to over estimate the actual average radionuclide concentrations in the soil. In fact, if one compares the raw data in Table 1 to the sample locations in Figure 3, it can readily be seen that the concentrations would be reduced to near 3 times background just by removing the top 2 feet from the center of the berm.

2.4.3 Impacted Zone Distribution Assumptions

The residual radioactivity is assumed (modeled) to be uniformly distributed throughout a 1-m (3 ft) thick layer of soil across the bermed area. Actual site conditions are expected to be much more irregular, with most of the radioactive material in the center of the E' bermed area. Similarly, the radionuclide concentrations are not homogeneous throughout the site. The 1-meter homogeneous layer assumed for this analysis represents an idealized model of actual conditions, but still provides a conservative dose estimate.

2.4.4 Source Term

As discussed in Section 2.1, much of the data taken in the bermed area had to be rejected (see Appendix B). Results were reported for 16 separate isotopes; however, only 6 could be used in the analysis. Short-lived decay products of the isotopes retained were assumed to be in equilibrium with the parent isotopes.

Although the E' area outside the berm was modeled using all the radiological data taken outside the berm, all the samples taken outside the berm were taken in close proximity to the berm (see Figure 3). The samples were taken over an area of about 900 m^2 (10,000 ft^2), whereas from the scale in Figure 1, it can be seen that the entire E' property is over 1.8 kilometers (1 mile) long.

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APPENDIX A

E' DATA

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The data in this appendix have been screened to eliminate any compounds that were not detected at least once on the site. If a compound was detected at least once, it is included in every sample even if it was not detected in the sample.

The radiological data are all presented, including the radionuclides that were rejected from the data (see Appendix B). Only the results for radionuclides acknowledged as having acceptable results in Appendix B were used in the dose and risk evaluation.

TCLP data are only available from 6 samples. Only SL01 has results for the complete suite of TCLP analytes. The other samples were analyzed only for volatiles and semivolatiles. None of the results exceeded TCLP limits.

