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ENVIRONMENTAL REMEDIATION RESIDENT OFFICE

MAIN REPORT - VOLUME 1

FINAL STATUS SURVEY REPORT for the DECOMMISSIONING of the BUSH RIVER - 26th STREET DISPOSAL SITE

ABERDEEN PROVING GROUND, MD
EDGEWOOD AREA

Prepared by
Foster Wheeler Environmental Corporation
for the
U.S. Army Corps of Engineers and Directorate of Safety, Health, and Environment-Radiation Protection Office
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This survey report documents the results of a removal action for the 26th Street Disposal Site located at the Edgewood Area of the Aberdeen Proving Ground, MD. The removal was conducted and funded under a remedial action program, managed by the U.S. Army Corps of Engineers, Baltimore District and the Aberdeen Proving Ground Directorate of Safety, Health, and Environment (DSHE) targeting specific areas of the Aberdeen Proving Ground facility. The objective of the removal action was to remove the immediate environmental threat and to eliminate the need for further radiological controls at the site. This report deals with the amount and significance of the residual radioactivity at the conclusion of the removal action. The purpose of the survey was to show that no residual radioactivity remained that would require future control.

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ACRONYM LIST

Abbreviation	
Ac-228	Actinium-228
ACE	U.S. Army Corps of Engineers
ACOE	Army Corps of Engineers
AEC	Atomic Energy Commission
AEHA	Army Environmental Hygiene Agency
APG	Aberdeen Proving Ground
APG RPO	Aberdeen Proving Ground Radiation Protection Officer
ATG	2Allied Technology Group
B-12	Baron-12
Ba-133	Barium-133
Bi-214	Bismuth-214
C-14	Carbon-14
CASY	Chemical Area Storage Yard
CERCLA	Comprehensive Environmental Restoration and Conservation Liability Act
CFR	Code of Federal Regulations
Co-60	Cobalt-60
cpm	Counts Per Minute
CRZ	Contaminated Reduction Zone
Cs-137	Cesium-137
CWA	Chemical Warfare Agent
dpm	Decentigration Per Minute
DQO	Data Quality Objectives
DSHE	Directorate of Safety, Health and Environment
EPA	Environmental Protection Agency
Eu-152	Europium-152
FWENC	Foster Wheeler Environmental Corporation
H-3	Hydrogen-3
HCN	Hydrogen Cyanide
HDPE	High Density Polyethylene
HP	Health Physicist
K-40	Potassium-40
MCA	Multi Channel Analysis
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentration
MDE	Maryland Department of Environment
NaI	Sodium Iodide
NIST	National Institute of Standards and Technology
NPL	National Priority List
NRC	Nuclear Regulatory Commission
NUREG	Nuclear Regulation
Pb-214	Lead-214
Po-210	Polonium-210

PPE	Personal Protective Equipment
Pu-239	Plutonium-239
QA/QC	Quality Assurance Quality Control
R&D	Research and Development
Ra-224	Radium-224
RI/FS	Remedial Investigations Feasibility Studies
SA	Screening Area
Sr-90	Strontium-90
Tc-99	Technetium-99
TCLP	Toxicity Characteristic Leaching Procedure
Th-234	Thorium-234
U-238	Uranium-238
UXO	Unexploded Ordnance
WESTON	Roy F. Weston, Inc.

ES.1 EXECUTIVE SUMMARY

This survey report documents the results of a removal action for the 26th Street Disposal Site located at the Edgewood Area of the Aberdeen Proving Ground, MD. The removal was conducted and funded under a remedial action program, managed by the U.S. Army Corps of Engineers, Baltimore District and the Aberdeen Proving Ground Directorate of Safety, Health, and Environment (DSHE) targeting specific areas of the Aberdeen Proving Ground facility. The objective of the removal action was to remove the immediate environmental threat and to eliminate the need for further radiological controls at the site. This report deals with the amount and significance of the residual radioactivity at the conclusion of the removal action. Residuals, if any, of non-radioactive material are not addressed.

The removal action was started by Roy F. Weston, Inc. (Weston) under Contract No. DACA87-90-D-0031 using a work plan issued on March 8, 1993. Initially, the work plan addressed the removal of chemically contaminated surface and buried solids and other wastes from the 26th Street Disposal Site. However, on June 16, 1993, radiation surveys revealed the presence of elevated radiation levels from two empty drums. Laboratory results revealed the presence of cobalt-60 (Co-60) and cesium-137 (Cs-137). As a result, Weston issued an updated Site Specific Work Plan and Health and Safety Plan to include provisions for the protection from radioactive materials. Based on these approved plans, Weston resumed the removal of both radioactive and non-radioactive waste. The waste was packaged and shipped out or stored at an adjacent secured site, depending upon the nature of the waste. The volume of the radioactive waste excavated by Weston and placed in storage was nearly 280 cubic yards. Weston's role on the project site was concluded in the fall of 1994.

On October 14, 1994, Foster Wheeler Environmental Corporation (FWENC), under Contract No. DACA31-94-D-0020, was issued a delivery order to resume work on the project. As part of its preparatory efforts, FWENC updated the Site Specific Work Plan and submitted the final document on March 17, 1995 to the U.S. Army Corps of Engineers, Baltimore District. The NRC authorized the resumption of the work on June 13, 1995. The field work began on July 5, 1995 following a mobilization phase, and concluded in May, 1996. FWENC excavated about 611 additional cubic yards of soil and waste during this time. The project continued until no further waste items were encountered and the amount of residual radioactivity was not readily distinguished from background radiation.

At this time a radiological survey was made of the excavation and in the marsh area down-gradient from the disposal site. The purpose of the survey was to show that no residual radioactivity remained that would require future control. If this were to be verified, the survey would be used to support a request to the NRC to release the site for unrestricted use. The results of this survey are summarized in Table ES-1. The first column in the table identifies the radionuclides found and other measured radiological criteria. Column 2 gives the limit that must be met for the site to be released. Note that these values are quantities in excess of the concentrations of radioactive materials and radiation dose rates caused by natural background. Column 3 contains the

background values for reference. The other columns give the average concentrations or dose rates in the areas noted. To evaluate the significance of any number in these columns one should subtract the corresponding background value (Column 3) and compare it to the associated limit (Column 2). The results of such an evaluation show that there are no values that exceed the limit for release. Furthermore, when the radionuclides are considered together using the "Rule of Fractions" the ratios (average concentration/limiting concentration) for each radionuclide when added sum to a value that is less than 1.0 for each of the six areas surveyed. Therefore, the site meets the criteria for release from further radiological controls.

Details in regard to the release limits, the survey methodology, individual measurement results and a discussion of the conclusion are contained in the following chapters of this report.

Table ES-1
Summary Tabulation of Soil Radionuclide Concentrations and Ambient Radiation Exposure Rates#

Nuclide or Exp. Rate	Limit pCi/g or μR/hr*	Backgrnd	Excav. Floor	Excav. Side/ Perimeter	Excav. Sub-Surface	Excav. Sediment	Screening Area	Marsh Area
K-40	21	8.1	7.0	7.0	8.8	7.9	3.0	9.2
Co-60	8	---@	0.26	0.095	0.098	0.21	0.1	0.078
Sr-90	5	0.082	1.2	0.37	0.37	0.30	---	0.077
Ba-133	15	---	0.084	0.083	0.092	0.11	0.07	0.078
Cs-137	15	0.28	4.3	3.1	2.9	7.4	3.3	0.68
Eu-152	6	---	0.38	0.38	0.4	0.39	0.33	0.36
Th-234	10/35[a]	2.2	1.9	2.3	1.2	2.3	1.3	2.0
Ra-226	5/15[a]	1.8	2.9	2.1	3.4	2.4	1.0	1.9
Ac-228	5/15[a]	1.2	1.1	1.1	1.1	1.1	0.55	1.1
Gross β	---[b]	22	30	27	30	31	18	24
Gross α	---[b]	12	21	24	19	19	7	16
Exposr. Rate - μR/hr	10	7.0	10.4	7.5	---	---	6.5	8.1

\# All averages are quoted at the 95% upper confidence limit and include contributions from naturally occurring background radiation or radioactivity levels. All results are given in pCi/g - dry, except for exposure rates, which are expressed in μR/hr at 1-m above ground.

* U.S. Nuclear Regulatory Commission limits, based on Table 2-1, Sect. 2.0.

@ Data not applicable, not determined, or not assigned.

a Values for the top 15 cm of soil and soil at lower levels, respectively

b No limits exist for gross alpha and beta concentrations in soil

1.0 INTRODUCTION

1.1 Background

This survey report is prepared in response to a removal action for the 26th Street Disposal Site located at the Edgewood Area of the Aberdeen Proving Ground, MD. The removal was conducted and funded under an overall remedial action program, managed by the U.S. Army Corps of Engineers, Baltimore District, and the Aberdeen Proving Ground Directorate of Safety, Health, and Environment targeting specific areas of the Aberdeen Proving Ground facility. The objective of the removal action is to remove the immediate environmental threat and eliminate the need for further radiological controls.

The removal action work was started by Roy F. Weston, Inc. (Weston) under Contract No. DACA87-90-D-0031 using a work plan issued on March 8, 1993. The work plan addressed the removal of chemically contaminated surface and buried solids and other wastes from the 26th Street Disposal Site. On June 16, 1993, radiation surveys revealed the presence of elevated radiation exposure rates from two empty drums. The drums, with radiation levels of about 3 times background, were isolated and placarded with appropriate signs and samples were collected for analysis. Laboratory results revealed the presence of cobalt-60 (Co-60) and cesium-137 (Cs-137). As a result, Weston developed an updated Site Specific Work Plan and Health and Safety Plan to include provisions for protection from radioactive materials. Addendum No.2 to the Site Specific Work Plan was issued on January 25, 1994. While awaiting the review and approval of the revised addendum by the NRC, interim radiation protection measures were instituted, and limited excavations continued. During this period the following types of waste were removed and packaged.

Non-Radioactive Waste	Radioactive Waste
· Scrap metals	· Soil
· Glass	· Scrap metals
· Ash	· Empty drums

The waste was packaged in 173 wooden boxes, except for a few high specific activity items, which were isolated in a 30-gallon drum (which was later placed in a 55-gallon drum) and segregated from the rest of the waste. All packaged waste were placed in secured storage in an adjacent area, called the Rad Storage Yard. Weston's role on the project site was concluded in the fall of 1994. (Note: Weston's 173 wooden boxes were repackaged for shipping purposes in 1996 by Foster Wheeler Environmental Corporation into B-25 containers.)

On October 14, 1994, Foster Wheeler Environmental Corporation (FWENC) was issued delivery order to resume work on this project under Contract No. DACA31-94-D-0020. As part of its preparatory efforts, FWENC also updated the Site Specific Work Plan. The updated Work Plan included a revised Radiological Health and Safety Plan, Radiological Field Characterization Plan,

Radiological Waste Management Plan, and Radiological Quality Assurance Plan. The Radiological Field Characterization Plan adopted soil concentration limits based on the NRC's 1981 Branch Technical Position (46 FR 205, 52061, October 23, 1981) and Site Decommissioning Management Plan (SECY-92-106, March 24, 1992). FWENC submitted these documents on March 17, 1995 to the U.S. Army Corps of Engineers (Foster 1995). Subsequently, the Aberdeen Proving Ground Directorate of Safety, Health, and Environment submitted these documents to the NRC for approval. The NRC issued an amendment (No. 37) to the Aberdeen Proving Ground license on June 13, 1995 authorizing the resumption of the removal work. The field work was started on July 5, 1995 following a mobilization phase. Field work ended in May, 1996.

The identification and removal of radioactive waste were complicated by the presence of chemical warfare agents (CWM) and unexploded ordnance (UXO), which presented much greater potential risks to field personnel than radioactivity. The presence of CWM and UXO required intrusive work to be conducted in areas that had been cleared, using methods that relied on field instrumentation and visual observations. Such field activities were conducted using plans and procedures approved by the U.S. Army Corps of Engineers, Baltimore District and the APG Directorate of Safety, Health, and Environment. Field instruments were used to identify magnetic anomalies from buried objects (e.g., UXO and containers with CWM) and chemical vapors emanated by CWM agents.

All soils and waste materials were visually screened to identify UXO and CWM agents that may not have been identified by use of the field instrumentation. Because of these constraints, all wastes were excavated and screened manually, relying on the use of mechanized equipment only to load or move materials that had already been cleared of the presence UXO and CWM.

The work was managed and conducted by FWENC, using subcontractors for specific services, including technical support and manpower. FWENC was responsible for specific phases of the field work, including project management, waste excavation and packaging, occupational health and safety monitoring under NRC and OSHA regulations, selecting qualified contractors and personnel, personnel training, project scheduling and cost control under FWENC's contract, and QA/QC functions. All contacts with the NRC's Staff were exclusively managed by the Aberdeen Proving Ground Radiation Protection Officer, with the Directorate of Safety, Health, and Environment. Finally, the characterization, repackaging, transportation, and disposal of the radioactive waste at the Envirocare facility in Clive, Utah were completed by FWENC for the U.S. Army Corps of Engineers and the Directorate of Safety, Health, and Environment. NRC Form 314 (Certificate of Disposition of Material) and other waste specific data are included in Appendix III of this report.

1.2 Report Format

The closure report is presented in multiple volumes. Volume 1 contains the main report. Volumes 2 and 3 contain all supporting attachments identified in the main report.

2.0 SITE INFORMATION

The 26th Street Disposal Site is located on the southern bank of the Bush River, north of Tapler Point, at the Edgewood Area of the Aberdeen Proving Ground (APG) complex (Figure 2-1). The APG complex is a U.S. Army installation located in northeastern Maryland, on the western shore of the upper Chesapeake Bay. Historically, the Edgewood Area has been a center of research and development, manufacturing, testing, and storage of military ordnance and chemical warfare materials. All of the Edgewood Area has been designated as an NPL site under CERCLA. The U.S. Army and Region III of the U.S. Environmental Protection Agency have signed an interagency agreement requiring APG to perform remedial investigations, feasibility studies (RI/FS) and, as necessary, removal actions at sites where past activities have resulted in environmental contamination. The Bush River area is one portion of the APG complex where remedial investigation work is currently ongoing.

The waste removed at the 26th Street Disposal Site was believed to have been associated with various R&D activities conducted over several decades, ending in the early 1970s. The waste disposal took place on the east side of the 26th Street, while the west side was used for burning various types of waste, including face masks and charcoal canisters. The site contained scrap metals, construction debris, ash, wood, rubble, and incinerated medical waste, primarily vials. Some of the waste had been stockpiled on the surface. In addition, the site also contained UXO, consisting of fuses, detonators, etc. and residual amounts of chemical warfare material.

Under current plans, the area immediately around 26th Street Disposal Site will be left in its natural state. There are no plans to completely backfill the area, except for minor grading and localized backfilling to stabilize the steep slopes on the north and west sides of the excavation. Beyond the 26th Street Disposal Site, the Army plans to build a large demilitarization facility to destroy chemical stockpiles. The facility is expected to be build and become operational at the turn of the century.

2.1 Site Description

The 26th Street Disposal Site is located southeast of the Chemical Area Storage Yard (CASY) (Figure 2-2). Exhibit-1, Existing Condition Survey presents a topographic survey plot plan (scale of 1 inch = 30 feet) tied to reference survey markers. In addition, Exhibit-1 presents the grid lines that divided site into quadrants and sample points. The waste was disposed in a natural swale. Currently, the site is approximately rectangular in shape, running about 150 feet in length along 26th Street (north-south direction) and about 80 feet in width. The disposal site is separated into two areas by the 26th Street. The area east of 26th Street and beyond the excavation consist of a low lying marsh area, discharging into the Bush River. A road separates the Marsh area to the Bush River. Access to the 26th Street Area and nearby CASY Yard is controlled for security purposes.

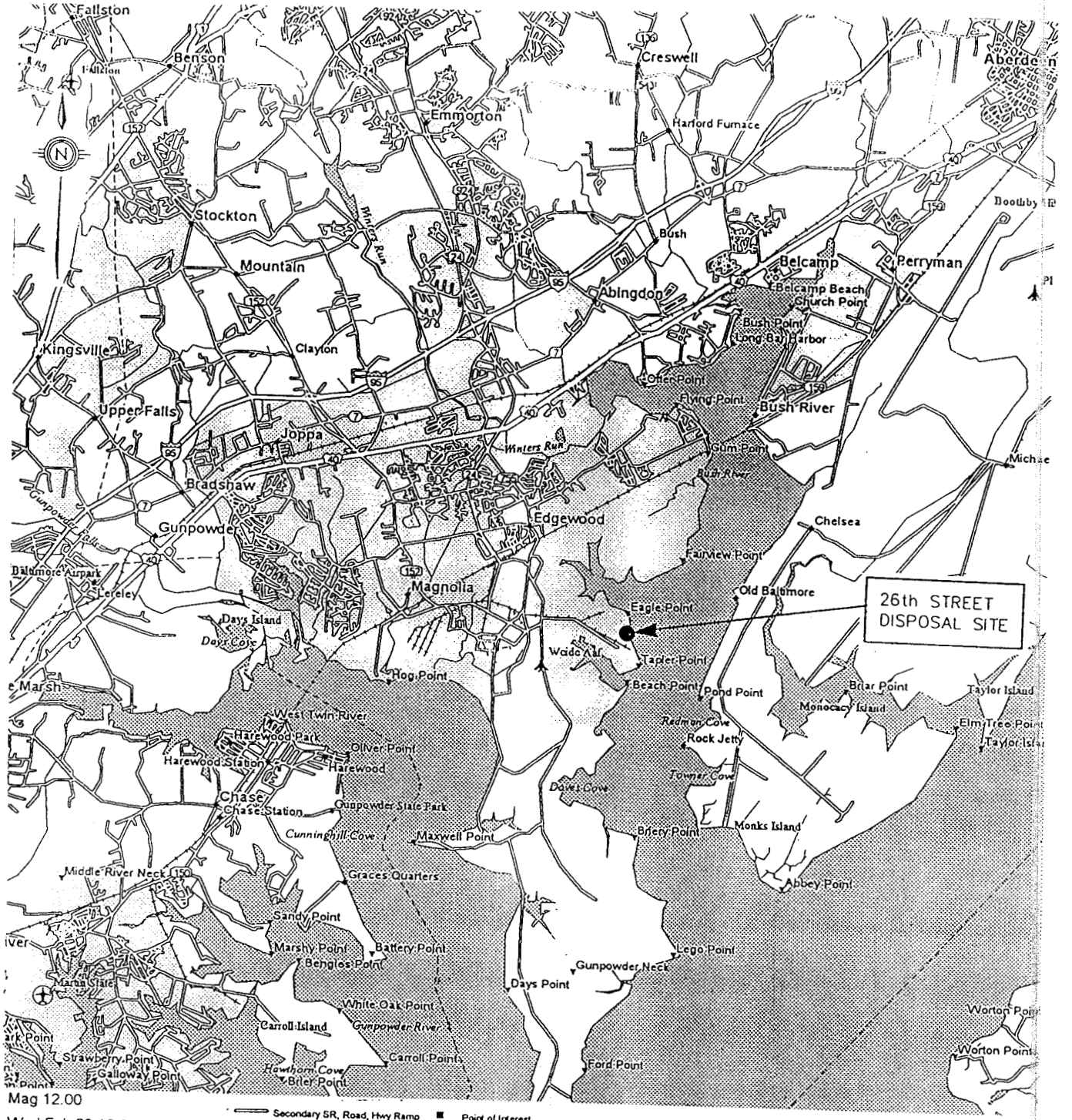

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FIGURE 2-1
EDGEWOOD AREA AND VICINTY

ABERDEEN PROVING GROUND-EDGEWOOD AREA,
MARYLAND

DELIVERY ORDER NO. 0001
26th STREET DISPOSAL SITE
CONTRACT NO. DACA 31-94-D-0020

FOSTER WHEELER ENVIRONMENTAL CORPORATION
LIVINGSTON, NEW JERSEY

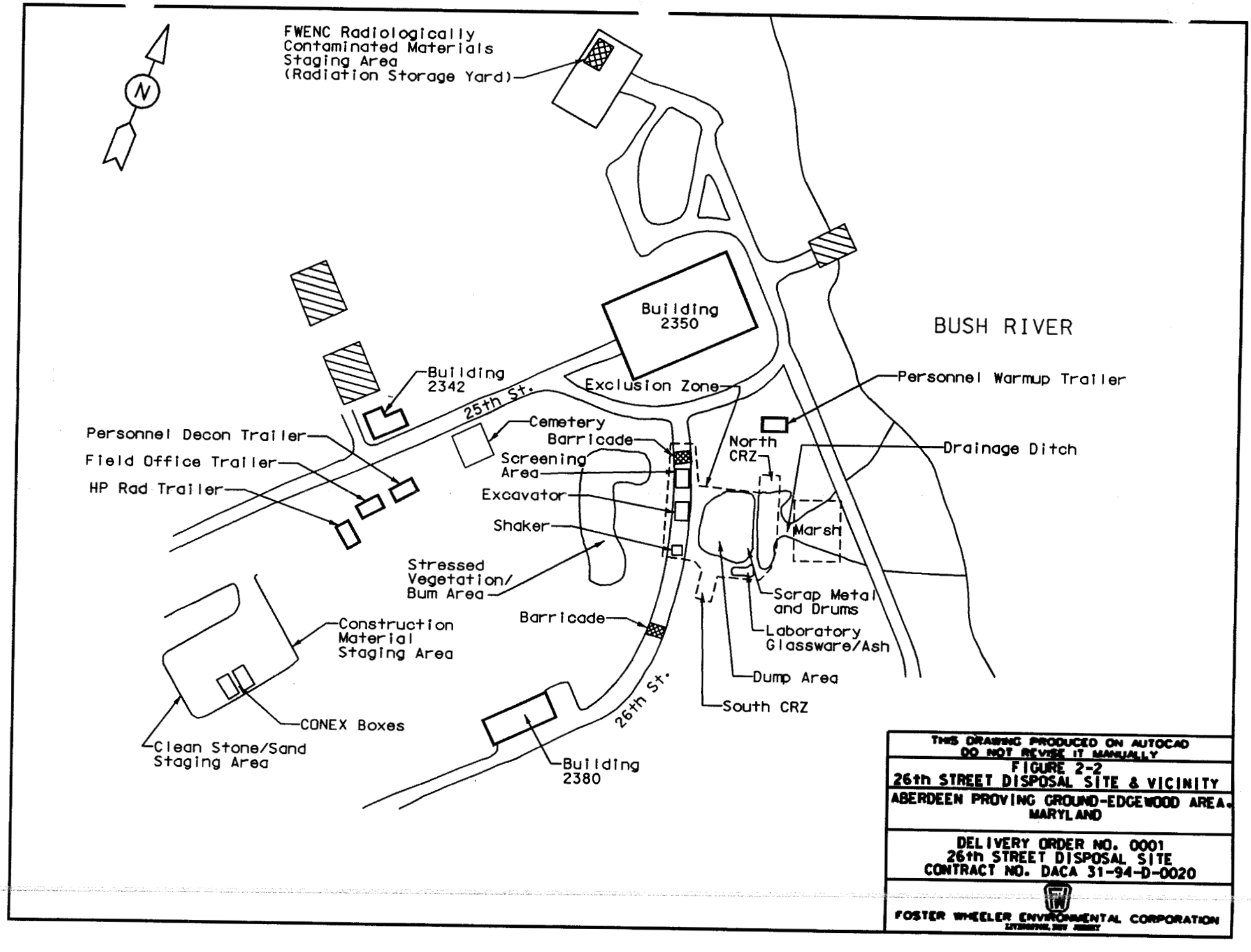
N
FWENC Radiologically Contaminated Materials Staging Area (Radiation Storage Yard)
Building 2350
BUSH RIVER
Building 2342
25th St.
Exclusion Zone
Personnel Warmup Trailer
Cemetery
Barricade
North CRZ
Drainage Ditch
Personnel Decon Trailer
Field Office Trailer
HP Rad Trailer
Screening Area
Excavator
Shaker
Marsh
Stressed Vegetation/ Burn Area
Scrap Metal and Drums
Barricade
Laboratory Glassware/Ash
Construction Material Staging Area
Dump Area
26th St.
South CRZ
CONEX Boxes
Clean Stone/Sand Staging Area
Building 2380
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FIGURE 2-2
26th STREET DISPOSAL SITE & VICINITY
ABERDEEN PROVING GROUND-EDGEWOOD AREA, MARYLAND
DELIVERY ORDER NO. 0001
26th STREET DISPOSAL SITE
CONTRACT NO. DACA 31-94-D-0020
FOSTER WHEELER ENVIRONMENTAL CORPORATION

There are no supporting structures or buildings associated with the disposal site besides 26th Street itself. No underground facilities or equipment (e.g., drainage system, sanitary pipes, or sumps) were found, either as part of the disposal site or for other nearby facilities. A manhole, located up-gradient from the disposal site (about 100 yards west, beyond the burn area), is believed to be part of the local drainage system and not associated with the disposal site.

The waste was buried down to a depth of about 10 feet, using the elevation of 26th Street (14' above sea level) as a reference. The burial depth of the waste decreased radially from 26th Street in a shallow-bowl like manner. In some portions of the site waste was found at or slightly below the seasonal water table. It is assumed that the waste was driven downward and compacted by the weight of the waste itself and overburden.

The presence of radioactive materials is believed to have been associated with various R&D activities. The disposal of radioactive materials at the 26th Street site may have been done under 10 CFR20.304. This regulation provided an option of on-site burial of radioactive materials until it was superseded in 1980.

The firm of Roy F. Weston, Inc. (Weston) conducted a radiological characterization of the areas where drums and contaminated soils and solids were found (Weston 1994). Ambient radiation survey measurements revealed exposure rates ranging from 30 to 60 uR/hr within the excavated area. Some of the higher radiation levels were reported to vary from 120 to 250 uR/hr. Also, two 55-gallon drums were found bearing radioactive material signs. Further investigations revealed that drums and other waste (scrap metals and soils) were characterized by elevated external radiation exposure rates, later attributed to Co-60 and Cs-137. The drums, scrap metals, and soils were removed and placed in new containers and held in storage. Radiation survey measurements have shown that the contamination is heterogeneous, unevenly distributed, and characterized by the presence of randomly distributed hot-spots. Typically, hot-spots consisted of small specs of radioactive materials, contaminated items, and small and well defined volumes of contaminated soil.

A summary of the results of this radiological survey is given in the following tabulation. Values should be considered to be typical of the site before remediation.

Soils - Radionuclide Concentrations (pCi/g)

	Gross Beta	K-40	Co-60	Cs-137	Ra-226	Th-228	Th-234	Ba-133	U-235
High	34,000	113	47,600	21,700	20,500	71.3	844	338	14
Low	10	1.2	0.7	0.1	5.2	0.4	3.8	305	4.4
Average	939	8.1	1,002	692	537	5.7	231	321	7.9

Solid Waste - Radionuclide Concentrations (pCi/g)

	Gross Beta	K-40	Co-60	Cs-137	Ra-226	Th-228	Th-234	U-235
High	170,000	449	47,500	4,910	45,500	6.2	24,900	382
Low	7.6	1.8	0.3	0.8	3.0	0.5	2.1	35.8
Average	6,542	50	1,874	504	2,840	1.8	5,718	175

The reports for the above noted soil and solid waste samples are presented in Attachment 1, Volume 2.