Table A-1. Radiological Data

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Outside Berm	EBH01	NFS011	0	0.5	Actinium-228	pCi/g	<	0.14	0.14	UJ	=
Outside Berm	EBH01	NFS011	0	0.5	Bismuth-212	pCi/g	<	0.21	0.21	UJ	=
Outside Berm	EBH01	NFS011	0	0.5	Cesium-137	pCi/g	<	-0.011	1	UJ	=
Outside Berm	EBH01	NFS011	0	0.5	Lead-212	pCi/g		0.094		J	=
Outside Berm	EBH01	NFS011	0	0.5	Lead-214	pCi/g	<	0	0	UJ	U
Outside Berm	EBH01	NFS011	0	0.5	Potassium-40	pCi/g		2.7		J	=
Outside Berm	EBH01	NFS011	0	0.5	Protactinium-231	pCi/g	<	0.25	0.25	UJ	=
Outside Berm	EBH01	NFS011	0	0.5	Radium-223	pCi/g	<	0.73	0.73	UJ	=
Outside Berm	EBH01	NFS011	0	0.5	Radium-224	pCi/g		1.1		J	=
Outside Berm	EBH01	NFS011	0	0.5	Radium-226	pCi/g		0.81		J	=
Outside Berm	EBH01	NFS011	0	0.5	Thorium-228	pCi/g		0.172	0.4		=
Outside Berm	EBH01	NFS011	0	0.5	Thorium-230	pCi/g	<	0.664	0.4	U	=
Outside Berm	EBH01	NFS011	0	0.5	Thorium-232	pCi/g		0.161	0.4		=
Outside Berm	EBH01	NFS011	0	0.5	Uranium-234	pCi/g		0.622	0.4		=
Outside Berm	EBH01	NFS011	0	0.5	Uranium-235	pCi/g		0.05	0.4		=
Outside Berm	EBH01	NFS011	0	0.5	Uranium-238	pCi/g		0.655	0.4		=
Outside Berm	EBH01	NFS015	1	2	Actinium-228	pCi/g		0.53		J	=
Outside Berm	EBH01	NFS015	1	2	Bismuth-212	pCi/g	<	0.41	0.41	UJ	=
Outside Berm	EBH01	NFS015	1	2	Cesium-137	pCi/g	<	0.038	1	UJ	=
Outside Berm	EBH01	NFS015	1	2	Lead-212	pCi/g		0.35		J	=
Outside Berm	EBH01	NFS015	1	2	Lead-214	pCi/g	<	0	0	UJ	U
Outside Berm	EBH01	NFS015	1	2	Potassium-40	pCi/g		8.6		J	=
Outside Berm	EBH01	NFS015	1	2	Protactinium-231	pCi/g	<	0.83	0.83	UJ	=
Outside Berm	EBH01	NFS015	1	2	Radium-223	pCi/g	<	2.1	2.1	UJ	=
Outside Berm	EBH01	NFS015	1	2	Radium-224	pCi/g	<	1.1	1.1	UJ	=
Outside Berm	EBH01	NFS015	1	2	Radium-226	pCi/g		6		J	=
Outside Berm	EBH01	NFS015	1	2	Thorium-228	pCi/g		0.564	0.4		=
Outside Berm	EBH01	NFS015	1	2	Thorium-230	pCi/g		2.2	0.4		=
Outside Berm	EBH01	NFS015	1	2	Thorium-232	pCi/g		0.589	0.4		=
Outside Berm	EBH01	NFS015	1	2	Uranium-234	pCi/g		1.71	0.4		=
Outside Berm	EBH01	NFS015	1	2	Uranium-235	pCi/g		0.113	0.4		=
Outside Berm	EBH01	NFS015	1	2	Uranium-238	pCi/g		1.61	0.4		=
Outside Berm	EBH02	NFS016	0	0.5	Actinium-228	pCi/g	<	0.17	0.17	UJ	=
Outside Berm	EBH02	NFS016	0	0.5	Bismuth-212	pCi/g	<	0.32	0.32	UJ	=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Outside Berm	EBH02	NFS016	0	0.5	Cesium-137	pCi/g	<	0.008	0.001	UJ	=
Outside Berm	EBH02	NFS016	0	0.5	Lead-212	pCi/g		0.13		J	=
Outside Berm	EBH02	NFS016	0	0.5	Lead-214	pCi/g		73		J	=
Outside Berm	EBH02	NFS016	0	0.5	Potassium-40	pCi/g		3.4		J	=
Outside Berm	EBH02	NFS016	0	0.5	Protactinium-231	pCi/g	<	0.31	0.31	UJ	=
Outside Berm	EBH02	NFS016	0	0.5	Radium-223	pCi/g	<	0.12	0.12	UJ	=
Outside Berm	EBH02	NFS016	0	0.5	Radium-224	pCi/g		1.5		J	=
Outside Berm	EBH02	NFS016	0	0.5	Radium-226	pCi/g		0.52		J	=
Outside Berm	EBH02	NFS016	0	0.5	Thorium-228	pCi/g	<	0.115	0.115	UJ	=
Outside Berm	EBH02	NFS016	0	0.5	Thorium-230	pCi/g	<	0.673	0.673	UJ	=
Outside Berm	EBH02	NFS016	0	0.5	Thorium-232	pCi/g		0.187		J	=
Outside Berm	EBH02	NFS016	0	0.5	Uranium-234	pCi/g		0.566	0.4		=
Outside Berm	EBH02	NFS016	0	0.5	Uranium-235	pCi/g	<	0.031	0.4	U	=
Outside Berm	EBH02	NFS016	0	0.5	Uranium-238	pCi/g		0.529	0.4		=
Outside Berm	EBH02	NFS018	2	3	Actinium-228	pCi/g		0.59		J	=
Outside Berm	EBH02	NFS018	2	3	Bismuth-212	pCi/g		0.93		J	=
Outside Berm	EBH02	NFS018	2	3	Cesium-137	pCi/g	<	0.051	1	UJ	=
Outside Berm	EBH02	NFS018	2	3	Lead-212	pCi/g		0.49		J	=
Outside Berm	EBH02	NFS018	2	3	Lead-214	pCi/g		1000		J	=
Outside Berm	EBH02	NFS018	2	3	Potassium-40	pCi/g		12		J	=
Outside Berm	EBH02	NFS018	2	3	Protactinium-231	pCi/g	<	0.91	0.91	UJ	=
Outside Berm	EBH02	NFS018	2	3	Radium-223	pCi/g		3.3		J	=
Outside Berm	EBH02	NFS018	2	3	Radium-224	pCi/g		5.5		J	=
Outside Berm	EBH02	NFS018	2	3	Radium-226	pCi/g		7.4		J	=
Outside Berm	EBH02	NFS018	2	3	Thorium-228	pCi/g		0.998			=
Outside Berm	EBH02	NFS018	2	3	Thorium-230	pCi/g		2.31			=
Outside Berm	EBH02	NFS018	2	3	Thorium-232	pCi/g		0.697			=
Outside Berm	EBH02	NFS018	2	3	Uranium-234	pCi/g		4.01	0.4		=
Outside Berm	EBH02	NFS018	2	3	Uranium-235	pCi/g		0.189	0.4		=
Outside Berm	EBH02	NFS018	2	3	Uranium-238	pCi/g		3.91	0.4		=
Outside Berm	EBH03	NFS020	0	0.5	Actinium-228	pCi/g		0.68		J	=
Outside Berm	EBH03	NFS020	0	0.5	Bismuth-212	pCi/g	<	0.65	0.65	UJ	=
Outside Berm	EBH03	NFS020	0	0.5	Cesium-137	pCi/g		0.12	1	J	=
Outside Berm	EBH03	NFS020	0	0.5	Lead-212	pCi/g		0.47		J	=
Outside Berm	EBH03	NFS020	0	0.5	Lead-214	pCi/g		270		J	=
Outside Berm	EBH03	NFS020	0	0.5	Potassium-40	pCi/g		9.9		J	=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Outside Berm	EBH03	NFS020	0	0.5	Protactinium-231	pCi/g	<	0.49	0.49	UJ	=
Outside Berm	EBH03	NFS020	0	0.5	Radium-223	pCi/g	<	1.1	1.1	UJ	=
Outside Berm	EBH03	NFS020	0	0.5	Radium-224	pCi/g	<	0.95	0.95	UJ	=
Outside Berm	EBH03	NFS020	0	0.5	Radium-226	pCi/g		1.8		J	=
Outside Berm	EBH03	NFS020	0	0.5	Thorium-228	pCi/g		0.747		J	=
Outside Berm	EBH03	NFS020	0	0.5	Thorium-230	pCi/g		1.18		J	=
Outside Berm	EBH03	NFS020	0	0.5	Thorium-232	pCi/g		0.826		J	=
Outside Berm	EBH03	NFS020	0	0.5	Uranium-234	pCi/g		1.34	0.4		=
Outside Berm	EBH03	NFS020	0	0.5	Uranium-235	pCi/g		0.131	0.4		=
Outside Berm	EBH03	NFS020	0	0.5	Uranium-238	pCi/g		1.27	0.4		=
Outside Berm	EBH03	NFS022	2	3	Actinium-228	pCi/g	<	0.25	0.25	UJ	=
Outside Berm	EBH03	NFS022	2	3	Bismuth-212	pCi/g	<	0.6	0.6	UJ	=
Outside Berm	EBH03	NFS022	2	3	Cesium-137	pCi/g	<	-0.01	1	UJ	=
Outside Berm	EBH03	NFS022	2	3	Lead-212	pCi/g		0.4		J	=
Outside Berm	EBH03	NFS022	2	3	Lead-214	pCi/g	<	0	0	UJ	U
Outside Berm	EBH03	NFS022	2	3	Potassium-40	pCi/g		10		J	=
Outside Berm	EBH03	NFS022	2	3	Protactinium-231	pCi/g	<	0.41	0.41	UJ	=
Outside Berm	EBH03	NFS022	2	3	Radium-223	pCi/g	<	0.95	0.95	UJ	=
Outside Berm	EBH03	NFS022	2	3	Radium-224	pCi/g		4.5		J	=
Outside Berm	EBH03	NFS022	2	3	Radium-226	pCi/g		0.79		J	=
Outside Berm	EBH03	NFS022	2	3	Thorium-228	pCi/g		0.552			=
Outside Berm	EBH03	NFS022	2	3	Thorium-230	pCi/g		0.933			=
Outside Berm	EBH03	NFS022	2	3	Thorium-232	pCi/g		0.624			=
Outside Berm	EBH03	NFS022	2	3	Uranium-234	pCi/g		0.683	0.4		=
Outside Berm	EBH03	NFS022	2	3	Uranium-235	pCi/g	<	0.03	0.4	U	=
Outside Berm	EBH03	NFS022	2	3	Uranium-238	pCi/g		0.692	0.4		=
Outside Berm	EBH04	NFS024	0	0.5	Actinium-228	pCi/g	<	0.27	0.27	U	=
Outside Berm	EBH04	NFS024	0	0.5	Bismuth-212	pCi/g	<	0.41	0.41	U	=
Outside Berm	EBH04	NFS024	0	0.5	Cesium-137	pCi/g	<	0.0071	0.001	U	=
Outside Berm	EBH04	NFS024	0	0.5	Lead-212	pCi/g		0.45			=
Outside Berm	EBH04	NFS024	0	0.5	Lead-214	pCi/g		120			=
Outside Berm	EBH04	NFS024	0	0.5	Potassium-40	pCi/g		10			=
Outside Berm	EBH04	NFS024	0	0.5	Protactinium-231	pCi/g	<	5.4	5.4	U	=
Outside Berm	EBH04	NFS024	0	0.5	Radium-223	pCi/g	<	0.73	0.73	U	=
Outside Berm	EBH04	NFS024	0	0.5	Radium-224	pCi/g		5.1			=
Outside Berm	EBH04	NFS024	0	0.5	Radium-226	pCi/g		3			=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Outside Berm	EBH04	NFS024	0	0.5	Thorium-228	pCi/g		0.734			=
Outside Berm	EBH04	NFS024	0	0.5	Thorium-230	pCi/g		1.69			=
Outside Berm	EBH04	NFS024	0	0.5	Thorium-232	pCi/g		0.06			=
Outside Berm	EBH04	NFS024	0	0.5	Uranium-234	pCi/g		2	0.4		=
Outside Berm	EBH04	NFS024	0	0.5	Uranium-235	pCi/g		0.096	0.4		=