Marsh Soils - Radionuclide Concentrations (pCi/g - top 6 inch)

	Uranium	Radium	Thorium	K-40	Cs-137	Co-60
Low	0.6	0.8	0.5	2.8	0.09	<0.005
High	4.7	5.8	2.0	22.4	5.9	<0.01
Average	1.7	2.1	1.0	9.1	1.3	n/a

The laboratory reports for the marsh samples are presented in Attachment 2, Volume 2.

2.2 Final Site Configuration

At the completion of the work, the excavation was left as is and was not backfilled. See Exhibit 1, Existing Site Conditions for topographic elevations of the site. 26th Street, separating the excavation from the Burn Area, is currently intact and useable, however heavy traffic is limited due to the steep slope of the west wall. The excavation is approximately rectangular in shape, running about 150 feet in length along 26th Street (north-south direction) and about 80 feet in width. At the deepest location, the excavation is about 10 feet below local grade, using 26th Street as a reference. Some portions of the floor of the excavation are covered with water. The west and north walls of the excavation rise steeply to the level of the surrounding grade. On the south end, the wall of the excavation is less abrupt, rising slowly to grade level. On the east side, the slope of the excavation rises to a narrow bank, which then slopes downward into the Marsh area. On the northern end of the bank, a channel discharges water into the Marsh area through a silt-fence and culvert.

The floor and west and north walls of the excavation are temporarily covered with a HDPE cover to minimize water erosion. For the long-term, it is planned to seed these areas with grass to minimize soil erosion. The entire area around the excavation is fenced off with a 4' high plastic traffic barrier and posted with the following signs, "Caution - Radioactive Materials" and "Caution - Entry Prohibited." Access to the 26th Street Area and nearby CASY Yard is controlled by a permanent security gate at the entrance to the Gunpowder Neck Peninsula.

The Marsh area has been left opened, except for the areas were surface soils were removed down to a depth of 6 inches as part of this removal action. Four areas have been delineated with yellow

warning tape. The areas are small, ranging in sizes from about 10 ft by 10 ft to 30 ft by 40 ft (3 m by 3 m to 9 m by 12 m). Other than these four areas and associated sampling, no other clean up work was conducted in the Marsh.

2.2.1 Facility Grounds

The immediate area around the excavation consists of opened grassy and wooded areas and access roads (asphalt and gravel). Other than contaminated waste and various types of solid waste excavated from the disposal site, the removal action did not encounter any remaining facility structures, foundations, and other systems, such as floor drainage, sumps, and sewers.

2.2.2 Project Support Facilities

Support facilities built to support the field work are shown in Figure 2-3. They consisted of temporary structures and enclosures, and equipment staged in the Screening Area (SA). Also, the SA has been surveyed and released for unrestricted use. The mechanized equipment included a soil shaker, a long-reach excavator, and a conveyor belt. Other types of temporary equipment included screening tables and blast shields. The soil shaker, long-reach excavator, and blast shields were cleaned, surveyed, and released using NRC approved release criteria (Foster 1995). The conveyor belt, screening tables, and other miscellaneous types of equipment were either stored in the Rad Storage Yard for later use or dismantled and packaged as radioactive waste. The temporary enclosures (personnel shelters) built for the CRZs were dismantled and surveyed and released using NRC approved release criteria (Foster 1995).

Other support facilities, such as the Personnel Decon Trailer, HP Support Trailer, Field Office Trailer, Warm Up Trailer, and vehicles were surveyed at the close of field activities. None of this equipment or facilities were used in the excavation or SA. The Decon Trailer was never used to decontaminate personnel. No detectable levels of contamination were ever found in support areas or on equipment and vehicles, based on the results of routine radiation and contamination surveys. The final surveys of these facilities have been completed and the documentation submitted to the APG RPO in support of project closure and site demobilization activities. The burn area was surveyed in 1995 by EA Engineering, Science, and Technology for Foster Wheeler. Although that facility was not addressed as part of the final survey, the results are summarized in Appendix 2.

A brief description of the management of the remediation work and the final cleanup and survey is given in Appendix 3.

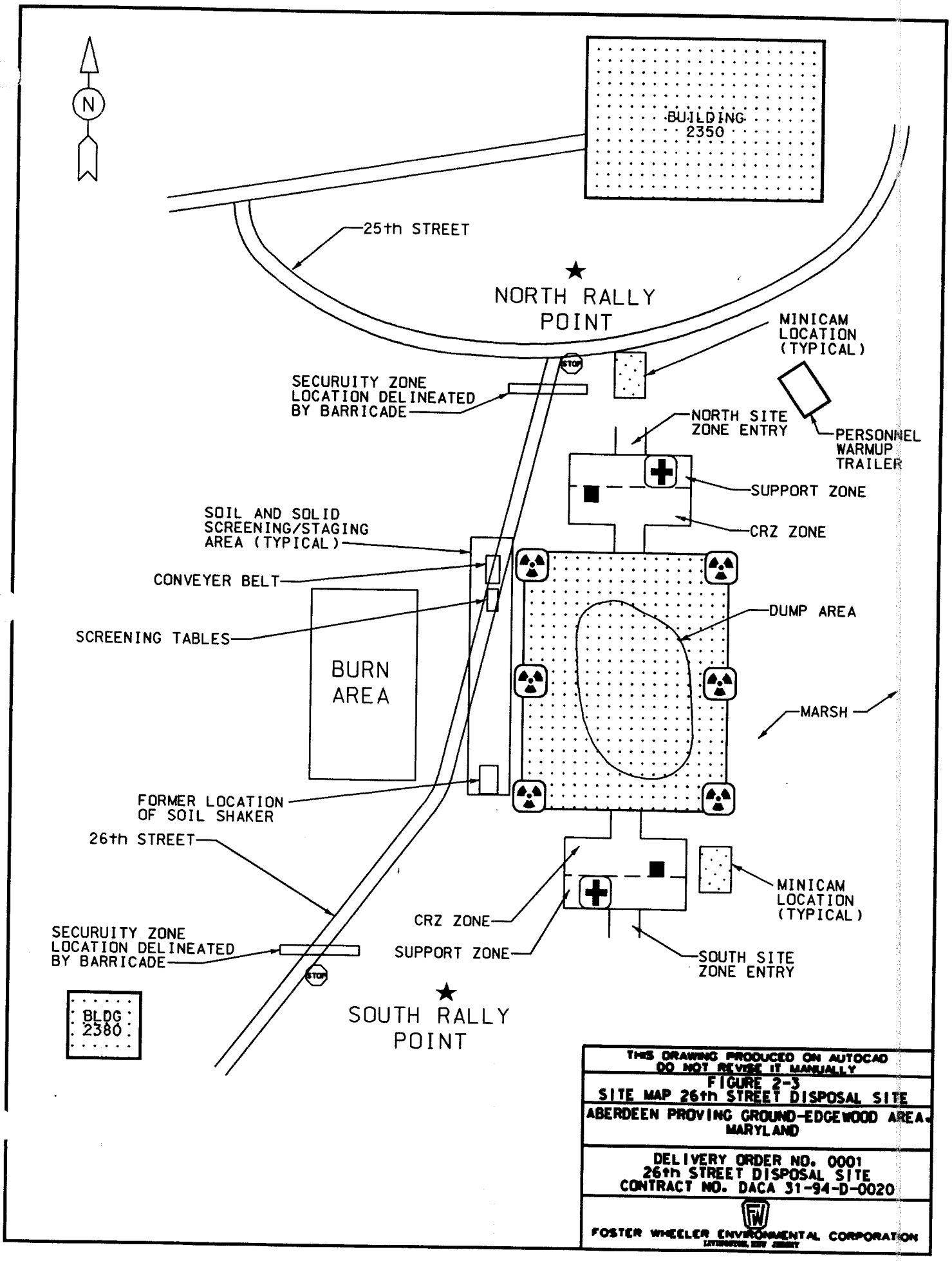
N
BUILDING 2350
25th STREET
NORTH RALLY POINT
MINICAM LOCATION (TYPICAL)
SECURUITY ZONE LOCATION DELINEATED BY BARRICADE
NORTH SITE ZONE ENTRY
PERSONNEL WARMUP TRAILER
SUPPORT ZONE
CRZ ZONE
SOIL AND SOLID SCREENING/STAGING AREA (TYPICAL)
CONVEYER BELT
SCREENING TABLES
DUMP AREA
BURN AREA
MARSH
FORMER LOCATION OF SOIL SHAKER
26th STREET
MINICAM LOCATION (TYPICAL)
CRZ ZONE
SUPPORT ZONE
SECURUITY ZONE LOCATION DELINEATED BY BARRICADE
SOUTH SITE ZONE ENTRY
BLDG 2380
SOUTH RALLY POINT
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FIGURE 2-3
SITE MAP 26th STREET DISPOSAL SITE
ABERDEEN PROVING GROUND-EDGEWOOD AREA, MARYLAND
DELIVERY ORDER NO. 0001
26th STREET DISPOSAL SITE
CONTRACT NO. DACA 31-94-D-0020
FW
FOSTER WHEELER ENVIRONMENTAL CORPORATION

2.3 Release Criteria

Release criteria have been established by the NRC for the clean up of the 26th Street Disposal Site. The limits are presented in Tables 2-1 and 2-2, based on the Radiological Field Characterization Plan (Foster 1995). The NRC endorsed these limits under Amendment No. 37 to the Aberdeen Proving Ground license (No. 19-10306-01, June 13, 1995).

2.3.1 Radioactive Contaminants

The major contaminants identified at the 26th Street Disposal site were Co-60, Cs-137, Ra-226, and uranium. Other contaminants identified in fewer number of samples and present at relatively lower concentrations were K-40, Sr-90, Ba-133, Eu-152, and Th-232. K-40 is a naturally occurring radionuclide found in soils containing potassium. Since there is no reason to believe that the potassium is enriched, K-40 is not considered to be a concern in this project. However, the data are presented for the sake of completeness.

2.3.2 Specific Release Criteria

Soil radionuclide concentration limits are given in Table 2-1. This table also presents acceptable radiation exposure limits for ambient areas. Most soil concentrations limits are based on NRC Branch Technical Position: Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations (46 FR 205, 52061, Oct. 23, 1981) and Action Plan to Ensure Timely Remediation of Sites Listed in the Site Decommissioning Management Plan (SECY-92-106, March 24, 1992).

No release limits were published in these documents for three radionuclides common to the 26th Street site, K-40, Eu-152, and Ba-133. Alternate release criteria were developed for these radionuclides. For K-40 and Eu-152 the alternate release criteria were taken directly from the NUREG-1500 Table B-2 (NRC 1994). The stated concentrations are those which would cause a dose of 15 mrem/year via the residential scenario, the most conservative of the scenarios addressed in that document.

No values for Ba-133 are given in NUREG 1500. Therefore a release criterion had to be developed. Ba-139 was used as the basis for this development since it is chemically identical to Ba-133 and there is published concentration in NUREG 1500 that corresponds to an annual dose of 15 mrem. This concentration, 722,000 pCi/g, was corrected for decay and to account for differences in the radiation emitted between the two isotopes. First, based on the respective External Dose Rate Conversion Factors, the dose from equal activities of the two isotopes in soil differ by a factor of 10.8, with the dose from Ba-133 being the higher (DOE 1988). Second, since Ba-139 has a shorter half-life than Ba-133, 4240 times more activity of Ba-139 is required initially to end up with the same average activity over a year. The correction therefore was to divide 722,000 by 10.8 and 4240. The resulting alternate release criterion for Ba-133 is 15 pCi/g.

The criteria for surface contamination are given in Table 2-2. The surface contamination limits for equipment and decontaminated areas are based on 1987 NRC guidelines - "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product, Source, or Special Nuclear Material." The values given in Table 2-2 were used when tools and equipment were taken out and personnel exited established radiologically-controlled areas. However, no surfaces remain on the site that were surveyed against these criteria for the purposes of the final release.

Table 2-1
26th Street Disposal Site
Release Criteria for Soils and Ambient Radiation Exposure Rates

Radionuclide	Soil Net Concentration Limit* (pCi/g)	Remarks@
K-40	21#	Based on Table B-2, NUREG-1500
Sr-90	5	
Co-60	8	
Cs-137	15	
Ba-133	15&	Derived from Table B-2, NUREG-1500
Eu-152	6#	Based on Table B-2, NUREG-1500
Ra-226	5	within the top 15 cm soil layer
	15	in each successive 15 cm soil layer
U-238 (Dep)	35	
U-238 (Nat)	10	in equilibrium with decay products
Th-232	5	within the top 15 cm soil layer
	15	in each successive 15 cm soil layer

Location	Ambient Exposure Rate Limit (μR/hr)	Remarks
General area average	$\leq$10 uR/hr	in areas 10m x 10 m above background.
General area maximum	<30 uR/hr	in areas <10 x 10 m including background.

* Extracted from: U.S. NRC, Branch Technical Position, Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations (46 FR 205, 52061, October 23, 1981) and Action Plan to Ensure Timely Remediation of Sites Listed in the Site Decommissioning Management Plan, NRC SECY-92-106, March 24, 1992. See Table 3, Radiological Field Characterization Plan (Foster 1995). Endorsed under U.S. NRC Amendment No. 37 to the Aberdeen Proving Ground license (No. 19-10306-01), June 13, 1995.

@ Concentration averaged over a 10 m x 10 m area, with a maximum not exceeding 3x the stipulated limit.

\# Based on Table B-2, for most restrictive exposure scenario (residential), NUREG-1500, Working Draft Regulatory Guide on Release Criteria for Decommissioning, U.S. NRC, August 1994 (NRC 1994).

& Derived from Ba-139 adjusted by the ratios of Ba-133/Ba-139 EDE conversion factors for external radiation and required amounts of radioactivity to reach equal concentrations over a one year period - see text for details. Based on most restrictive exposure scenario (residential), see Table B-2, NUREG-1500, Ibid.

Table 2-2
26th Street Disposal Site Surface Contamination Limits*

Parameter	Criteria
Removable Surface Contamination Limits	
- Removable:	
Beta/Gamma	1,000 dpm/100 cm^2
Alpha	20 dpm/100 cm^2
Fixed Surface Contamination Limits	
- Average:	
Beta/Gamma	5,000 dpm/100 cm^2
Alpha	100 dpm/100 cm^2
- Maximum:	
Beta/Gamma	15,000 dpm/100 cm^2
Alpha	300 dpm/100 cm^2
Exposure Rates	
Average	0.2 mrad/hr at one 1 cm, in areas $\leq$ 1 m^2.
Maximum	1.0 mrad/hr at one 1 cm, in areas $\leq$100 cm^2.

* From 1987 NRC guidelines: Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product, Source, or Special Nuclear Material.

3.0 FINAL SURVEY APPROACH AND METHODS

The following sections present a description of the approach and methods used for conducting the final survey.

3.1 Survey Objectives

The final characterization survey was conducted to document the radiological conditions present after remediation and to demonstrate, if possible, that there is no further need for radiological controls at the site.

A three-step approach was used for demonstrating that the survey objectives were met. They were:

a. to demonstrate that the average exposure rate at 1-m above the ground in each 10m by 10m area is less than 10 μR/hr above background, and that nowhere on the site is the exposure rate (including background) is greater than 30 μR/hr.

b. to demonstrate that the average net concentration of each radioactive material in soil in each 10m by 10m area is lower than the corresponding release criterion listed in Table 2-1.

c. to demonstrate that the maximum net concentration of each radioactive material in soil samples is lower than three times the corresponding release criterion listed in Table 2-1.

Besides 26th Street itself, there are no supporting structures or buildings associated with the disposal site. No underground facilities or equipment (e.g., drainage system, sanitary sewer pipes, or sumps) were found, either as part of the disposal site or for other nearby facilities. A manhole, located up-gradient from the disposal site (about 100 yards beyond the burn area) is believed to be part of the local drainage system and not associated with the disposal site. Since only temporary facilities and equipment were used at the 26th Street Disposal Site, the objectives will be met by the removal of all such facilities and equipment. The areas, once occupied by such equipment and facilities, will be surveyed, cleaned (if necessary), and released in accordance with NRC criteria.

3.2 Background Measurements

A series of measurements were made to define the amount of radiation and the concentration of radioactive materials present because of causes unrelated to operation of the 26th Street Disposal Site. The predominant radioactive materials are naturally occurring elements in the crust of the earth, e.g., uranium, radium, thorium, and potassium-40. A minor amount of the radioactive material found in the environment is from fallout, particularly cesium-137. Natural background

radiation comes from these materials as well as radiation (cosmic rays) from space. A knowledge of the amount of natural background is necessary because radiation measurements at 26th Street are the sum of the radiation due to the natural background and that due to any remaining residual radioactivity from the work there. Therefore, to assess the amount of the work residual it is necessary to subtract the contribution from natural background from the total measured.

Two types of background measurements were made; i.e., measurements of the radiation exposure, and measurements of the concentration of radioactive material in soil. These types of measurements are discussed in the following two sections.

3.2.1 Ambient Background Radiation (Exposure Rate)

Ambient background radiation exposure rates were made at 30 measurements in areas around the 26th Street Site, 13 measurements in areas outside of the 26th Street Site Security Fence but located on the Edgewood Post, and 18 measurements made in two nearby communities, Abingdon and Bel Air, MD. The measurements were made on publicly accessible property along Routes 924 North and 24 South (See Attachment 9, Volume 2).

Ambient radiation measurements were made at about 1-meter above the ground. At each measurement location, the lowest and highest readings were noted and the average of the two was assigned as the exposure rate. The measurements were taken using a Ludlum Micro-R-Meter (Model 19) with a built-in 1 x 1 inch NaI(Tl) detector. The instrument had been recently calibrated against Cs-137 by the manufacturer.

For each type of radiation instrumentation used during the survey, responses to background radiation levels were established using each instrument and survey configuration. The methodology given in NRC's NUREG/CR-5849 (Sect. 5.2) was used to derive detection sensitivity levels. Pressurized ion-chambers were not used for this purpose. Background responses and detection limits for the three types of survey instruments used during the surveys are given in Tables 3-1 and 3-2. Attachment 8, Volume 2 presents a complete listing, operational characteristics, and calibration status of all instruments used during the project. All survey locations, designations, and radiation measurements were recorded in field logs and radiation survey forms.

Table 3-1
Instrumentation & Detector Response

	NaI(Tl) Scint. Model 19 Micro-R-Meter	Alpha/Beta Scint.+ Model 2223/43-89	NaI(Tl) Scint. Model 2241/44-2
Background Response			
Aver. Bkgd:	9 uR/hr	300 cpm β	9 uR/hr
Bkgd Range*:	7 - 12 uR/hr	200 - 400 cpm β ≤ 3 cpm α	8 - 11 uR/hr
Detection Limits			
Slow response:	2 uR/hr&	--	2 uR/hr#
Fast response*:	5 uR/hr$	--	3 uR/hr@
Response**			
- Alpha:	--	11 cpm	--
	--	70 dpm/100 cm^2	--
- Beta:	--	85 cpm	--
	--	850 dpm/100 cm^2	--

+ Used primarily for areas and equipment monitoring.
* Observed range, lowest to highest readings. All values have been rounded off.
& Time constant, 22 sec.
$ Time constant, 4 sec.
# Time constant, 30 sec.
@ Time constant, 10 sec.
** Logarithmic scale, no time constant given in instrument manual.

Table 3-2
Side by Side Comparison of
Instrumentation Response to Background Radiation

	NaI(Tl) Scint. Model 19*1 Micro-R-Meter	NaI(Tl) Scint.*2 Model 2241/44-2	NaI(Tl) Scint.*3 Model 2241/44-2
Slow response:	6 uR/hr&	1.3k cpm#	6.8 uR/hr#
Fast response**:	5-8 uR/hr$	1.2-1.4k cpm@	6.2-7.7 uR/hr@
Assumed Aver.:	6 uR/hr	1.3k cpm+	6.8 uR/hr

*1 Unit serial number 120914, calibrated with Cs-137, 12/14/1995.
*2 Unit/detector serial numbers 118433/010990, calibrated with Cs-137, 12/29/1995.
*3 Unit/detector serial numbers 118453/125027, calibrated with Cs-137, 12/29/1995.
** Observed range, lowest to highest readings. All values have been rounded off.
& Time constant, 22 sec.
$ Time constant, 4 sec.
# Time constant, 30 sec.
@ Time constant, 10 sec.
+ Assumed average response normalized to 10 μR/hr = 2,031 cpm or ~ 2,000 cpm.

3.2.2 Background Soil Radionuclide Concentrations

Six surface soil samples were collected for defining background levels for naturally occurring radionuclides in soil. The sampling locations were selected using the results of radiation surveys conducted to maintain some relationship between the two types of background measurements. The selected sampling points were located away from existing buildings and vegetative cover. The six surface soil samples were collected as follows:

- Two samples near to the 26th Street Disposal Site, corner of Bush River Road and 25th Street.
- Two samples on the Edgewood Post, but beyond the security area to the CASY yard and 26th Street Disposal Site. One collected at the Foster Wheeler Administrative Office, Bldg. E1356, Bush River and Scully Road and one at the Stokes Road Parking Area, near elevated steam lines.
- Two samples off the Edgewood Post in the towns of Abingdon and Bel Air. One sample collected at the corner of Route 924N and Woodsdale Road in Abingdon and at the corner of Route 24S and West Ring Factory Road, in Bel Air.

The protocol for the analysis of these soil samples as well as those taken from the remediation area is described in Section 3.6.

3.3 Sampling/Measurement Locations

A square grid was established by civil survey to permit the documentation of measurement/sample locations. The sides of each grid were 10 foot long. Exhibit 1 shows the grid system used for this final survey. This figure shows the remediation area, consisting of the excavation area and the marsh area. The marsh area is included in this classification since it is located down-gradient from the excavation and radioactivity might have been deposited there by surface water runoff.

This is the same grid reference system that was used for conducting radiation surveys and sampling as was implemented by Roy F. Weston, Inc. during earlier surveys (Weston 1994). The grid's coordinates were bench-marked to an established reference point (see Exhibit 1). The center portion of the excavation is situated at about 5 feet above sea level. The corner and center points of each grid were identified by flags. The overall dimensions of the excavation are about 90 feet wide and 150 feet long (or about 27 by 46 m). The longest dimension runs north/south. For the purpose of conducting radiation surveys, the grid size is 10 ft by 10 ft, using the pre-established grid system. For the purpose of taking soil samples, the grid size is 10 m by 10 m, which has been rounded off to 30 ft x 30 ft for the purpose of easily superimposing both grids on the site. Each grid has been designated by grid coordinates keyed to the northeast corner of the site. A prefix was assigned to designate samples collected on the floor of the excavation (EF) and sides (ES). For example, the corner grid located on the southwest corner floor of the excavation is designated as grid EF-J23.

For the purpose of conducting surface scan surveys, each grid was further divided into four quadrants of 5 ft x 5 ft each. Each quadrant were designated by letters (A, B, C, and D) running clockwise and starting with the upper left corner as quadrant A, also keyed to the northeast corner of the site. For example, the upper left quadrant of the grid located in the southwest corner of the excavation is designated as grid EF-J23A. When mandated by survey results, specific details were provided by subdividing each grid down to 1 ft^2 areas.

The marsh area is about 140 feet long and 80 feet wide (43 m by 24 m). As with the excavation, the existing 10 ft by 10 ft grid was used for the marsh area (Weston 1994). The center portion of the marsh area is situated at about 3 feet above sea level. The grid's coordinates were bench-marked to an established reference point (see Exhibit 1). Radiation survey measurements were conducted in each 10 ft x 10 ft grid. Survey measurements included ambient radiation exposure rates taken at 1-meter. In areas where surface soils have been removed, gamma surface scans were conducted over the entire areas. Similar measurements were taken in nearby grids. However, for soil sampling, a 30 ft by 30 ft grid was used.

Auxiliary areas, used for support during remediation include the screening area, and the north and south contamination reduction zones.

The Screening Area (SA) was used to stage the movement of boxed or bagged soils and solid waste from the excavation and for staging the conveyor belt, excavator, and soil shaker. The SA was prepared by adding a sand and gravel layer to support heavy equipment. Two locations within the SA where contaminated soils and waste were processed were also covered with HDPE liners. The locations include where the screening tables and conveyor belt were set up and the area where a soil shaker had once been used.

The SA is about 163 feet long and 22 feet wide (50 m by 7 m). For the conduct of radiation measurements, the SA was divided into 10 ft by 10 ft grids, based on the coordinate system used for the excavation. The SA is situated at about 14 feet above sea level (see Exhibit 1). For soil sampling, the SA was divided in five grids of 10 m by 7 m. For areas that were covered with sand and gravel, the surveys were first conducted over the existing ground cover. Additional measurements were taken over the original ground cover by removing the sand and gravel cover in selected areas. These areas include where the conveyor belt and soil shaker were once used and where contaminated soils and waste were temporarily stockpiled. The same radiation and contamination survey procedures were used as described earlier. For the purpose of releasing the SA area, radiation surface gamma scans were conducted over the areas (100% coverage) once used to process and store waste and soils, including areas previously covered with HDPE, areas where the HDPE liner had been torn, and around the full perimeter of the HDPE liner. Ambient radiation measurements were taken at a height of 1-m in each grid.

The North and South contamination reduction zones (CRZs) were used only for personnel access to and from the excavation and SA. Only personnel, personnel monitoring equipment, and bagged samples were moved through the CRZs. Both CRZ areas were protected by covering the ground

with HDPE covers. The dimensions of each CRZ is about 15 ft by 20 ft (5 m by 6 m). Each CRZ was divided into eight 2 m by 2 m grids. The approximate configurations of both CRZs are illustrated in Figure 2-3. For the purpose of releasing both CRZs, surface gamma scans were conducted over both areas (100% coverage), including areas previously covered with HDPE liners, areas where the HDPE liner had been torn, and around the full perimeter of the HDPE liner. Ambient radiation measurements were made at a height of 1-m in each 2 m by 2-m grid.

3.4 Exposure Rate Measurements

Exposure rate measurements were made in all exposed and accessible areas. Before the final survey was initiated, a screening survey was conducted to confirm that the excavation and adjacent areas had been cleared of surface debris and were free of radioactive waste and sources of radiation that could invalidate the results. All excess waste held in boxes, bags, or drums were removed from the general area before conducting the final surveys. Hot-spots identified during the conduct of the screening surveys were removed and the areas were resurveyed to confirm the removal of the radioactivity. Attachment 8, Volume 2 presents a listing and characteristics of the instrumentation used for the surveys.

Two types of routine exposure rate measurements were taken. They include:

a. Ambient radiation levels measured at 1-meter above grade at the center of each full or partial grid.

   (1) The corners and center of each grid was identified by flags. Two measurements were recorded at each center, lowest and highest readings observed over a period of at least 30 seconds. The instrument was operated with the audio turned on. When detected, additional measurements were made in areas exhibiting higher radiation levels. For the purpose of this survey, elevated levels were defined as any readings that are above background but less than or equal to ($\leq$) 3 times background over an area $>1\text{-m}^2$. When detected, hot-spots were defined as readings that are >3 times background and confined to areas $\leq 1\ \text{m}^2$.