Outside Berm	EBH04	NFS024	0	0.5	Uranium-238	pCi/g		1.84	0.4		=
Outside Berm	EBH04	NFS025	2	3	Actinium-228	pCi/g		1			=
Outside Berm	EBH04	NFS025	2	3	Bismuth-212	pCi/g	<	0.84	0.84	U	=
Outside Berm	EBH04	NFS025	2	3	Cesium-137	pCi/g	<	0.016	1	U	=
Outside Berm	EBH04	NFS025	2	3	Lead-212	pCi/g		0.55			=
Outside Berm	EBH04	NFS025	2	3	Lead-214	pCi/g		42			=
Outside Berm	EBH04	NFS025	2	3	Potassium-40	pCi/g		13			=
Outside Berm	EBH04	NFS025	2	3	Protactinium-231	pCi/g	<	0.43	0.43	U	=
Outside Berm	EBH04	NFS025	2	3	Radium-223	pCi/g	<	0.71	0.71	U	=
Outside Berm	EBH04	NFS025	2	3	Radium-224	pCi/g		6.2			=
Outside Berm	EBH04	NFS025	2	3	Radium-226	pCi/g		1.6			=
Outside Berm	EBH04	NFS025	2	3	Thorium-228	pCi/g		0.815			=
Outside Berm	EBH04	NFS025	2	3	Thorium-230	pCi/g	<	0.917	0.917	U	=
Outside Berm	EBH04	NFS025	2	3	Thorium-232	pCi/g		0.586			=
Outside Berm	EBH04	NFS025	2	3	Uranium-234	pCi/g		1.1	0.4		=
Outside Berm	EBH04	NFS025	2	3	Uranium-235	pCi/g	<	0.098	0.098	U	=
Outside Berm	EBH04	NFS025	2	3	Uranium-238	pCi/g		1.1	0.4		=
Outside Berm	EBH05	NFS026	0	0.5	Actinium-228	pCi/g	<	0.3	0.3	U	=
Outside Berm	EBH05	NFS026	0	0.5	Bismuth-212	pCi/g	<	0.73	0.73	U	=
Outside Berm	EBH05	NFS026	0	0.5	Cesium-137	pCi/g	<	0.031	1	U	=
Outside Berm	EBH05	NFS026	0	0.5	Lead-212	pCi/g		0.33			=
Outside Berm	EBH05	NFS026	0	0.5	Lead-214	pCi/g		60			=
Outside Berm	EBH05	NFS026	0	0.5	Potassium-40	pCi/g		9.2			=
Outside Berm	EBH05	NFS026	0	0.5	Protactinium-231	pCi/g	<	0.49	0.49	U	=
Outside Berm	EBH05	NFS026	0	0.5	Radium-223	pCi/g	<	0.64	0.64	U	=
Outside Berm	EBH05	NFS026	0	0.5	Radium-224	pCi/g		3.7			=
Outside Berm	EBH05	NFS026	0	0.5	Radium-226	pCi/g		1.3			=
Outside Berm	EBH05	NFS026	0	0.5	Thorium-228	pCi/g		0.341			=
Outside Berm	EBH05	NFS026	0	0.5	Thorium-230	pCi/g	<	0.69	0.69	U	=
Outside Berm	EBH05	NFS026	0	0.5	Thorium-232	pCi/g		0.341			=
Outside Berm	EBH05	NFS026	0	0.5	Uranium-234	pCi/g		0.886	0.4		=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Outside Berm	EBH05	NFS026	0	0.5	Uranium-235	pCi/g		0.064	0.4		=
Outside Berm	EBH05	NFS026	0	0.5	Uranium-238	pCi/g		0.863	0.4		=
Outside Berm	EBH05	NFS029	5	6	Actinium-228	pCi/g		1.2		J	=
Outside Berm	EBH05	NFS029	5	6	Bismuth-212	pCi/g	<	0.95	0.95	UJ	=
Outside Berm	EBH05	NFS029	5	6	Cesium-137	pCi/g	<	-0.017	1	UJ	=
Outside Berm	EBH05	NFS029	5	6	Lead-212	pCi/g		0.65		J	=
Outside Berm	EBH05	NFS029	5	6	Lead-214	pCi/g		130		J	=
Outside Berm	EBH05	NFS029	5	6	Potassium-40	pCi/g		15		J	=
Outside Berm	EBH05	NFS029	5	6	Protactinium-231	pCi/g	<	0.5	0.5	UJ	=
Outside Berm	EBH05	NFS029	5	6	Radium-223	pCi/g	<	0.42	0.42	UJ	=
Outside Berm	EBH05	NFS029	5	6	Radium-224	pCi/g		7.3		J	=
Outside Berm	EBH05	NFS029	5	6	Radium-226	pCi/g		1.7		J	=
Outside Berm	EBH05	NFS029	5	6	Thorium-228	pCi/g		0.863			=
Outside Berm	EBH05	NFS029	5	6	Thorium-230	pCi/g	<	0.926	0.926	U	=
Outside Berm	EBH05	NFS029	5	6	Thorium-232	pCi/g		0.827			=
Outside Berm	EBH05	NFS029	5	6	Uranium-234	pCi/g		1.29	0.4		=
Outside Berm	EBH05	NFS029	5	6	Uranium-235	pCi/g		0.176	0.4		=
Outside Berm	EBH05	NFS029	5	6	Uranium-238	pCi/g		0.795	0.4		=
Outside Berm	EBH06	NFS041	0	0.5	Actinium-228	pCi/g		0.86		J	=
Outside Berm	EBH06	NFS041	0	0.5	Bismuth-212	pCi/g	<	0.71	0.71	UJ	=
Outside Berm	EBH06	NFS041	0	0.5	Cesium-137	pCi/g		0.07	1	J	=
Outside Berm	EBH06	NFS041	0	0.5	Lead-212	pCi/g		0.57		J	=
Outside Berm	EBH06	NFS041	0	0.5	Lead-214	pCi/g		120		J	=
Outside Berm	EBH06	NFS041	0	0.5	Potassium-40	pCi/g		13		J	=
Outside Berm	EBH06	NFS041	0	0.5	Protactinium-231	pCi/g	<	0.38	0.38	UJ	=
Outside Berm	EBH06	NFS041	0	0.5	Radium-223	pCi/g	<	1	1	UJ	=
Outside Berm	EBH06	NFS041	0	0.5	Radium-224	pCi/g		6.4		J	=
Outside Berm	EBH06	NFS041	0	0.5	Radium-226	pCi/g		1.2		J	=
Outside Berm	EBH06	NFS041	0	0.5	Thorium-228	pCi/g		0.77	0.4		=
Outside Berm	EBH06	NFS041	0	0.5	Thorium-230	pCi/g	<	1.1	0.4	U	=
Outside Berm	EBH06	NFS041	0	0.5	Thorium-232	pCi/g		0.715	0.4		=
Outside Berm	EBH06	NFS041	0	0.5	Uranium-234	pCi/g		0.86	0.4		=
Outside Berm	EBH06	NFS041	0	0.5	Uranium-235	pCi/g		0.063	0.4		=
Outside Berm	EBH06	NFS041	0	0.5	Uranium-238	pCi/g		0.775	0.4		=
Outside Berm	EBH06	NFS043	1.5	2.5	Actinium-228	pCi/g		0.7		J	=
Outside Berm	EBH06	NFS043	1.5	2.5	Bismuth-212	pCi/g	<	0.78	0.78	UJ	=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Outside Berm	EBH06	NFS043	1.5	2.5	Cesium-137	pCi/g		0.055	1	J	=
Outside Berm	EBH06	NFS043	1.5	2.5	Lead-212	pCi/g		0.62		J	=
Outside Berm	EBH06	NFS043	1.5	2.5	Lead-214	pCi/g		300		J	=
Outside Berm	EBH06	NFS043	1.5	2.5	Potassium-40	pCi/g		13		J	=
Outside Berm	EBH06	NFS043	1.5	2.5	Protactinium-231	pCi/g	<	4.3	4.3	UJ	=
Outside Berm	EBH06	NFS043	1.5	2.5	Radium-223	pCi/g	<	1.2	1.2	UJ	=
Outside Berm	EBH06	NFS043	1.5	2.5	Radium-224	pCi/g		7.1		J	=
Outside Berm	EBH06	NFS043	1.5	2.5	Radium-226	pCi/g		2.8		J	=
Outside Berm	EBH06	NFS043	1.5	2.5	Thorium-228	pCi/g		0.92	0.4		=
Outside Berm	EBH06	NFS043	1.5	2.5	Thorium-230	pCi/g	<	1.4	0.4	U	=
Outside Berm	EBH06	NFS043	1.5	2.5	Thorium-232	pCi/g		0.796	0.4		=
Outside Berm	EBH06	NFS043	1.5	2.5	Uranium-234	pCi/g		1.16	0.4		=
Outside Berm	EBH06	NFS043	1.5	2.5	Uranium-235	pCi/g		0.05	0.4		=
Outside Berm	EBH06	NFS043	1.5	2.5	Uranium-238	pCi/g		1.07	0.4		=
Berm	EBH07	NFS033	0	0.5	Actinium-228	pCi/g	<	0.2	0.2	UJ	=
Berm	EBH07	NFS033	0	0.5	Bismuth-212	pCi/g	<	0.26	0.26	UJ	=
Berm	EBH07	NFS033	0	0.5	Cesium-137	pCi/g	<	-0.02	1	UJ	=
Berm	EBH07	NFS033	0	0.5	Lead-212	pCi/g		0.19		J	=
Berm	EBH07	NFS033	0	0.5	Lead-214	pCi/g		71		J	=
Berm	EBH07	NFS033	0	0.5	Potassium-40	pCi/g		5.3		J	=
Berm	EBH07	NFS033	0	0.5	Protactinium-231	pCi/g	<	1.1	1.1	UJ	=
Berm	EBH07	NFS033	0	0.5	Radium-223	pCi/g	<	-0.015	-0.015	UJ	=
Berm	EBH07	NFS033	0	0.5	Radium-224	pCi/g		2.1		J	=
Berm	EBH07	NFS033	0	0.5	Radium-226	pCi/g		0.74		J	=
Berm	EBH07	NFS033	0	0.5	Thorium-228	pCi/g		0.274			=
Berm	EBH07	NFS033	0	0.5	Thorium-230	pCi/g	<	0.729	0.729	U	=
Berm	EBH07	NFS033	0	0.5	Thorium-232	pCi/g		0.206			=
Berm	EBH07	NFS033	0	0.5	Uranium-234	pCi/g		0.889	0.4		=
Berm	EBH07	NFS033	0	0.5	Uranium-235	pCi/g		0.053	0.4		=
Berm	EBH07	NFS033	0	0.5	Uranium-238	pCi/g		0.824	0.4		=
Berm	EBH07	NFS036	4	5	Actinium-228	pCi/g	<	0.45	0.45	UJ	=
Berm	EBH07	NFS036	4	5	Bismuth-212	pCi/g	<	1.1	1.1	UJ	=
Berm	EBH07	NFS036	4	5	Cesium-137	pCi/g		0.1	1	J	=
Berm	EBH07	NFS036	4	5	Lead-212	pCi/g		0.69		J	=
Berm	EBH07	NFS036	4	5	Lead-214	pCi/g	<	0	0	UJ	U
Berm	EBH07	NFS036	4	5	Potassium-40	pCi/g		14		J	=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Berm	EBH07	NFS036	4	5	Protactinium-231	pCi/g	<	0.88	0.88	UJ	=
Berm	EBH07	NFS036	4	5	Radium-223	pCi/g	<	2.1	2.1	UJ	=
Berm	EBH07	NFS036	4	5	Radium-224	pCi/g	<	1.6	1.6	UJ	=
Berm	EBH07	NFS036	4	5	Radium-226	pCi/g		3.9		J	=
Berm	EBH07	NFS036	4	5	Thorium-228	pCi/g		0.934			=
Berm	EBH07	NFS036	4	5	Thorium-230	pCi/g		1.6			=
Berm	EBH07	NFS036	4	5	Thorium-232	pCi/g		0.809			=
Berm	EBH07	NFS036	4	5	Uranium-234	pCi/g		1.73	0.4		=
Berm	EBH07	NFS036	4	5	Uranium-235	pCi/g		0.117	0.4		=
Berm	EBH07	NFS036	4	5	Uranium-238	pCi/g		1.7	0.4		=
Berm	EBH08	NFS028	0	0.5	Actinium-228	pCi/g	<	0.39	0.39	U	=
Berm	EBH08	NFS028	0	0.5	Bismuth-212	pCi/g	<	0.84	0.84	U	=
Berm	EBH08	NFS028	0	0.5	Cesium-137	pCi/g	<	0.011	1	U	=