   (2) A Ludlum model 19 Mirco-R-Meter (with a built-in 1 x 1 inch NaI(Tl) detector) was used for these surveys. Each instrument had been calibrated by the manufacturer against Cs-137 and source-checked before and after each survey.

b. Gamma radiation scans measured within 2-inch of the surface over the entire area of each full or partial grid.

   (1) A full scan (100% coverage) of each grid was conducted, with results reported by quadrants (four to a grid). All readings were observed while

scanning at rate of $\leq$12 inches per second and sweeping back and forth over a 12-inch wide strip. The following measurements were recorded for each quadrant, the lowest and highest readings observed over the area just scanned. When detected, the presence of any hot-spots was noted. For the purpose of this survey, elevated levels were defined as any readings that were above background but $\leq$3 times background. Hot-spots were defined as readings that are greater than (>) 3 times background and confined within an area of $\leq$ 100 cm^2.

(2) The instrument used during the survey was operated with the audio turned on. When scanning, the instrument selector switch was placed in the ratemeter position. When elevated readings were noted, 1-minute readings were taken in the scaler mode.

(3) A Ludlum model 2241 Scaler/Meter equipped with a hand-held gamma [1 x 1 inch NaI(Tl)] scintillation detector (Ludlum model 44-2) was used for these surveys. Each instrument was factory calibrated against Cs-137 and source-checked before and after each survey.

In addition, exposure rate measurements were taken adjacent to soil while under water since over the course of the removal action, parts of the excavation were submerged. Two underwater surveys were conducted to assess radiation exposure rates by scanning the bottoms and sides of the submerged areas. The depth of the water varied from about 2 to 24 inches.

Survey teams were made up of qualified HP Technician paired with support personnel. Each team included one HP Technician responsible for taking all field measurements and one data recorder. The HP Technicians were assigned to the project staff, while data recorders were drawn from existing project staff and trained for this purpose. The same approach was used for sampling activities. All survey and sampling activities were conducted under the supervision of FWENC QC personnel, also trained for this purpose. A 3-hour training session was conducted for this purpose. The training session addressed the following subjects:

1. Purpose and objectives for conducting the surveys.
2. Survey methods and radiation detection instrumentation.
3. Survey grid system and designation.
4. Instrumentation operation, characteristics, and response.
5. Daily instrumentation checks, pre- and post-survey.
6. Data collection and logging.
7. Sample collection and preparation.
8. Health and safety procedures and requirements.
9. QA/QC requirements.
10. Field exercise and dry run.

3.5 Soil, Sediment, and Water Sampling

Soil samples were collected to characterize the presence and concentration of residual radioactivity in soils. Sampling locations and number of samples were identified using the established grid system, with the outline and features of the excavation overlaid onto the grid. (See Exhibit 1) Soil samples were collected only when the results of radiation survey measurements (1-m and surface scans) indicated that results were ≤ 2 times background in general areas and that elevated readings were ≤ 3 times backgrounds. In a few instances, additional measurements were made and steps were taken to remove excessive levels of radioactivity. The following types and number of samples were taken:

Excavation:	32 (surface floor)
Excavation:	14 (walls/sides)
Screening area:	6 (surface soil)
Marsh area:	16 (12 surface and 4 subsoil)
Submerged areas:	6 (3 sediment and 3 subsoil)
Water:	6 (3 from excavation, 1 from discharge point, and 2 with sediments)
Biased samples:	22 (based on lab analyses, 13 surface soils, 2 water, 4 sediments, 1 subsurface, and 1 low and high bias each)
Duplicates:	8 as QA/QC samples

All sampling tools and mixing containers were initially cleaned and before proceeding to the next sampling point, using deionized water, or new ones were used for each sample. The samples were taken over a depth of 6-inch, while increasing the size of the area until the required weight was reached. Each sample was placed in a clean mixing container, mixed, and two 1-kg samples were taken from the mixing container. One set of samples was initially field-screened using an onsite multi-channel analyzer (MCA) equipped with 3 x 3 inch NaI(Tl) detector and 1-L Marinelli containers. The second set of samples was sent offsite for laboratory analysis after they had been screened for CWM by the U.S. Army; i.e., ERDEC. The laboratories used during the project were:

- Primary: Data Chem, Salt Lake City, UT.
  Pace, Inc. Golden, CO (no longer in business).
- QA Lab: Quanterra, Inc., Earth City, MO.

All sampling locations and designations were recorded in field sampling logs and forms. All samples were bagged, labeled, and coded accordingly. Custody sheets were used to track each sample from the time of collection, interim storage, and shipment to the laboratory. Sample custody forms were completed for each set of samples sent to the designated laboratory. The completed sample chain of custody forms were included with laboratory results. All laboratory results are reported in pCi/g of dry soil and sediments and pCi/L for water samples.

The results submitted by the offsite laboratory were reviewed and assembled with each survey package. The review of the laboratory reports included verifying sample designations, data reporting format, adequacy of analytical detection limits, data completeness for all requested analyses, inclusion of laboratory QA/QC checks with results, submittal of complete data package and backup documentation.

3.5.1 Excavation

Surface soil samples were collected on the floor and walls and sides of the excavation. Subsurface sampling beyond 12 inches was not conducted in the floor and walls of the excavation in light of the potential presence of military ordnance (UXO) and chemical warfare material (CWM). The procedure described by the NRC in NUREG/CR-5849, which specifies that sampling be conducted at least 1-m below the lowest suspected zone of contamination, could not be implemented since the use of conventional drilling methods was prohibited by U.S. Army requirements due to the potential presence of UXO and CWM. Furthermore, some portions of the excavation were submerged by water.

Biased-samples were collected in areas for characterizing the range of soil radionuclide concentrations. The criteria for collecting such soil samples were based on the results of radiation surveys. Two samples were collected at locations with the highest and lowest exposure rates 5 cm above the soil surface.

3.5.2 Marsh Area

Samples were collected in the marsh located down-gradient of the excavation site. Soil samples were collected on the surface where slightly contaminated soils had been removed during remediation. Four additional samples were collected at these locations at depths of 6 to 24 inches as a follow up to sampling and analysis done during the remediation. Samples were collected in adjacent grids as well. All samples were tied to the grid system for the marsh area. See Figure 3-1.

3.5.3 Screening Area (SA)

Given the size of the SA, samples were collected within each of the five grids (each 10 m by 7 m). A sixth sample was collected at the entrance of the SA, where soils and waste were moved out.

3.5.4 North and South Contamination Reduction Zones

Soil samples were not collected in the North and South CRZs since contaminated waste and soils were not processed through either CRZ.

3.5.5. Water Sampling

Water samples were collected in instances were water was found standing in isolated pockets or when leaving the excavation, e.g., after rainfalls. Since the removal action did not use any water or generate liquid waste, the water samples are from natural origins. Whenever there was enough water to collect, two one-gallon water samples were taken at each location. Sampling locations and number of samples were identified using the grid system and outline and features of the submerged areas. The samples were taken before any other types of sampling or measurement activities were initiated to minimize the presence of suspended solids. The water samples were taken at mid-depth at each designated location. The sampling locations and water depth at the sampling locations were recorded.

When sediments were sampled, the water was separated and the sediments and solids were placed in separate containers. For sediments, the amounts of water that were collected were highly variable, as free water was obtained by allowing the sample to drain by gravity. All samples; i.e., sediment and water, were sent offside for analysis as matched pairs or as single samples. The laboratory provided all sample preservatives (ca 5 mL of nitric acid). The results are contained in Attachment 12, Volume 3.

3.5.6. Special Measurements and Sampling

Except for measurements conducted in submerged areas of the excavation and marsh area, no special survey measurement methods were conducted in support of this final survey. The under water measurements were made by submerging a 1 x 1 inch NaI(Tl) detector placed into a capped schedule-40 PVC pipe, with a 52 cm inner diameter and 4 mm thick wall. The pipe and detector were lowered into each body of water and scans were conducted along the bottom and sides of trenches and holes. All results were evaluated and compared to responses to ambient background. The results are reported in both cpm and μR/hr for the sake of completeness.

A perimeter survey was conducted earlier in the project (August 4-9, 1995) to determine if the presence of radioactivity extended beyond the Burn Area, located just west of 26th Street. The survey involved drilling 18 boreholes, collecting 37 soil samples at five-depth intervals (down to 10 feet), and conducting a gamma scan of each borehole. The results are summarized in Sect. 4.0 and Attachment 13, Volume 2 includes the field report and soil sample data from laboratory analyses.

3.6 Sample Analysis

All samples were initially field-screened using an onsite MCA equipped with 3 x 3 inch NaI(Tl) detector and 1-L Marinelli containers. Samples were sent offsite for laboratory analysis after the samples had been screened for CWM. All laboratory results are reported in pCi/g of dry soil and sediments and pCi/L for water samples.

3.6.1 Soils and Sediments

Soil and sediments samples were subjected to the following analytical protocol:

a. Gamma Emitting Radionuclides - All soil and sediment samples were subjected to high resolution gamma spectroscopy analyses (Germanium detector).

b. Beta Emitting Radionuclides - All soil and sediment samples were also subjected to gross beta activity analysis.

c. The spectroscopy and gross beta analytical results were reviewed and samples having the most activity were selected and subjected to further analysis, including alpha spectroscopy for isotopic U, Th, and Ra. Higher activity samples were picked because of a higher probability of finding measurable amounts of these harder-to-detect radionuclides.

d. Selected samples were also subjected to analyses of Sr-90 (based on total Sr) and Tc-99.

3.6.2 Water Samples

Water samples were subjected to the following analytical protocol:

a. Gamma Emitting Radionuclides - All water samples were subjected to high resolution gamma spectroscopy analysis (GeLi/HPGe). Suspended solids were separated from the water phase by filtration, using 0.45 μm filters (Gelman A/E). The filtered solids were combined and counted with its matching sediment or soil sample.

b. Gross Alpha/Beta Activity - All water samples were also subjected to gross alpha and beta activity analyses. Suspended solids were separated from the water phase by filtration, using 0.45 μm filters. The filtered solids were combined and counted with its matching sediment or soil sample.

c. The spectroscopy and gross alpha/beta analytical results were reviewed and samples having the most activity were selected for further analysis, including alpha spectroscopy for isotopic U, Th, and Ra. Higher activity samples were picked because of a higher probability of finding measurable amounts of these harder-to-detect radionuclides.

d. Selected samples were also subjected to other analyses, including Sr-90 (based on total Sr), Tc-99, and H-3.

3.6.3 Background Soil Samples

Background soil samples were subjected to the following analytical protocol:

a. Gamma Emitting Radionuclides - High resolution gamma spectroscopy analyses (GeLi/HPGe).

b. Alpha/Beta Emitting Radionuclides - Gross alpha and beta activity analyses, with one sample analyzed for Sr-90 (based on total Sr).

c. Alpha Emitting Radionuclides - Alpha spectroscopic analysis for isotopic U, Th, and Ra.

3.7 Data Interpretation

Upon receipt, data from each of the different measurement systems and laboratories were reviewed, edited, and checked for omissions or errors. The data and files for each set of results were organized by site, purpose of survey, measurement locations, and date and time. The conversion and evaluation of field survey measurements and laboratory results were conducted using the guidance given in NUREG/CR-5849 (NRC 1992). Information on instrumentation calibrations and responses are given in Attachment 8, Volume 2. Measurements were converted to dpm/100 cm^2 for surface contamination levels, μR/hr for ambient and surface radiation exposure rates, depending on calibrations and instrument readout, pCi/g for soils or sediments (dry weight), and pCi/L or μCi/mL for water samples. When needed, areas characterized by "elevated levels" of radiation or radioactivity were compared with the corresponding NRC criteria. The upper 95% confidence limits of the average radiation exposure rates and soil concentrations were evaluated against their corresponding limits using the methodology given in NUREG/CR-5849.

3.8 Quality Assurance

QA/QC procedures were followed to ensure that proper field survey measurements, sample collection, and sample processing techniques were used during the conduct the activities detailed above. The QA/QC plan relied on data quality objectives (DQO) for monitoring the conduct of such activities (Foster 1995). DQOs are defined as requirements which specify an acceptable level of uncertainty regarding the collection of data characterizing a set of measurements. The uncertainties associated with DQOs incorporate a number of errors which are known to occur during survey measurements or sampling. Such errors may be due to the use of different sampling or measurement methods, variations in equipment calibration and response, improper use of procedures, variation in the spatial distribution of contaminants, etc. It is recognized that for a chosen level of precision and bias, some results may be questionable in reliably detecting conditions at or below specific criteria. DQOs include the following criteria: precision and accuracy, completeness, representativeness, and comparability.

3.8.1 Precision and Accuracy

Precision and bias were assessed by duplicating field measurements, sampling methods, and laboratory measurements. A representative number (10%) of duplicate samples and measurements were taken. Whenever erroneous or bias results were observed, an explanation was provided and a discussion described their impact on DQOs.

3.8.2 Completeness of Data Acquisition

The goal for data completeness was 100% retrieval or collection. The loss of any data may be due to various causes. Such losses may be due to inadvertently discarding a sample, misplacement during shipping or handling, or while in processing. Other data losses may be associated with survey personnel failing to observe sampling or measurement instructions or instrument malfunctions. Whenever missing data were detected, an explanation was provided and a discussion described its impact on DQOs.

3.8.3 Representativeness of Measurements

Since survey results were used to infer conditions in locations not sampled, it is important to ensure that sampling or measurement techniques used are representative of the conditions being evaluated. Such inferences were made by applying statistical methods. The results were evaluated to determine whether additional measurements or samples needed to be made or taken. Whenever erroneous or bias results were observed, an explanation was provided and a discussion described its impact on DQOs.

3.8.4 Comparability to Past and Current Measurements

The results were compared among past and recent surveys or samples for assessing the reliability and performance of sampling and measurement methods. The evaluation was used to identify failures or system degradation which may be unique to a particular type of measurement technique, sampling procedure, or analytical method. Observations drawn from this evaluation were addressed and an assessment was made as to the significance of these findings.

3.8.5 Measurement Procedures

All radiological analyses and radiation monitoring or measurements were performed using recognized industry practices and NIST traceable radioactive standards and sources. In addition, technical guidance on survey methodology was drawn from the following NRC document: Manual for Conducting Radiological Surveys in Support of License Termination, NUREG/CR-5849 (NRC 1992).

3.8.6 Sample Collection, Handling, and Custody

Sample collection, handling, and custody requirements are noted in the Work Plan (Foster 1995). In addition, samples contaminated with radioactive materials were characterized as to their external radiation exposure rates, suspected or known radionuclides, estimated total activity, and surface contamination levels on the outer surfaces of the sample package. This information accompanied the samples, either in groups or individually.

3.8.7 Calibration Procedures

All survey instrumentation were calibrated by the manufacturer or supplier using the following radionuclides, Cs-137 for gamma emitters, C-14, Sr-90, Tc-99 for beta emitters, and Th-230 and Pu-239 for alpha emitters. Supporting calibration certificates and documents were maintained in project files for each piece of equipment used during the surveys. Routine source and background checks were carried out and documented before and after each survey. Daily field operational checks were conducted using Cs-137 for gamma detectors, Tc-99 for beta detectors, and Th-230 for alpha detectors, and also included noting responses to background. The field sources included Tc-99, 23,500 dpm; Th-230, 21,800 dpm, and Cs-137, 0.24 μCi, with radioactivity levels certificated in April 1995.

3.8.8 Analytical Procedures

Soil samples were analyzed by contracted laboratories in accordance with their quality assurance procedures. A copy of the laboratory's Quality Assurance Plan and relevant procedures were obtained and reviewed to ensure compatibility with the QA Plan (Data Chem 1996a, Pace 1994).

3.8.9 Data Receipt and Processing

Upon receipt, sample analytical results were entered in project data files. Field data were recorded and maintained in project files. All data and supporting information were recorded in survey forms, worksheets, and logbooks. Data from each of the different measurement systems and laboratory were reviewed, edited, and checked for omissions or errors. The data and files for each set of results were organized by site, purpose of survey, measurement locations, and date and time.

3.9 Project Records and Files

All survey results and supporting data are kept in FWENC files and records. Under contractual obligations, copies or originals of project records are submitted to the ERRO as they are generated.

4.0 SURVEY FINDINGS AND RESULTS

This section presents the results of the exposure rate measurements and the analysis of samples taken as part of the final survey. The exposure rate measurements were taken 1-meter and 5 cm above the soil surfaces. The media sampled included surface and subsurface soils, sediments, and surface water. The analyses included gross alpha and beta activity, and gamma spectroscopy for eight radionuclides (i.e., K-40, Co-60, Ba-133, Cs-137, Eu-152, Th-234, Ra-226, and Ac-228), and alpha spectroscopy for five radionuclides (i.e., Ra-226, Ra-224, U-238, U-234, and U-235). In addition, there were special analyses for Sr-90, Tc-99, and H-3 made for a selected number of samples. The gamma spectroscopy results for Th-234 and Ac-228 were used to infer the presence of U-238 and Th-232, respectively.

Radiation survey results and sample analyses are presented in summary tables in this section. The individual sample results, however, are provided in Appendix 4 along with the associated statistics. The statistics include number of measurements, maximum and minimum values, averages and standard deviations given in this section, coefficient of variation, and upper 95% confidence limit for each average determined. The upper confidence limit as used in this document is the value below which the true average will be found 95% of the time. This value is always higher than the arithmetic average of the measurements because it includes the sample variation. The upper confidence limit is the sum of the sample average and the product of the sample standard deviation and the appropriate t-statistic from the Student's t-distribution ($t_{0.05,\ n-1\ df}$). For the gamma and alpha spectroscopy results, both the sample result and its corresponding minimum detectable activity (MDA) or concentration (MDC) are given, as reported by the analytical laboratory. Since some measurements overlap the analytical detection threshold, the results used for data analysis are based on the higher of the two results; i.e., either sample result or the MDC/MDA. For water samples, the results also include the concentrations of total solids, based on filtration using 0.45 μm filters (Gelman A/E).

Tables 4-1 through 4-4 summarize the results of laboratory analyses and survey measurements characterizing background conditions at the Edgewood site and nearby areas. Tables 4-6 through 4-15 give the comparable values in the areas remediated as well as the auxiliary or support areas. Tables 4-16 through 4-21 summarize the results of the analyses of standing water and run off collected at the conclusion of the remediation activities.

4.1 Background Measurement Results

Background measurements were made to establish benchmarks for the evaluation of the significance of the measurements made at the site after remediation. Two types of background measurements were made; i.e., measurements of the exposure rate 1m above the soil surface, and measurements of the concentration of radionuclides in soil. The results of these measurements are given in the following sections.

4.1.1 Ambient Background Radiation Levels

Measurements of the ambient background were made at about 1-meter above the ground. Sets of these measurements were made in three general areas: near the 26th Street site, elsewhere on the base, and in the surrounding community. The results are shown in Table 4-1.

Table 4-1
Typical Ambient Background Radiation Exposure Rates*

Results	Radiation Exposure Rate - μR/hr 26th Street Area	Edgewood Base	Nearby Communities
High	10	8	8
Low:	5	6	5
Average	6.7	7.0	6.8
Std. dev.	1.1	0.7	0.8
No. of measurements	30	13	17

* Based on survey of Feb. 8, 1996. See Attachment 9, Volume 2.

The overall average was estimated to be 6.8 +/- 0.97 using all 60 measurement results. The upper 95% confidence limit for the overall average exposure rate (mean plus two standard deviations) was found to be 7.0 μR/hr.

4.1.2 Background Soil Radionuclide Concentrations

Six samples were taken by Foster Wheeler and analyzed by Data Chem. Gas proportional counting was used to make the gross alpha and beta measurements shown in Table 4.2. Other values in the table were obtained using high resolution gamma spectrometry. Most values in Table 4.3 were obtained using alpha spectrometry, but isotope separations were required for Sr-90 and Tc-99.

Table 4-2
Background Concentrations of Radionuclides in Soil

	Concentration (pCi/g)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	13	22	9.4	0.019	0.055
Minimum	8.3	15	5	non-detect	0.0025
Average	10	19	6.67	0.0085	0.0207
Std. Dev.	1.77	3.03	1.79	0.011	0.0186

	Concentration (pCi/g)				
Parameter	Cs-137	Eu-152	Th-234[1]	Ra-226	Ac-228[2]
Maximum	0.48	0.32	1.9	2.3	1.4
Minimum	non-detect	non-detect	0.26	0.92	0.66
Average	0.112	0.14	1.15	1.42	0.958
Std. Dev.	0.187	0.113	0.623	0.478	0.279

[1] Indicative of uranium-238
[2] Indicative of thorium-232

See Appendix 4, Tables A4-1 and A4-2 for the results of individual analyses.

Table 4-3
Background Concentrations of Radionuclides in Soil by Alpha Spectrometry and other Special Analyses

	Concentration (pCi/g)				
Parameter	U-234	U-235	U-238	Ra-224	Ra-226
Maximum	1.06	.0560	1.03	2.60	1.14
Minimum	.816	.0247	.780	1.16	.838
Average	.898	.0426	.883	1.79	.996
Std. Dev.	.140	.161	.131	.737	.151

	Concentration (pCi/g)				
Parameter	Th-228	Th-230	Th-232	Sr-90	Tc-99
Maximum	1.37	1.09	1.23	non-detect	
Minimum	1.15	.959	.0924		
Average	1.23	1.01	.804		
Std. Dev.	.122	.0692	.620		

Three samples were taken previously and analyzed to quantify the background concentrations of radioactive materials present radiation present. These were taken in support of earlier field activities (Weston 1994, Teledyne 1994a) but provide an additional check on the six sets of 1996 values (Table 4-2). The results are presented in Table 4-4. The results of the two sets of data are consistent. Radionuclides detected in the 1996 samples only; i.e., Co-60, Ba-133, Eu-152, Ra-226, and Th-234, were near the lower limit of detection, and may not have been seen in the earlier samples because of differences in the required sensitivity or minor differences in technique. Appendix 4, Table A4-28 contains the results of the individual measurements.

Table 4-4
Soil Background Radionuclide Concentrations for Samples Collected in 1994*

Radionuclide Concentrations (pCi/g)						
Sample Code 26BK-	Gross Beta	K-40	Co-60	Cs-137	Ra-226	Th-228
001	10±2	18±0.52	<0.07	0.55±0.72	≤1.0	0.52±0.68
002	26±3	6.9±0.69	<0.05	0.23±0.60	≤1.0	1.22±0.12
002Dup	25±3	7.9±0.15	<0.24	0.28±0.14	≤3.0	1.62±0.18
003	12±3	3.3±0.56	<0.04	0.11±0.42	≤0.8	0.66±0.65
003Dup	14±3	3.6±0.57	<0.04	0.09±0.05	≤1.0	0.72±0.72

* Teledyne Brown Engineering Environmental Services, Report of Analysis, Work Order No. 3-0521, April 15, 1994, Westwood, NJ (Teledyne 1994b).

4.2 Support Facilities and Equipment Surveys

The support facilities consisted of the Field Office Trailer, the Personnel Decontamination Trailer, Health Physics Trailer, and the Personnel Warm-up Trailer. Major equipment items included the 320 L cat excavator, the 544 G Loader, the soil shaker, the hopper, and the conveyor belt. These facilities were temporary and were set up by Foster Wheeler to support the removal action. These facilities and equipment items were checked in accordance with requirements of the Radiological Health and Safety Plan and released for unrestricted use.

4.3 Remediation Site Radiation Survey Results

The results of the site radiological survey are summarized in the following four sections: 4.3.1, Exposure Rate Measurements, 4.3.2. Soil Sample Results, 4.3.3. Water Sampling Results, and 4.3.4. Burn Area Survey Results. Results of individual measurements are tabulated in Appendix 4.

4.3.1 Exposure Rate Measurements

Table 4.5 gives a summary of the exposure rate measurements taken as part of the final survey. Measurements were made at 5 centimeter and 1 meter distances above the soil surface. In the remediation areas measurements were taken over the surfaces of the excavation (Excavat'n), at the perimeter of the excavation (Perimeter), submerged in water on the floor of the excavation, and in the marsh. Additional measurements were made in the surrounding work areas, the

screening area (Scr'n Area) and the north and south contamination reduction zones, (CRZ-N'rth, and CRZ-So'th). The results of individual measurements summarized in Table 4.5 are included in Appendix 4, Tables A4-3 through A4-9.

Table 4-5
Exposure Rate Measurements

	Exposure Rate (μR/hr)					
Parameter	Excavat'n (1m)	Excavat'n (5 cm)	Perimeter (1 m)	Excavat'n (in H_2O)*	Marsh (1m)	Marsh (5 cm)
Max.	15	22	10	6	10	11
Minimum	7	7	4	1.4	6	6
Average	10.13	12.86	7.3	3.06	7.95	7
Std. Dev.	1.74	3.04	1.62	0.96	0.91	1.13
No. of Measure-ments	90	315	61	98	118	110

	Exposure Rate (μR/hr)					
Parameter	Scr'n Area (1m)	Scr'n Area (5 cm)	CRZ-N'rth (1m)	CRZ-N'rth (5 cm)	CRZ-So'th (1m)	CRZ-So'th (5 cm)
Max.	9	11	10	13	11	11
Minimum	5	5	9	9	8	8
Average	6	7.26	9.32	10.06	8.92	8.98
Std. Dev.	0.96	1.39	0.4	0.96	0.9	0.57
No. of Measure-ments	47	190	11	34	12	40

* Values given in units of 1,000 counts per minute

a) Excavation (1m)

Ambient (1m) radiation exposure rates were found to vary from 7 to 15 μR/hr, with an average of 10.1 $\pm$ 1.7 μR/hr. The 95% upper confidence limit on the average was found to be 10.4 μR/hr, based on 90 measurements (see Table 4-5). The average 1-m reading is higher that the area background, ca. 7.0 μR/hr, and indicates that residual amounts of radioactivity remain. However, the difference, about 3.4 μR/hr, is below the 10 μR/hr NRC limit.

b) Excavation (5 cm)

Surface scan measurements, based on average of low and high readings noted in each subquadrant, range from 7 to 22 μR/hr and average at 12.9 $\pm$ 3.0 μR/hr. The 95% upper confidence limit on the average was found to be 13.1 μR/hr, based on 315 measurements. There is a trend in radiation exposure rates with levels being slightly more elevated in the northern half of the excavation than in other areas. In some of the survey grids (10' x 10'), measurements indicated the presence of some randomly distributed hot spots. However, a comparison of the averages indicates that the guideline has been met for general areas confined to less than 10 m by 10 m in size.

c) Perimeter (1m)

A perimeter survey of the excavation revealed exposure rates ranging from 4 to 10 μR/hr, with an average of 7.3 $\pm$ 1.6 μR/hr (see Table 4-5). The 95% upper confidence limit on the average was found to be 7.5 μR/hr, based on 61 measurements (see Table 4-5). The measurements were made on the outer side of the perimeter fence and within the width of one grid. The average 1-m reading is not significantly different than the background, ca. 7.0 μR/hr. This indicates that soil surfaces outside of the excavation do not have significant amounts of residual radioactivity due to previous operations or remediation activities.

d) Underwater Surface Scan Exposure Rates

For evaluation purposes, the results of two surveys are combined into one set of data since the measurements were taken in the same general vicinity, with only the changes being in the general shape and depth of the submerged areas.