Berm	EBH08	NFS028	0	0.5	Lead-212	pCi/g		0.64			=
Berm	EBH08	NFS028	0	0.5	Lead-214	pCi/g		49			=
Berm	EBH08	NFS028	0	0.5	Potassium-40	pCi/g		16			=
Berm	EBH08	NFS028	0	0.5	Protactinium-231	pCi/g	<	2	2	U	=
Berm	EBH08	NFS028	0	0.5	Radium-223	pCi/g	<	0.54	0.54	U	=
Berm	EBH08	NFS028	0	0.5	Radium-224	pCi/g		7.2			=
Berm	EBH08	NFS028	0	0.5	Radium-226	pCi/g		2.1			=
Berm	EBH08	NFS028	0	0.5	Thorium-228	pCi/g		0.827			=
Berm	EBH08	NFS028	0	0.5	Thorium-230	pCi/g	<	1.13	1.13	U	=
Berm	EBH08	NFS028	0	0.5	Thorium-232	pCi/g		0.82			=
Berm	EBH08	NFS028	0	0.5	Uranium-234	pCi/g		0.94	0.4		=
Berm	EBH08	NFS028	0	0.5	Uranium-235	pCi/g		0.068	0.4		=
Berm	EBH08	NFS028	0	0.5	Uranium-238	pCi/g		0.986	0.4		=
Berm	EBH08	NFS030	7	8	Actinium-228	pCi/g		0.96		J	=
Berm	EBH08	NFS030	7	8	Bismuth-212	pCi/g	<	0.9	0.9	UJ	=
Berm	EBH08	NFS030	7	8	Cesium-137	pCi/g	<	0.038	1	UJ	=
Berm	EBH08	NFS030	7	8	Lead-212	pCi/g		0.7		J	=
Berm	EBH08	NFS030	7	8	Lead-214	pCi/g		170		J	=
Berm	EBH08	NFS030	7	8	Potassium-40	pCi/g		16		J	=
Berm	EBH08	NFS030	7	8	Protactinium-231	pCi/g	<	2.5	2.5	UJ	=
Berm	EBH08	NFS030	7	8	Radium-223	pCi/g	<	1.2	1.2	UJ	=
Berm	EBH08	NFS030	7	8	Radium-224	pCi/g	<	1.2	1.2	UJ	=
Berm	EBH08	NFS030	7	8	Radium-226	pCi/g		3.3		J	=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Berm	EBH08	NFS030	7	8	Thorium-228	pCi/g		0.864			=
Berm	EBH08	NFS030	7	8	Thorium-230	pCi/g	<	0.97	0.97	U	=
Berm	EBH08	NFS030	7	8	Thorium-232	pCi/g		0.928			=
Berm	EBH08	NFS030	7	8	Uranium-234	pCi/g		3.67	0.4		=
Berm	EBH08	NFS030	7	8	Uranium-235	pCi/g		0.235	0.4		=
Berm	EBH08	NFS030	7	8	Uranium-238	pCi/g		3.28	0.4		=
Berm	EBH09	NFS042	0	0.5	Actinium-228	pCi/g	<	0.21	0.21	UJ	=
Berm	EBH09	NFS042	0	0.5	Bismuth-212	pCi/g	<	0.23	0.23	UJ	=
Berm	EBH09	NFS042	0	0.5	Cesium-137	pCi/g	<	-0.013	1	UJ	=
Berm	EBH09	NFS042	0	0.5	Lead-212	pCi/g		0.27		J	=
Berm	EBH09	NFS042	0	0.5	Lead-214	pCi/g		62		J	=
Berm	EBH09	NFS042	0	0.5	Potassium-40	pCi/g		7.3		J	=
Berm	EBH09	NFS042	0	0.5	Protactinium-231	pCi/g	<	0.29	0.29	UJ	=
Berm	EBH09	NFS042	0	0.5	Radium-223	pCi/g	<	0.55	0.55	UJ	=
Berm	EBH09	NFS042	0	0.5	Radium-224	pCi/g		3		J	=
Berm	EBH09	NFS042	0	0.5	Radium-226	pCi/g		0.89		J	=
Berm	EBH09	NFS042	0	0.5	Thorium-228	pCi/g		0.488	0.4		=
Berm	EBH09	NFS042	0	0.5	Thorium-230	pCi/g	<	0.866	0.4	U	=
Berm	EBH09	NFS042	0	0.5	Thorium-232	pCi/g		0.454	0.4		=
Berm	EBH09	NFS042	0	0.5	Uranium-234	pCi/g		0.668	0.4		=
Berm	EBH09	NFS042	0	0.5	Uranium-235	pCi/g		0.043	0.4		=
Berm	EBH09	NFS042	0	0.5	Uranium-238	pCi/g		0.544	0.4		=
Berm	EBH09	NFS044	3	4	Actinium-228	pCi/g		0.63		J	=
Berm	EBH09	NFS044	3	4	Bismuth-212	pCi/g	<	0.63	0.63	UJ	=
Berm	EBH09	NFS044	3	4	Cesium-137	pCi/g	<	0.0046	0.001	UJ	=
Berm	EBH09	NFS044	3	4	Lead-212	pCi/g		0.5		J	=
Berm	EBH09	NFS044	3	4	Lead-214	pCi/g	<	0	0	UJ	U
Berm	EBH09	NFS044	3	4	Potassium-40	pCi/g		12		J	=
Berm	EBH09	NFS044	3	4	Protactinium-231	pCi/g	<	0.34	0.34	UJ	=
Berm	EBH09	NFS044	3	4	Radium-223	pCi/g	<	0.7	0.7	UJ	=
Berm	EBH09	NFS044	3	4	Radium-224	pCi/g	<	0.94	0.94	UJ	=
Berm	EBH09	NFS044	3	4	Radium-226	pCi/g		1.1		J	=
Berm	EBH09	NFS044	3	4	Thorium-228	pCi/g		0.871	0.4		=
Berm	EBH09	NFS044	3	4	Thorium-230	pCi/g	<	1.04	0.4	U	=
Berm	EBH09	NFS044	3	4	Thorium-232	pCi/g		0.748	0.4		=
Berm	EBH09	NFS044	3	4	Uranium-234	pCi/g		1.74	0.4		=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Berm	EBH09	NFS044	3	4	Uranium-235	pCi/g		0.139	0.4		=
Berm	EBH09	NFS044	3	4	Uranium-238	pCi/g		1.59	0.4		=
Berm	EBH10	NFS039	0	0.5	Actinium-228	pCi/g		0.47		J	=
Berm	EBH10	NFS039	0	0.5	Bismuth-212	pCi/g	<	1	1	UJ	=
Berm	EBH10	NFS039	0	0.5	Cesium-137	pCi/g		0.14	1	J	=
Berm	EBH10	NFS039	0	0.5	Lead-212	pCi/g		0.45		J	=
Berm	EBH10	NFS039	0	0.5	Lead-214	pCi/g		94		J	=
Berm	EBH10	NFS039	0	0.5	Potassium-40	pCi/g		11		J	=
Berm	EBH10	NFS039	0	0.5	Protactinium-231	pCi/g	<	0.37	0.37	UJ	=
Berm	EBH10	NFS039	0	0.5	Radium-223	pCi/g	<	0.9	0.9	UJ	=
Berm	EBH10	NFS039	0	0.5	Radium-224	pCi/g	<	0.97	0.97	UJ	=
Berm	EBH10	NFS039	0	0.5	Radium-226	pCi/g		1		J	=
Berm	EBH10	NFS039	0	0.5	Thorium-228	pCi/g		0.638	0.4		=
Berm	EBH10	NFS039	0	0.5	Thorium-230	pCi/g	<	1.13	0.4	U	=
Berm	EBH10	NFS039	0	0.5	Thorium-232	pCi/g		0.659	0.4		=
Berm	EBH10	NFS039	0	0.5	Uranium-234	pCi/g		0.87	0.4		=
Berm	EBH10	NFS039	0	0.5	Uranium-235	pCi/g		0.048	0.4		=
Berm	EBH10	NFS039	0	0.5	Uranium-238	pCi/g		0.692	0.4		=
Berm	EBH10	NFS040	4	5	Actinium-228	pCi/g		0.8		J	=
Berm	EBH10	NFS040	4	5	Bismuth-212	pCi/g	<	0.45	0.45	UJ	=
Berm	EBH10	NFS040	4	5	Cesium-137	pCi/g		0.11	1	J	=
Berm	EBH10	NFS040	4	5	Lead-212	pCi/g		0.46		J	=
Berm	EBH10	NFS040	4	5	Lead-214	pCi/g		320		J	=
Berm	EBH10	NFS040	4	5	Potassium-40	pCi/g		12		J	=
Berm	EBH10	NFS040	4	5	Protactinium-231	pCi/g	<	0.61	0.61	UJ	=
Berm	EBH10	NFS040	4	5	Radium-223	pCi/g	<	1.1	1.1	UJ	=
Berm	EBH10	NFS040	4	5	Radium-224	pCi/g	<	1.1	1.1	UJ	=
Berm	EBH10	NFS040	4	5	Radium-226	pCi/g		3.6		J	=
Berm	EBH10	NFS040	4	5	Thorium-228	pCi/g		0.864	0.4		=
Berm	EBH10	NFS040	4	5	Thorium-230	pCi/g		2.08	0.4		=
Berm	EBH10	NFS040	4	5	Thorium-232	pCi/g		0.75	0.4		=
Berm	EBH10	NFS040	4	5	Uranium-234	pCi/g		1.88	0.4		=
Berm	EBH10	NFS040	4	5	Uranium-235	pCi/g		0.111	0.4		=
Berm	EBH10	NFS040	4	5	Uranium-238	pCi/g		1.76	0.4		=
Inside Berm	EBH11	NFS035	0	0	Actinium-228	pCi/g		0.78		J	=
Inside Berm	EBH11	NFS035	0	0	Bismuth-212	pCi/g	<	0.47	0.47	UJ	=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Inside Berm	EBH11	NFS035	0	0	Cesium-137	pCi/g		0.095	1	J	=
Inside Berm	EBH11	NFS035	0	0	Lead-212	pCi/g		0.5		J	=
Inside Berm	EBH11	NFS035	0	0	Lead-214	pCi/g		620		J	=
Inside Berm	EBH11	NFS035	0	0	Potassium-40	pCi/g		12		J	=
Inside Berm	EBH11	NFS035	0	0	Protactinium-231	pCi/g	<	8.8	8.8	UJ	=
Inside Berm	EBH11	NFS035	0	0	Radium-223	pCi/g	<	1.5	1.5	UJ	=
Inside Berm	EBH11	NFS035	0	0	Radium-224	pCi/g	<	1.3	1.3	UJ	=
Inside Berm	EBH11	NFS035	0	0	Radium-226	pCi/g		5.4		J	=
Inside Berm	EBH11	NFS035	0	0	Thorium-228	pCi/g		0.779			=
Inside Berm	EBH11	NFS035	0	0	Thorium-230	pCi/g		3.24			=
Inside Berm	EBH11	NFS035	0	0	Thorium-232	pCi/g		0.721			=
Inside Berm	EBH11	NFS035	0	0	Uranium-234	pCi/g		2.07	0.4		=
Inside Berm	EBH11	NFS035	0	0	Uranium-235	pCi/g		0.176	0.4		=
Inside Berm	EBH11	NFS035	0	0	Uranium-238	pCi/g		2.15	0.4		=
Inside Berm	EBH11	NFS034	0	0.5	Actinium-228	pCi/g	<	0.37	0.37	UJ	=
Inside Berm	EBH11	NFS034	0	0.5	Bismuth-212	pCi/g	<	0.49	0.49	UJ	=
Inside Berm	EBH11	NFS034	0	0.5	Cesium-137	pCi/g		0.2	1	J	=
Inside Berm	EBH11	NFS034	0	0.5	Lead-212	pCi/g		0.48		J	=
Inside Berm	EBH11	NFS034	0	0.5	Lead-214	pCi/g		610		J	=
Inside Berm	EBH11	NFS034	0	0.5	Potassium-40	pCi/g		12		J	=
Inside Berm	EBH11	NFS034	0	0.5	Protactinium-231	pCi/g	<	1.2	1.2	UJ	=
Inside Berm	EBH11	NFS034	0	0.5	Radium-223	pCi/g	<	1.5	1.5	UJ	=
Inside Berm	EBH11	NFS034	0	0.5	Radium-224	pCi/g		5.5		J	=
Inside Berm	EBH11	NFS034	0	0.5	Radium-226	pCi/g		5		J	=
Inside Berm	EBH11	NFS034	0	0.5	Thorium-228	pCi/g		0.77			=
Inside Berm	EBH11	NFS034	0	0.5	Thorium-230	pCi/g		2.08			=
Inside Berm	EBH11	NFS034	0	0.5	Thorium-232	pCi/g		0.819			=
Inside Berm	EBH11	NFS034	0	0.5	Uranium-234	pCi/g		2.03	0.4		=
Inside Berm	EBH11	NFS034	0	0.5	Uranium-235	pCi/g		0.121	0.4		=
Inside Berm	EBH11	NFS034	0	0.5	Uranium-238	pCi/g		2.15	0.4		=
Inside Berm	EBH11	NFS037	0.5	1	Actinium-228	pCi/g		0.93		J	=
Inside Berm	EBH11	NFS037	0.5	1	Bismuth-212	pCi/g	<	0.52	0.52	UJ	=
Inside Berm	EBH11	NFS037	0.5	1	Cesium-137	pCi/g		0.11	1	J	=
Inside Berm	EBH11	NFS037	0.5	1	Lead-212	pCi/g		0.52		J	=
Inside Berm	EBH11	NFS037	0.5	1	Lead-214	pCi/g	<	0	0	UJ	U
Inside Berm	EBH11	NFS037	0.5	1	Potassium-40	pCi/g		13		J	=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Inside Berm	EBH11	NFS037	0.5	1	Protactinium-231	pCi/g	<	0.83	0.83	UJ	=
Inside Berm	EBH11	NFS037	0.5	1	Radium-223	pCi/g	<	1.9	1.9	UJ	=
Inside Berm	EBH11	NFS037	0.5	1	Radium-224	pCi/g		5.9		J	=
Inside Berm	EBH11	NFS037	0.5	1	Radium-226	pCi/g		4.5		J	=
Inside Berm	EBH11	NFS037	0.5	1	Thorium-228	pCi/g		0.78			=
Inside Berm	EBH11	NFS037	0.5	1	Thorium-230	pCi/g		1.48			=
Inside Berm	EBH11	NFS037	0.5	1	Thorium-232	pCi/g		0.78			=
Inside Berm	EBH11	NFS037	0.5	1	Uranium-234	pCi/g		2.21	0.4		=
Inside Berm	EBH11	NFS037	0.5	1	Uranium-235	pCi/g		0.106	0.4		=
Inside Berm	EBH11	NFS037	0.5	1	Uranium-238	pCi/g		2.02	0.4		=
Inside Berm	EBH12	NFS021	0	0.5	Actinium-228	pCi/g		0.72		J	=
Inside Berm	EBH12	NFS021	0	0.5	Bismuth-212	pCi/g	<	0.97	0.97	UJ	=
Inside Berm	EBH12	NFS021	0	0.5	Cesium-137	pCi/g		0.16	1	J	=
Inside Berm	EBH12	NFS021	0	0.5	Lead-212	pCi/g		0.51		J	=
Inside Berm	EBH12	NFS021	0	0.5	Lead-214	pCi/g	<	0	0	UJ	U
Inside Berm	EBH12	NFS021	0	0.5	Potassium-40	pCi/g		12		J	=
Inside Berm	EBH12	NFS021	0	0.5	Protactinium-231	pCi/g	<	2.5	2.5	UJ	=
Inside Berm	EBH12	NFS021	0	0.5	Radium-223	pCi/g		28		J	=
Inside Berm	EBH12	NFS021	0	0.5	Radium-224	pCi/g	<	2.4	2.4	UJ	=
Inside Berm	EBH12	NFS021	0	0.5	Radium-226	pCi/g		45		J	=
Inside Berm	EBH12	NFS021	0	0.5	Thorium-228	pCi/g		0.844		J	=
Inside Berm	EBH12	NFS021	0	0.5	Thorium-230	pCi/g		9.79		J	=
Inside Berm	EBH12	NFS021	0	0.5	Thorium-232	pCi/g		0.858		J	=
Inside Berm	EBH12	NFS021	0	0.5	Uranium-234	pCi/g		3.85	0.4		=
Inside Berm	EBH12	NFS021	0	0.5	Uranium-235	pCi/g		0.256	0.4		=
Inside Berm	EBH12	NFS021	0	0.5	Uranium-238	pCi/g		3.75	0.4		=
Inside Berm	EBH12	NFS023	0.5	1	Actinium-228	pCi/g	<	0.54	0.54	UJ	=
Inside Berm	EBH12	NFS023	0.5	1	Bismuth-212	pCi/g	<	0.059	0.059	UJ	=
Inside Berm	EBH12	NFS023	0.5	1	Cesium-137	pCi/g	<	0.068	1	UJ	=
Inside Berm	EBH12	NFS023	0.5	1	Lead-212	pCi/g		0.49		J	=
Inside Berm	EBH12	NFS023	0.5	1	Lead-214	pCi/g	<	0	0	UJ	U
Inside Berm	EBH12	NFS023	0.5	1	Potassium-40	pCi/g		13		J	=
Inside Berm	EBH12	NFS023	0.5	1	Protactinium-231	pCi/g		510		J	=
Inside Berm	EBH12	NFS023	0.5	1	Radium-223	pCi/g		130		J	=
Inside Berm	EBH12	NFS023	0.5	1	Radium-224	pCi/g		5.6		J	=
Inside Berm	EBH12	NFS023	0.5	1	Radium-226	pCi/g		230		J	=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Inside Berm	EBH12	NFS023	0.5	1	Thorium-228	pCi/g		0.855		J	=
Inside Berm	EBH12	NFS023	0.5	1	Thorium-230	pCi/g		38.1		J	=
Inside Berm	EBH12	NFS023	0.5	1	Thorium-232	pCi/g		0.795		J	=
Inside Berm	EBH12	NFS023	0.5	1	Uranium-234	pCi/g		6.49	0.4		=
Inside Berm	EBH12	NFS023	0.5	1	Uranium-235	pCi/g		0.377	0.4		=
Inside Berm	EBH12	NFS023	0.5	1	Uranium-238	pCi/g		6.36	0.4		=
Inside Berm	EBH13	NFS017	0	0.5	Actinium-228	pCi/g		0.95		J	=
Inside Berm	EBH13	NFS017	0	0.5	Bismuth-212	pCi/g	<	1.6	1.6	UJ	=
Inside Berm	EBH13	NFS017	0	0.5	Cesium-137	pCi/g		0.22	1	J	=
Inside Berm	EBH13	NFS017	0	0.5	Lead-212	pCi/g		0.67		J	=
Inside Berm	EBH13	NFS017	0	0.5	Lead-214	pCi/g		8800		J	=
Inside Berm	EBH13	NFS017	0	0.5	Potassium-40	pCi/g		9.9		J	=
Inside Berm	EBH13	NFS017	0	0.5	Protactinium-231	pCi/g	<	3.3	3.3	UJ	=
Inside Berm	EBH13	NFS017	0	0.5	Radium-223	pCi/g		32		J	=
Inside Berm	EBH13	NFS017	0	0.5	Radium-224	pCi/g	<	3.1	3.1	UJ	=
Inside Berm	EBH13	NFS017	0	0.5	Radium-226	pCi/g		63		J	=
Inside Berm	EBH13	NFS017	0	0.5	Thorium-228	pCi/g		0.66			=
Inside Berm	EBH13	NFS017	0	0.5	Thorium-230	pCi/g		21.2			=
Inside Berm	EBH13	NFS017	0	0.5	Thorium-232	pCi/g		0.673			=
Inside Berm	EBH13	NFS017	0	0.5	Uranium-234	pCi/g		3.13	0.4		=
Inside Berm	EBH13	NFS017	0	0.5	Uranium-235	pCi/g		0.197	0.4		=
Inside Berm	EBH13	NFS017	0	0.5	Uranium-238	pCi/g		3.14	0.4		=
Inside Berm	EBH13	NFS019	0.5	1	Actinium-228	pCi/g	<	0.33	0.33	UJ	=
Inside Berm	EBH13	NFS019	0.5	1	Bismuth-212	pCi/g	<	0.35	0.35	UJ	=
Inside Berm	EBH13	NFS019	0.5	1	Cesium-137	pCi/g	<	0.0043	0.001	UJ	=
Inside Berm	EBH13	NFS019	0.5	1	Lead-212	pCi/g		0.49		J	=
Inside Berm	EBH13	NFS019	0.5	1	Lead-214	pCi/g		2900		J	=
Inside Berm	EBH13	NFS019	0.5	1	Potassium-40	pCi/g		12		J	=
Inside Berm	EBH13	NFS019	0.5	1	Protactinium-231	pCi/g	<	35	35	UJ	=
Inside Berm	EBH13	NFS019	0.5	1	Radium-223	pCi/g		10		J	=
Inside Berm	EBH13	NFS019	0.5	1	Radium-224	pCi/g	<	1.5	1.5	UJ	=
Inside Berm	EBH13	NFS019	0.5	1	Radium-226	pCi/g		19		J	=
Inside Berm	EBH13	NFS019	0.5	1	Thorium-228	pCi/g		0.718			=
Inside Berm	EBH13	NFS019	0.5	1	Thorium-230	pCi/g		4.26			=
Inside Berm	EBH13	NFS019	0.5	1	Thorium-232	pCi/g		0.583			=
Inside Berm	EBH13	NFS019	0.5	1	Uranium-234	pCi/g		2.87	0.4		=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Inside Berm	EBH13	NFS019	0.5	1	Uranium-235	pCi/g		0.171	0.4		=
Inside Berm	EBH13	NFS019	0.5	1	Uranium-238	pCi/g		2.69	0.4		=
Inside Berm	EBH14	NFS009	0	0.5	Actinium-228	pCi/g		0.75		J	=
Inside Berm	EBH14	NFS009	0	0.5	Bismuth-212	pCi/g	<	0.69	0.69	UJ	=
Inside Berm	EBH14	NFS009	0	0.5	Cesium-137	pCi/g	<	-0.003	0.001	UJ	=
Inside Berm	EBH14	NFS009	0	0.5	Lead-212	pCi/g		0.59		J	=
Inside Berm	EBH14	NFS009	0	0.5	Lead-214	pCi/g	<	0	0	UJ	U
Inside Berm	EBH14	NFS009	0	0.5	Potassium-40	pCi/g		14		J	=
Inside Berm	EBH14	NFS009	0	0.5	Protactinium-231	pCi/g	<	0.4	0.4	UJ	=
Inside Berm	EBH14	NFS009	0	0.5	Radium-223	pCi/g	<	1.4	1.4	UJ	=
Inside Berm	EBH14	NFS009	0	0.5	Radium-224	pCi/g		6.6		J	=
Inside Berm	EBH14	NFS009	0	0.5	Radium-226	pCi/g		1.7		J	=
Inside Berm	EBH14	NFS009	0	0.5	Thorium-228	pCi/g		0.738	0.4		=
Inside Berm	EBH14	NFS009	0	0.5	Thorium-230	pCi/g	<	0.991	0.4	U	=
Inside Berm	EBH14	NFS009	0	0.5	Thorium-232	pCi/g		0.768	0.4		=
Inside Berm	EBH14	NFS009	0	0.5	Uranium-234	pCi/g		0.878	0.4		=
Inside Berm	EBH14	NFS009	0	0.5	Uranium-235	pCi/g	<	0.036	0.4	UJ	=
Inside Berm	EBH14	NFS009	0	0.5	Uranium-238	pCi/g		1.11	0.4		=
Inside Berm	EBH14	NFS010	1	2	Actinium-228	pCi/g		0.5		J	=
Inside Berm	EBH14	NFS010	1	2	Bismuth-212	pCi/g	<	0.53	0.53	UJ	=
Inside Berm	EBH14	NFS010	1	2	Cesium-137	pCi/g	<	-0.013	1	UJ	=
Inside Berm	EBH14	NFS010	1	2	Lead-212	pCi/g		0.35		J	=
Inside Berm	EBH14	NFS010	1	2	Lead-214	pCi/g	<	0	0	UJ	U
Inside Berm	EBH14	NFS010	1	2	Potassium-40	pCi/g		9.6		J	=
Inside Berm	EBH14	NFS010	1	2	Protactinium-231	pCi/g	<	0.27	0.27	UJ	=
Inside Berm	EBH14	NFS010	1	2	Radium-223	pCi/g	<	0.66	0.66	UJ	=
Inside Berm	EBH14	NFS010	1	2	Radium-224	pCi/g	<	0.76	0.76	UJ	=
Inside Berm	EBH14	NFS010	1	2	Radium-226	pCi/g		0.91		J	=
Inside Berm	EBH14	NFS010	1	2	Thorium-228	pCi/g		0.473	0.4		=
Inside Berm	EBH14	NFS010	1	2	Thorium-230	pCi/g	<	0.845	0.4	U	=
Inside Berm	EBH14	NFS010	1	2	Thorium-232	pCi/g		0.525	0.4		=
Inside Berm	EBH14	NFS010	1	2	Uranium-234	pCi/g		0.729	0.4		=
Inside Berm	EBH14	NFS010	1	2	Uranium-235	pCi/g		0.037	0.4		=
Inside Berm	EBH14	NFS010	1	2	Uranium-238	pCi/g		0.637	0.4		=
Inside Berm	EBH15	NFS012	0	0.5	Actinium-228	pCi/g		0.73		J	=
Inside Berm	EBH15	NFS012	0	0.5	Bismuth-212	pCi/g	<	0.78	0.78	UJ	=