The radiation measurements were noted to range from 1,400 to 6,000 cpm, and averaging at 3,100 $\pm$ 960 cpm. The 95% upper confidence limit on the average was found to be 3,220 cpm, based on 98 measurements. The depth of the water varied from about 2 to 24 inches. The background count-rate, obtained under similar conditions, was found to be about 1,300 cpm, using the same method and instrumentation. This corresponds to an exposure rate of about 7 μR/hr.

The submerged areas are small, typically less than 20' by 20' and the survey results are treated in the same manner as that of surface scans. Accordingly, comparison of the averages indicates that the guideline has been met for general areas.

e) Marsh Area (1m)

Two radiation surveys were conducted and both revealed results at about background levels. The results were combined and the summary appears in Table 4-5. For the survey conducted in January 1996, ambient radiation exposure rates vary from 6 to 10 μR/hr, with an average of 8.0 $\pm$ 0.9 μR/hr. The 95% upper confidence limit on the average was found to be 8.0 μR/hr, based on 118 measurements. The second survey, conducted in March 1996, revealed similar results, with ambient radiation exposure rates varying from 6 to 11 μR/hr and averaging at 7.0 $\pm$ 1.1 μR/hr. The 95% upper confidence limit on the average was found to be 7.6 μR/hr, based on 110 measurements. The average 1-m reading is not significantly different than background, ca. 7.0 μR/hr, indicating that areas within and outside of the Marsh do not have the presence of residual amounts of radioactivity, at least not near ground surface.

A comparison of the averages indicates that the NRC guidelines have been met for the Marsh Area.

f) Marsh Area (5 cm)

Surface contact measurements were found to be essentially identical to those observed at a height of 1-meter above ground.

g) Screening Area (1m)

In the Screening Area (SA), ambient radiation exposure rates vary from 5 to 9 μR/hr, with an average of 6.0 $\pm$ 1.0 μR/hr (See Table 4-5). The 95% upper confidence limit on the average was found to be 6.5 μR/hr, based on 47 measurements. The average 1-m reading is not significant different than the background, ca. 7.0 μR/hr, indicating that surface soils in the SA do not have residual levels of radioactivity.

A comparison of the averages indicates that the NRC guideline has been met for the SA.

h) Screening Area (5 cm)

Surface scan surveys of the SA revealed exposure rates that were similar to those seen at 1m. Rates varied from 5 to 11 μR/hr and averaged at 7.3 $\pm$ 1.4 μR/hr. The 95% upper confidence limit on the average was found to be 7.4 μR/hr, based on 190 measurements.

I) Contamination Reduction Zones (1m)

For the South CRZ, ambient radiation exposure rates varied from 8 to 11 μR/hr, with an average of 8.9 $\pm$ 0.9μR/hr (see Table 4-5). The 95% upper confidence limit on the average was found to be 9.4 μR/hr, based on 12 measurements.

For the North CRZ, ambient radiation exposure rates varied from 9 to 10 μR/hr, with an average of 9.3 $\pm$ 0.4 μR/hr (see Table 4-5). The 95% upper confidence limit on the average was found to be 9.5 μR/hr, based on 11 measurements.

In both cases, the average 1-m readings were slightly higher than background, ca. 7.0 μR/hr, suggesting that ambient radiation levels in the CRZs may be influenced by residual levels of radioactivity from the adjacent excavation. However, the difference, maximum of 2.3 μR/hr, is below the NRC limit of 10 μR/hr.

j) Surface scan surveys of the South CRZ revealed exposure rates similar to the 1-meter rates. Exposure rates varied from 8 to 11 μR/hr and averaged 9.0 $\pm$ 0.6 μR/hr. The 95% upper confidence limit on the average was found to be 9.1 μR/hr, based on 40 measurements.

Surface scan surveys of the North CRZ also were similar to the 1-meter rates in the corresponding area. The exposure rates varied from 9 to 13 μR/hr and averaged 10.1 $\pm$ 1.0 μR/hr. The 95% upper confidence limit on the average was found to be 10.3 μR/hr, based on 34 measurements.

4.3.2 Results of the Analyses of Soil Samples

Table 4-6 through 4-15 give a summary of the results of soil sample analyses from the remediation areas and the Screening Area taken as part of the final survey. The first six give results of gross alpha and beta measurements and gamma spectrometric measurements. Gross alpha and beta measurements cannot be specifically related to any individual radionuclide. However, they do give a ball-park estimate of the overall concentration of radioactive material present. The gamma spectrometry measurements are sensitive to only those radionuclides which emit gamma radiation. Since two of the key radionuclides initially found at the site (U-238 and Th-232) do not emit gamma rays they are evaluated based on the gamma radiation from their daughter radionuclides, Th-234 and Ac-228 respectively.

The final four tables give results of alpha spectrometry analyses, and isotope specific analyses to measure the concentrations of strontium-90 and technetium-99 which emit neither gamma nor alpha radiation.

Cases where the background count rate was found to be higher than the sample count rate (including background) were designated as "non-detect" to avoid reporting negative values in this

section. However, the negatives were used for calculation of the averages and standard deviations appearing in the section. These negative values were preserved and appear in the tables in Appendix 4. IN these cases and whenever the measured value was lower than the maximum detectable concentration (MDC) the MDC was used in the computation of the upper 95% confidence limit on the averages.

a) Tables 4-6, 4-7, and 4-8 summarize the gross alpha and beta results and the concentrations of gamma emitting radionuclides found in soils taken from the excavation bottoms, sides, and subsoils, respectively. Results of individual analyses are given in Appendix 4. Tables A4-10, -11, and -12 contain gross alpha and beta results. Tables A4-13, -14, and -15 contain gamma spectrometry results.

Table 4-6
Concentrations of Radionuclides in Excavation Floor Soil

	Concentration (pCi/g)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	46	63	11	0.87	0.03
Minimum	10	18	1.1	non-detect	non-detect
Average	18.53	27.85	6.29	0.14	non-detect
Std. Dev.	7.17	8.84	2.34	0.21	0.04

	Concentration (pCi/g)				
Parameter	Cs-137	Eu-152	Th-234[1]	Ra-226	Ac-228[2]
Maximum	19	0.61	3.8	11	2.9
Minimum	non-detect	non-detect	0.00	0.87	0.39
Average	3.03	0.14	1.25	2.26	0.95
Std. Dev.	4.28	0.15	0.80	2.10	0.44

[1]Indicative of uranium-238
[2]Indicative of thorium-232

Table 4-7
Concentrations of Radionuclides in Excavation Sides Soil

	Concentration (pCi/g)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	56	34	9.9	0.18	0.055
Minimum	4.3	9.9	3	non-detect	0.0025
Average	17.66	23.71	5.99	0.03	0.0207
Std. Dev.	12.47	7.88	2.23	0.06	0.0186

	Concentration (pCi/g)				
Parameter	Cs-137	Eu-152	Th-234[1]	Ra-226	Ac-228[2]
Maximum	12	0.17	4.5	3.3	1.9
Minimum	0.00	non-detect	0.25	0.30	0.40
Average	1.57	0.08	1.48	1.68	0.90
Std. Dev.	3.15	0.07	1.16	0.90	0.42

[1]Indicative of uranium-238
[2]Indicative of thorium-232

Table 4-8
Concentrations of Radionuclides in Excavation Subsurface Soil

	Concentration (pCi/g)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	18.5	32	9.2	0.10	0.02
Minimum	13	19	6.1	0.00	non-detect
Average	15.38	22.73	7.02	0.05	non-detect
Std. Dev.	2.81	6.2	1.48	0.04	0.11

	Concentration (pCi/g)				
Parameter	Cs-137	Eu-152	Th-234[1]	Ra-226	Ac-228[2]
Maximum	3.3	0.11	1.10	3.3	1.10
Minimum	0.09	0.00	0.86	0.58	0.64
Average	1.09	0.08	0.99	2.10	0.91
Std. Dev.	1.51	0.05	0.13	1.13	0.20

[1]Indicative of uranium-238
[2]Indicative of thorium-232

Soil gross alpha activity results were found to range from 4.3 to 56.0 pCi/g for samples taken on the floor, sides, and subsurface locations of the excavation. Gross beta activity concentrations varied from 9.9 to 63.0 pCi/g. For the three areas, the 95% upper confidence limits on the averages of the gross alpha activity were found to be relatively constant at 20.6 pCi/g for the floor of the excavation, 23.6 pCi/g for the sides, and 18.7 pCi/g for the subsurface samples. Similarly, for beta activity the 95% upper confidence limit on the gross beta concentrations were reported to be 30.4 pCi/g for the floor of the excavation, 27.4 pCi/g for the sides, and 30.0 pCi/g for subsurface samples.

Three individual sample results from this area were found to exceed the NRC release limits for average net concentrations. One sample, taken in the bottom of the excavation from grid No. EF-28-M17D, was found to have a Cs-137 net concentration of 18.72 pCi/g - above the NRC limit of 15 pCi/g. The other two high values contained radium-226 at net concentrations of 9.2 and 5.7 pCi/g - above the NRC limit of 5 pCi/g. These concentrations were measured in samples from grids No. EF-38-O14A, and EF-34-J16C, also at the bottom of the excavation. However, these results, by themselves, do not keep the site from meeting the release criteria since neither one exceeds the NRC limit by as much as a factor of three, and because the average concentrations of these radionuclides remaining in the remediation area do not exceed the NRC limits (on the averages). The 95% upper confidence limits on the averages for these two radionuclides were 4.3 pCi/g for cesium-137 (based on 34 samples) and 2.9 pCi/g (figured without subtracting background) for Ra-226.

All other radionuclide concentrations were found to be lower than the NRC Release criteria as given in Table 2-1. For the 14 samples collected on the sides of the excavation, the highest concentrations were noted in two distinct samples, 12.0 pCi/g of Cs-137 in one, and 3.3 pCi/g of Ra-226, 1.9 pCi/g for Ac-228, and 4.5 pCi/g of Th-234 in the other. The 95% upper confidence limits on the respective averages were found to be 3.1 pCi/g for Cs-137, 2.1 pCi/g for Ra-226, 1.1 pCi/g for Ac-228, and 2.3 pCi/g for Th-234.

Similar results were obtained for the subsurface samples. All four subsurface soil samples were shown to meet NRC release criteria or to be below analytical detection limits. The highest concentrations were noted to be 3.3 pCi/g for Cs-137, 3.3 pCi/g for Ra-226, 1.1 pCi/g for Ac-228, and 1.1 pCi/g for Th-234. The 95% upper confidence limits on the respective averages were 2.8 pCi/g for Cs-137, 3.4 pCi/g for Ra-226, 1.1 pCi/g for Ac-228, and 1.2 pCi/g for Th-234.

A comparison of the results for two biased soil samples indicate that exposure rates noted at the sampling locations do not correlate well with soil radionuclide concentrations. The radionuclide concentration results for samples No. EF-47-N13C (biased high) and EF-48-L22A (biased low) are shown in Table A3-15. The associated radiation exposure rates (based on surface scans) for these samples ranged from 11 to 12 μR/hr for the low bias and from 15 to 29 μR/hr for the high bias. Of the eight radionuclides listed, the highest concentrations for the high bias sample were reported to be 0.49 pCi/g for Cs-137, 3.9 pCi/g for Ra-226, 2.1 pCi/g for Th-234, and 1.5 pCi/g for Ac-228. All other radionuclides were reported to be below analytical detection limits. For K-40, the concentration was reported to be 7.8 pCi/g. For the low bias sample, the concentrations were reported to be 0.50 pCi/g for Cs-137, 1.7 pCi/g for Ra-226, 1.2 pCi/g for Th-234, and 0.96 pCi/g for Ac-228. All other radionuclides were reported to be below analytical detection limits, while for K-40, the concentration was reported to be 7.7 pCi/g.

b) Table 4.9 gives the results of the gross alpha and beta measurements and gamma spectrometry for 16 samples of marsh area soils. Concentrations of surface samples (0" to 6") and subsurface samples (6" to 24") are combined in this table. Individual values are tabulated in Appendix 4.

Table 4-9
Concentrations of Radionuclides in Marsh Soil

	Concentration (pCi/g)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	19	28	12	0.620	0.042
Minimum	7.2	14	4.7	non-detect	non-detect
Average	14.03	21.94	8.08	0.000091	non-detect
Std. Dev.	3.36	3.96	2.34	0.0259	0.0848

	Concentration (pCi/g)				
Parameter	Cs-137	Eu-152	Th-234[1]	Ra-226	Ac-228[2]
Maximum	1.40	0.20	2.7	3.0	1.7
Minimum	0.36	non-detect	0.16	0.81	0.49
Average	0.484	0.062	1.05	1.64	0.949
Std. Dev.	0.449	0.0807	0.668	0.598	0.295

[1]Indicative of uranium-238
[2]Indicative of thorium-232

Soil gross alpha activity concentrations were shown to vary from 7.2 to 19 pCi/g for the 16 samples from the marsh area, with no discernable differences between samples taken at the surface (upper 6 inches) and those taken at greater depths (6 to 24 inches). Beta activity results ranged from 14 to 28 pCi/g. The 95% upper confidence limit on the average gross alpha activity was found to be 15.5 pCi/g. For gross beta activity the 95% upper confidence limit was found to be 23.7 pCi/g. The results of individual analyses of marsh area soil are contained in Appendix 4. Gross alpha and beta results are in Table A4-16, and gamma spectrometry results are in Table A4-17.

All gamma spectrometry results were found to meet NRC release criteria or were below analytical detection limits. The highest concentrations were 1.4 pCi/g for Cs-137, 3.0 pCi/g for Ra-226, and 2.7 pCi/g for Th-234. The 95% upper confidence limits on the respective averages were 0.68 pCi/g for Cs-137, 1.9 pCi/g for Ra-226, and 1.9 pCi/g for Th-234.