Table A-1. Radiological Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Inside Berm	EBH15	NFS012	0	0.5	Cesium-137	pCi/g	<	0.0033	0.001	UJ	=
Inside Berm	EBH15	NFS012	0	0.5	Lead-212	pCi/g		0.51		J	=
Inside Berm	EBH15	NFS012	0	0.5	Lead-214	pCi/g	<	0	0	UJ	U
Inside Berm	EBH15	NFS012	0	0.5	Potassium-40	pCi/g		12		J	=
Inside Berm	EBH15	NFS012	0	0.5	Protactinium-231	pCi/g	<	0.39	0.39	UJ	=
Inside Berm	EBH15	NFS012	0	0.5	Radium-223	pCi/g	<	1.6	1.6	UJ	=
Inside Berm	EBH15	NFS012	0	0.5	Radium-224	pCi/g		5.7		J	=
Inside Berm	EBH15	NFS012	0	0.5	Radium-226	pCi/g		1.1		J	=
Inside Berm	EBH15	NFS012	0	0.5	Thorium-228	pCi/g		0.769	0.4		=
Inside Berm	EBH15	NFS012	0	0.5	Thorium-230	pCi/g	<	0.88	0.4	U	=
Inside Berm	EBH15	NFS012	0	0.5	Thorium-232	pCi/g		0.664	0.4		=
Inside Berm	EBH15	NFS012	0	0.5	Uranium-234	pCi/g		0.795	0.4		=
Inside Berm	EBH15	NFS012	0	0.5	Uranium-235	pCi/g		0.057	0.4		=
Inside Berm	EBH15	NFS012	0	0.5	Uranium-238	pCi/g		0.83	0.4		=
Inside Berm	EBH15	NFS014	1	2	Actinium-228	pCi/g	<	0.2	0.2	UJ	=
Inside Berm	EBH15	NFS014	1	2	Bismuth-212	pCi/g	<	0.53	0.53	UJ	=
Inside Berm	EBH15	NFS014	1	2	Cesium-137	pCi/g	<	0.01	1	UJ	=
Inside Berm	EBH15	NFS014	1	2	Lead-212	pCi/g		0.34		J	=
Inside Berm	EBH15	NFS014	1	2	Lead-214	pCi/g	<	0	0	UJ	U
Inside Berm	EBH15	NFS014	1	2	Potassium-40	pCi/g		10		J	=
Inside Berm	EBH15	NFS014	1	2	Protactinium-231	pCi/g	<	0.25	0.25	UJ	=
Inside Berm	EBH15	NFS014	1	2	Radium-223	pCi/g	<	0.78	0.78	UJ	=
Inside Berm	EBH15	NFS014	1	2	Radium-224	pCi/g	<	0.71	0.71	UJ	=
Inside Berm	EBH15	NFS014	1	2	Radium-226	pCi/g		0.69		J	=
Inside Berm	EBH15	NFS014	1	2	Thorium-228	pCi/g		0.603	0.4		=
Inside Berm	EBH15	NFS014	1	2	Thorium-230	pCi/g	<	0.803	0.4	U	=
Inside Berm	EBH15	NFS014	1	2	Thorium-232	pCi/g		0.551	0.4		=
Inside Berm	EBH15	NFS014	1	2	Uranium-234	pCi/g		0.617	0.4		=
Inside Berm	EBH15	NFS014	1	2	Uranium-235	pCi/g	<	0.025	0.4	UJ	=
Inside Berm	EBH15	NFS014	1	2	Uranium-238	pCi/g		0.534	0.4		0

Table A-2. TSCA Data

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Outside Berm	EBH01	NFS011	0	0.5	PCB1016	µg/kg		410	33	J	=
Outside Berm	EBH01	NFS011	0	0.5	PCB1248	µg/kg	<	33	33		U
Outside Berm	EBH01	NFS011	0	0.5	PCB1254	µg/kg	<	33	33		U
Outside Berm	EBH01	NFS011	0	0.5	PCB1260	µg/kg		470	33		=
Outside Berm	EBH01	NFS015	1	2	PCB1016	µg/kg		410	33	J	=
Outside Berm	EBH01	NFS015	1	2	PCB1248	µg/kg	<	33	33		U
Outside Berm	EBH01	NFS015	1	2	PCB1254	µg/kg		960	33		=
Outside Berm	EBH01	NFS015	1	2	PCB1260	µg/kg	<	33	33		U
Outside Berm	EBH02	NFS016	0	0.5	PCB1016	µg/kg		170	33	J	=
Outside Berm	EBH02	NFS016	0	0.5	PCB1248	µg/kg	<	33	33		U
Outside Berm	EBH02	NFS016	0	0.5	PCB1254	µg/kg		210	33		=
Outside Berm	EBH02	NFS016	0	0.5	PCB1260	µg/kg	<	33	33		U
Outside Berm	EBH02	NFS018	2	3	PCB1016	µg/kg	<	33	33		U
Outside Berm	EBH02	NFS018	2	3	PCB1248	µg/kg	<	33	33		U
Outside Berm	EBH02	NFS018	2	3	PCB1254	µg/kg	<	33	33		U
Outside Berm	EBH02	NFS018	2	3	PCB1260	µg/kg	<	33	33		U
Outside Berm	EBH03	NFS020	0	0.5	PCB1016	µg/kg		1300	33	J	=
Outside Berm	EBH03	NFS020	0	0.5	PCB1248	µg/kg	<	33	33		U
Outside Berm	EBH03	NFS020	0	0.5	PCB1254	µg/kg	<	33	33		U
Outside Berm	EBH03	NFS020	0	0.5	PCB1260	µg/kg		670	33		=
Outside Berm	EBH03	NFS022	2	3	PCB1016	µg/kg		44	33	J	=
Outside Berm	EBH03	NFS022	2	3	PCB1248	µg/kg	<	33	33		U
Outside Berm	EBH03	NFS022	2	3	PCB1254	µg/kg	<	33	33		U
Outside Berm	EBH03	NFS022	2	3	PCB1260	µg/kg		63	33		=
Outside Berm	EBH04	NFS024	0	0.5	PCB1016	µg/kg		1400	330	J	=
Outside Berm	EBH04	NFS024	0	0.5	PCB1248	µg/kg	<	330	330		U
Outside Berm	EBH04	NFS024	0	0.5	PCB1254	µg/kg	<	330	330		U
Outside Berm	EBH04	NFS024	0	0.5	PCB1260	µg/kg		530	330		=
Outside Berm	EBH04	NFS025	2	3	PCB1016	µg/kg	<	330	330		U
Outside Berm	EBH04	NFS025	2	3	PCB1248	µg/kg	<	330	330		U
Outside Berm	EBH04	NFS025	2	3	PCB1254	µg/kg	<	330	330		U
Outside Berm	EBH04	NFS025	2	3	PCB1260	µg/kg	<	330	330		U
Outside Berm	EBH05	NFS026	0	0.5	PCB1016	µg/kg		1800	330	J	=
Outside Berm	EBH05	NFS026	0	0.5	PCB1248	µg/kg	<	330	330		

Table A-2. TSCA Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Outside Berm	EBH05	NFS026	0	0.5	PCB1254	µg/kg	<	330	330		U
Outside Berm	EBH05	NFS026	0	0.5	PCB1260	µg/kg		1000	330		=
Outside Berm	EBH05	NFS029	5	6	PCB1016	µg/kg	<	330	330		U
Outside Berm	EBH05	NFS029	5	6	PCB1248	µg/kg	<	330	330		U
Outside Berm	EBH05	NFS029	5	6	PCB1254	µg/kg	<	330	330		U
Outside Berm	EBH05	NFS029	5	6	PCB1260	µg/kg	<	330	330		U
Outside Berm	EBH06	NFS041	0	0.5	PCB1016	µg/kg	<	220	220	UJ	U
Outside Berm	EBH06	NFS041	0	0.5	PCB1248	µg/kg		200	220	J	J
Outside Berm	EBH06	NFS041	0	0.5	PCB1254	µg/kg	<	430	430	UJ	U
Outside Berm	EBH06	NFS041	0	0.5	PCB1260	µg/kg		570	430	J	=
Outside Berm	EBH06	NFS043	1.5	2.5	PCB1016	µg/kg		1300	33	J	=
Outside Berm	EBH06	NFS043	1.5	2.5	PCB1248	µg/kg	<	33	33		U
Outside Berm	EBH06	NFS043	1.5	2.5	PCB1254	µg/kg	<	33	33		U
Outside Berm	EBH06	NFS043	1.5	2.5	PCB1260	µg/kg		280	33		=
Berm	EBH07	NFS033	0	0.5	PCB1016	µg/kg		350	330	J	=
Berm	EBH07	NFS033	0	0.5	PCB1248	µg/kg	<	330	330		U
Berm	EBH07	NFS033	0	0.5	PCB1254	µg/kg	<	330	330		U
Berm	EBH07	NFS033	0	0.5	PCB1260	µg/kg		1300	330		=
Berm	EBH07	NFS036	4	5	PCB1016	µg/kg	<	330	330		U
Berm	EBH07	NFS036	4	5	PCB1248	µg/kg	<	330	330		U
Berm	EBH07	NFS036	4	5	PCB1254	µg/kg	<	330	330		U
Berm	EBH07	NFS036	4	5	PCB1260	µg/kg		1100	330		=
Berm	EBH08	NFS028	0	0.5	PCB1016	µg/kg	<	330	330		U
Berm	EBH08	NFS028	0	0.5	PCB1248	µg/kg	<	330	330		U
Berm	EBH08	NFS028	0	0.5	PCB1254	µg/kg	<	330	330		U
Berm	EBH08	NFS028	0	0.5	PCB1260	µg/kg	<	330	330		U
Berm	EBH08	NFS030	7	8	PCB1016	µg/kg	<	330	330		U
Berm	EBH08	NFS030	7	8	PCB1248	µg/kg	<	330	330		U
Berm	EBH08	NFS030	7	8	PCB1254	µg/kg	<	330	330		U
Berm	EBH08	NFS030	7	8	PCB1260	µg/kg	<	330	330		U
Berm	EBH09	NFS042	0	0.5	PCB1016	µg/kg		72	33	J	=
Berm	EBH09	NFS042	0	0.5	PCB1248	µg/kg	<	33	33		U
Berm	EBH09	NFS042	0	0.5	PCB1254	µg/kg	<	33	33		U
Berm	EBH09	NFS042	0	0.5	PCB1260	µg/kg		310	33		=
Berm	EBH09	NFS044	3	4	PCB1016	µg/kg	<	33	33		U
Berm	EBH09	NFS044	3	4	PCB1248	µg/kg	<	33	33		U

Table A-2. TSCA Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Berm	EBH09	NFS044	3	4	PCB1254	µg/kg	<	33	33		U
Berm	EBH09	NFS044	3	4	PCB1260	µg/kg		55	33		=
Berm	EBH10	NFS039	0	0.5	PCB1016	µg/kg		190	33	J	=
Berm	EBH10	NFS039	0	0.5	PCB1248	µg/kg	<	33	33		U
Berm	EBH10	NFS039	0	0.5	PCB1254	µg/kg	<	33	33		U
Berm	EBH10	NFS039	0	0.5	PCB1260	µg/kg		400	33		=
Berm	EBH10	NFS040	4	5	PCB1016	µg/kg		310	33	J	=
Berm	EBH10	NFS040	4	5	PCB1248	µg/kg	<	33	33		U
Berm	EBH10	NFS040	4	5	PCB1254	µg/kg		640	33		=
Berm	EBH10	NFS040	4	5	PCB1260	µg/kg	<	33	33		U
Inside Berm	EBH11	NFS035	0	0	PCB1016	µg/kg		83000	330	J	=
Inside Berm	EBH11	NFS035	0	0	PCB1248	µg/kg	<	330	330		U
Inside Berm	EBH11	NFS035	0	0	PCB1254	µg/kg	<	330	330		U
Inside Berm	EBH11	NFS035	0	0	PCB1260	µg/kg		150000	330		=
Inside Berm	EBH11	NFS034	0	0.5	PCB1016	µg/kg	<	60000	60000	UJ	U
Inside Berm	EBH11	NFS034	0	0.5	PCB1248	µg/kg		100000	60000	J	=
Inside Berm	EBH11	NFS034	0	0.5	PCB1254	µg/kg	<	120000	120000	UJ	U
Inside Berm	EBH11	NFS034	0	0.5	PCB1260	µg/kg		250000	120000	J	=
Inside Berm	EBH11	NFS037	0.5	1	PCB1016	µg/kg		42000	330	J	=
Inside Berm	EBH11	NFS037	0.5	1	PCB1248	µg/kg	<	330	330		U
Inside Berm	EBH11	NFS037	0.5	1	PCB1254	µg/kg	<	330	330		U
Inside Berm	EBH11	NFS037	0.5	1	PCB1260	µg/kg		65000	330		=
Inside Berm	EBH12	NFS021	0	0.5	PCB1016	µg/kg	<	30000	30000	UJ	U
Inside Berm	EBH12	NFS021	0	0.5	PCB1248	µg/kg		53000	30000	J	=
Inside Berm	EBH12	NFS021	0	0.5	PCB1254	µg/kg	<	59000	59000	UJ	U
Inside Berm	EBH12	NFS021	0	0.5	PCB1260	µg/kg		53000	59000	J	J
Inside Berm	EBH12	NFS023	0.5	1	PCB1016	µg/kg		15000	33	J	=
Inside Berm	EBH12	NFS023	0.5	1	PCB1248	µg/kg	<	33	33		U
Inside Berm	EBH12	NFS023	0.5	1	PCB1254	µg/kg	<	33	33		U
Inside Berm	EBH12	NFS023	0.5	1	PCB1260	µg/kg		16000	33		=
Inside Berm	EBH13	NFS017	0	0.5	PCB1016	µg/kg		240000	33	J	=
Inside Berm	EBH13	NFS017	0	0.5	PCB1248	µg/kg	<	33	33		U
Inside Berm	EBH13	NFS017	0	0.5	PCB1254	µg/kg	<	33	33		U
Inside Berm	EBH13	NFS017	0	0.5	PCB1260	µg/kg		110000	33	J	=
Inside Berm	EBH13	NFS019	0.5	1	PCB1016	µg/kg	<	24000	24000	UJ	U
Inside Berm	EBH13	NFS019	0.5	1	PCB1248	µg/kg		100000	24000	J	=

Table A-2. TSCA Data (continued)

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Inside Berm	EBH13	NFS019	0.5	1	PCB1254	µg/kg	<	48000	48000	UJ	U
Inside Berm	EBH13	NFS019	0.5	1	PCB1260	µg/kg		22000	48000	J	J
Inside Berm	EBH14	NFS009	0	0.5	PCB1016	µg/kg		3000	33	J	=
Inside Berm	EBH14	NFS009	0	0.5	PCB1248	µg/kg	<	33	33		U
Inside Berm	EBH14	NFS009	0	0.5	PCB1254	µg/kg	<	33	33		U
Inside Berm	EBH14	NFS009	0	0.5	PCB1260	µg/kg		7800	33		=
Inside Berm	EBH14	NFS010	1	2	PCB1016	µg/kg		230	33	J	=
Inside Berm	EBH14	NFS010	1	2	PCB1248	µg/kg	<	33	33		U
Inside Berm	EBH14	NFS010	1	2	PCB1254	µg/kg	<	33	33		U
Inside Berm	EBH14	NFS010	1	2	PCB1260	µg/kg		1400	33		=
Inside Berm	EBH15	NFS012	0	0.5	PCB1016	µg/kg		6600	33	J	=
Inside Berm	EBH15	NFS012	0	0.5	PCB1248	µg/kg	<	33	33		U
Inside Berm	EBH15	NFS012	0	0.5	PCB1254	µg/kg	<	33	33		U
Inside Berm	EBH15	NFS012	0	0.5	PCB1260	µg/kg		37000	33	J	=
Inside Berm	EBH15	NFS013	0.5	1	PCB1016	µg/kg	<	2400	2400	UJ	U
Inside Berm	EBH15	NFS013	0.5	1	PCB1248	µg/kg		14000	2400	J	=
Inside Berm	EBH15	NFS013	0.5	1	PCB1254	µg/kg	<	4800	4800	UJ	U
Inside Berm	EBH15	NFS013	0.5	1	PCB1260	µg/kg		6800	4800	J	=
Inside Berm	EBH15	NFS014	1	2	PCB1016	µg/kg		2600	33	J	=
Inside Berm	EBH15	NFS014	1	2	PCB1248	µg/kg	<	33	33		U
Inside Berm	EBH15	NFS014	1	2	PCB1254	µg/kg	<	33	33		U
Inside Berm	EBH15	NFS014	1	2	PCB1260	µg/kg		3800	33	J	=
Inside Berm	SL01	NFS027	0	0.5	PCB1016	µg/kg	<	24000	24000	UJ	U
Inside Berm	SL01	NFS027	0	0.5	PCB1248	µg/kg		58000	24000	J	=
Inside Berm	SL01	NFS027	0	0.5	PCB1254	µg/kg	<	48000	48000	UJ	U
Inside Berm	SL01	NFS027	0	0.5	PCB1260	µg/kg		34000	48000	J	J

Table A-3. TCLP Data

Area	Station	Sample ID	Start Depth (ft)	End Depth (ft)	Analyte	Units	Prefix	Result	Detection Limit	Validation Qualifier	Lab Qualifier
Outside Berm	EBH06	NFS041	0	0.5	1,4-Dichlorobenzene	mg/L	<	0.1	0.1		U
Outside Berm	EBH06	NFS041	0	0.5	Chlorobenzene	mg/L	<	0.05	0.05		U
Inside Berm	EBH11	NFS034	0	0.5	1,4-Dichlorobenzene	mg/L		0.39	0.1		=
Inside Berm	EBH11	NFS034	0	0.5	Chlorobenzene	mg/L		0.054	0.05		=
Inside Berm	EBH12	NFS021	0	0.5	1,4-Dichlorobenzene	mg/L	<	0.1	0.1		U
Inside Berm	EBH12	NFS021	0	0.5	Chlorobenzene	mg/L		0.019	0.05		J
Inside Berm	EBH13	NFS019	0.5	1	1,4-Dichlorobenzene	mg/L	<	0.1	0.1		U
Inside Berm	EBH13	NFS019	0.5	1	Chlorobenzene	mg/L		0.014	0.05		J
Inside Berm	EBH15	NFS013	0.5	1	1,4-Dichlorobenzene	mg/L	<	0.1	0.1		U
Inside Berm	EBH15	NFS013	0.5	1	Chlorobenzene	mg/L	<	0.05	0.05		U
Inside Berm	SL01	NFS027	0	0.5	1,4-Dichlorobenzene	mg/L	<	0.1	0.1		U
Inside Berm	SL01	NFS027	0	0.5	Barium	µg/L		1070	4.1		=
Inside Berm	SL01	NFS027	0	0.5	Cadmium	µg/L		12	3		=
Inside Berm	SL01	NFS027	0	0.5	Chlorobenzene	mg/L	<	0.05	0.05		U
Inside Berm	SL01	NFS027	0	0.5	Lead	µg/L		110	46.6		=
Inside Berm	SL01	NFS027	0	0.5	Lindane	µg/L		2.2	1	J	0

APPENDIX B

MEMORANDUM TO FILE

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D 23292

M E M O R A N D U M

DATE: December 13, 1995

TO: file

FROM: Heather Baldy, FUSRAP Data Manager HB

RE: Radiological results from DataChem

CC:

All of the chemical and the following radiological analytes have acceptable results in D# packages 23291, 22464. 23292, 22463, 23290, and 22465:

Thorium 228

Thorium 230

Uranium 234

Uranium 235

Uranium 238

Protactinium 234 (Uranium 238)

Radium 226

All other radiological results, particularly gamma spec results, in the above listed packages are suspect and should be used only with further investigation and documentation. These packages were found to be generally unacceptable deliverables not meeting many of the standard deliverable format and quality checks.