These results are similar to those obtained from samples collected in October 23, 1995. Gamma spectroscopy analyses were conducted on 30 subsurface soil samples, collected within a depth of 6 - 24 inches. The analyses were reported by Pace, Inc. on November 7, 1995 (see Attachment 11, Volume 3). The results indicates that Co-60 and Th-234 were found to be below analytical detection limits, ranging from 0.026 to 0.35 pCi/g for Co-60 and 2.7 to 13 pCi/g for Th-234 (U-238). For Th-232, the presence of Pb-212 or Ac-228 was reported to range from 0.42 to 5.0 pCi/g. The concentrations of Cs-137 and Ra-226 were noted to be less 1.6 and 1.4 pCi/g, respectively. These results were also found to be consistent with surface soils samples collected by Weston in 1994 (Attachment 2, Volume 2).

c) Table 4.10 gives the gross alpha and gross beta measurements and gamma spectrometry results of Screening Area soils.

Table 4-10
Concentrations of Radionuclides in Screening Area Soil

	Concentration (pCi/g)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	10	24	3.5	0.14	0.03
Minimum	non-detect	non-detect	0.71	non-detect	non-detect
Average	3.45	9.58	2.14	0.05	non-detect
Std. Dev.	3.68	10.32	1.23	0.05	0.02

	Concentration (pCi/g)				
Parameter	Cs-137	Eu-152	Th-234[1]	Ra-226	Ac-228[2]
Maximum	6.5	0.14	2.0	1.3	0.69
Minimum	0.0	non-detect	0.07	0.33	0.20
Average	1.56	0.06	0.53	0.61	0.41
Std. Dev.	2.37	0.06	0.67	0.38	0.19

[1]Indicative of uranium-238
[2]Indicative of thorium-232

Soil gross alpha activity concentrations were shown to vary from 8.3 to 10 pCi/g for the seven samples taken in the SA with an average of 3.5 $\pm$ 3.7 pCi/g. Beta activity results range from non-detectable to 24 pCi/g with an average of 9.6 $\pm$ 10.32 pCi/g. The 95% upper confidence limits on the gross alpha and beta concentrations were found to be 6.2 and 17.2 pCi/g respectively. The results of individual analyses of SA soils are contained in Appendix 4. Gross alpha and beta results are given in Table A8-18, and gamma spectrometry results are found in Table A4-19.

All of the analytical results were found to meet NRC release criteria or were below analytical detection limits. The highest concentrations were 2.0 pCi/g for Th-234 and 6.5 pCi/g for Cs-137. The 95% upper confidence limits on the respective averages were found to be 1.3 pCi/g for Th-234 and 3.3 pCi/g for Cs-137.

d) Table 4.11 summarizes the results of gross alpha and beta measurements and gamma spectrometry results for four sediments samples were taken at the bottom of the submerged areas of the excavation.

Table 4-11
Concentrations of Radionuclides in Excavation Sediment

	Concentration (pCi/g)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	18.9	31	7.88	0.21	0.03
Minimum	13	20.9	5.1	0.13	non-detect
Average	15.73	25.98	6.42	0.17	non-detect
Std. Dev.	2.71	4.43	1.29	0.04	0.09

	Concentration (pCi/g)				
Parameter	Cs-137	Eu-152	Th-234[1]	Ra-226	Ac-228[2]
Maximum	8.4	0.17	2.2	2.5	1.1
Minimum	non-detect	non-detect	0.57	1.3	0.61
Average	3.71	0.05	1.14	1.71	0.84
Std. Dev.	3.16	0.09	0.72	0.56	0.23

[1]Indicative of uranium-238
[2]Indicative of thorium-232

The gross alpha and beta activity results are shown in Table 4-11. The gross alpha activity results varied from 13 to 18.9 pCi/g and from 20.9 to 31 pCi/g for beta activity. The 95% upper confidence limits on the average gross alpha and beta activities were found to be 18.9 and 31.2 pCi/g respectively. Appendix 4 gives the results of individual gross alpha and beta analyses in Table A4-26. Gamma spectrometry results are given in Table A4-27.

A review of the data indicates that all results meet NRC release criteria or were below analytical detection limits. The highest radionuclide concentrations were reported to be 8.4 pCi/g for Cs-137, 2.5 pCi/g for Ra-226, 1.1 pCi/g for Ac-228, and 2.6 pCi/g for Th-234.

The 95% upper confidence limits on the respective averages were found to be 7.4 pCi/g for Cs-137, 2.4 pCi/g for Ra-226, 1.1 pCi/g for Ac-228, and 2.3 pCi/g for Th-234.

e) Tables 4.12 through 4.15 give the results of alpha spectrometry and isotopic specific analyses for strontium-90 and technetium-99 of soil samples taken from the excavation bottoms and sides, and from the marsh area. The results of these analyses are given for individual samples in Appendix 4, Table A4-28.

Table 4-12
Concentrations of Radionuclides in Excavation Floor Soil

	Concentration (pCi/g)				
Parameter	U-234	U-235	U-238	Ra-224	Ra-226
Maximum	2.93	.184	2.98	7.75	7.25
Minimum	1.11	.0452	.949	non-detect	.0266
Average	2.08	.112	1.89	3.96	2.77
Std. Dev.	0 784	.0507	.723	2.84	2.76

	Concentration (pCi/g)				
Parameter	Th-228	Th-230	Th-232	Sr-90	Tc-99
Maximum	2.84	2.54	2.29	0.92	0.220
Minimum	.522	.42	.0677	0.021	0.018
Average	1.29	1.11	.916	0.354	0.0094
Std. Dev.	.908	.834	.838	0.493	0.110

The 95% upper confidence limits on the averages of the alpha spectrometry analyses of six soil samples taken from the floor of the excavations are the following: U-238, 2.49 pCi/g; Ra-226, 5.0 pCi/g; and Th-232, 1.61 pCi/g. The comparable limits on the averages for the other radionuclides were Ra-224, 6.26 pCi/g; Th-228, 2.04 pCi/g; Th-230, 1.79 pCi/g; U-234, 2.72 pCi/g; and U-235, 0.154 pCi/g. The presence of Sr-90 and Tc-99 were reported to be 1.17 and 0.275 pCi/g, respectively, based on 95% upper confidence limits for three samples. The obvious difference between the averages shown in Table 4.12 and the 95% upper confidence limits on the averages is due to substantial variation between samples.

Table 4-13
Concentrations of Radionuclides in Excavation Sides Soil

	Concentration (pCi/g)				
Parameter	U-234	U-235	U-238	Ra-224	Ra-226
Maximum	2.4	.239	2.19	5.91	2.80
Minimum	1.16	.112	.388	3.29	2.72
Average	1.78	.176	1.29	4.60	2.76
Std. Dev.	.877	.0898	1.27	1.85	.566

	Concentration (pCi/g)				
Parameter	Th-228	Th-230	Th-232	Sr-90	Tc-99
Maximum	2.31	2.25	2.05	0.260	0.130
Minimum	0.698	.469	.494	0.220	non-detect
Average	1.50	1.36	1.27	0.240	0.025
Std. Dev.	.114	1.26	1.1	0.283	0.148

The 95% upper confidence limits on the averages of the alpha spectrometry results are U-238, 6.98 pCi/g; Ra-226, 3.0 pCi/g; and Th-232, 6.18 pCi/g. The upper confidence limits on the average concentrations for the other alpha emitting radionuclides were Ra-224, 12.9 pCi/g; Th-228, 6.59 pCi/g; Th-230, 6.98 pCi/g; U-234, 5.69 pCi/g; and U-235, 0.576 pCi/g. Again, the large difference between the averages listed in the table and these upper confidence limits is due to significant variation between measurements and the small number of samples analyzed; i.e., two.

The 95% upper confidence limit on the aveage concentrations of Sr-90 and Tc-99 were found to be 0.366 and 0.364 pCi/g, respectively, based on two samples.

Table 4-14
Concentrations of Radionuclides in Marsh Soil

	Concentration (pCi/g)				
Parameter	U-234	U-235	U-238	Ra-224	Ra-226
Maximum	1.03	.0554	1.15	2.16	1.18
Minimum	.873	.0330	.890	0.441	.107
Average	.952	.0442	1.02	1.30	.644
Std. Dev.	.111	.0158	.184	1.22	.759

	Concentration (pCi/g)				
Parameter	Th-228	Th-230	Th-232	Sr-90	Tc-99
Maximum	1.65	6.76	1.48	0.16	0.57
Minimum	1.60	2.04	1.47		
Average	1.63	4.40	1.48		
Std. Dev.	.0354	3.34	.00707		

The 95% upper confidence limits on the averages of the alpha spectrometry analyses made on samples of the marsh area soil were found to be U-238, 1.84 pCi/g; Ra-226, 3.84 pCi/g; and Th-232, 1.51 pCi/g. The upper confidence limits on the averages of the other alpha emitting radionuclides were found to be Ra-224, 6.73 pCi/g; Th-228, 1.78 pCi/g; Th-230, 19.3 pCi/g; U-234, 1.45 pCi/g; and U-235, 0.115 pCi/g. The large variation between the averages listed in the table and the upper confidence limits is due to variation between samples and the low number of samples; i.e., two.

Table 4-15
Concentrations of Radionuclides in
Excavation Subsurface Soil and Sediment

	Concentration (pCi/g)				
Sample ID	U-234	U-235	U-238	Ra-224	Ra-226
EF-04-N14A	1.63	.124	1.47	2.03	2.59
EF-02-M18B	1.64	.0839	1.83	5.65	2.44

	Concentration (pCi/g)				
Sample ID	Th-228	Th-230	Th-232	Sr-90	Tc-99
EF-04-N14A	1.20	1.02	1.01	0.30	0.25
EF-02-M18B	1.20	0.994	1.01	0.37	0.11

The highest U-238, U-234, and U-235 concentrations measured by alpha spectrometry were found to be 1.83 pCi/g, 1.64 pCi/g, 0.124 pCi/g, respectively. The Ra-224 and Ra-226 soil concentrations were noted to be somewhat higher, at 5.65 and 2.59 pCi/g, respectively. For the three isotopes of thorium soil concentrations were reported to vary between 1.0 and 1.20 pCi/g.

4.3.3 Water Sample Results

Tables 4-16 through 4-18 summarize the results of the water sampling program. Seven samples were taken from standing water in the excavation and three samples were taken after rains when water was flowing out of the excavation. The results of each individual sample analysis are given in Appendix 4. Tables A4-20 and -23 give the gross alpha and beta results. Gamma spectrometry results are given in Tables A4-21, -22, -24 and -25. Individual alpha spectrometry results are in Appendix 4, Table A4-28.

Table 4-16
Concentrations of Radionuclides in Standing Water (unfiltered)

	Concentration (10^{-8} μCi/mL)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	1300	1300	48	3.2	0.33
Minimum	26	89	3.7	non-detect	non-detect
Average	432.3	604.1	19.8	0.801	non-detect
Std. Dev.	459	506	17.3	1.31	1.82

	Concentration (10^{-8} μCi/mL)				
Parameter	Cs-137	Eu-152	Th-234	Ra-226	Ac-228
Maximum	16	8.6	57	180	12
Minimum	non-detect	non-detect	non-detect	7.5	0.21
Average	4.72	0.764	20.1	46.2	5.5
Std. Dev.	6.79	4.27	27.4	60.4	5.52

Table 4-17
Concentrations of Radionuclides in Standing Water (filtered)

	Concentration (10^{-8} μCi/mL)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	590	700	63	9.2	1.1
Minimum	7.2	43	2.3	non-detect	non-detect
Average	140	203.9	23.2	1.35	non-detect
Std. Dev.	207.2	232.8	21.9	3.51	1.37

	Concentration (10^{-8} μCi/mL)				
Parameter	Cs-137	Eu-152	Th-234	Ra-226	Ac-228
Maximum	5.8	19	370	41	12
Minimum	non-detect	non-detect	8.9	6.7	0.09
Average	1.05	3.04	62.5	21.5	3.98
Std. Dev.	2.16	7.18	136	12.90	4.75

a) Standing water

For standing water found in the bottom of the excavation, gross alpha and beta activity results for unfiltered and filtered water samples are shown in Table 4.16 and 4.17, respectively, for seven samples. Elevated amounts of suspended solids (456 to 3,781 mg/L) have introduced some uncertainty in interpreting alpha activity results. The gross beta activity results are believed to be more reliable, as beta activity measurements are less susceptible to the presence of suspended solids. The gross beta activity results vary from 4.3 to 130 pCi/L and from 0.72 to 130 pCi/L for alpha activity. In contrast to the other data set, the gross alpha and beta activity results are lower for the filtered water samples.

The highly variable and inconsistent results are due to high amounts of suspended and dissolved solids, which required the lab to prepare smaller sample volumes so as to not exceed mass-loading limits established by laboratory procedures. In turn, the smaller sample volumes resulted in comparably higher reported MDC values, in contrast to samples with lesser amounts of suspended and dissolved solids. As a consequence, the results presented here primarily reflect the variability introduced by these limitations.

The corresponding gamma spectrometry analyses are also summarized in Tables 4-16 and 4-17. A review of the data and comparisons with individual results in Appendix 4 indicates that except for Co-60, Ra-226, and Th-234, all results are below analytical detection limits. For these radionuclides, the concentrations were noted to be just above the analytical detection limits. The results are 9.2E-08 μCi/L for Co-60, 3.7E-06 μCi/mL for Th-234, and 2.8E-07 μCi/mL for Ra-226 (for three filtered samples) and 3.1E-07 μCi/mL for Th-234, and 1.8E-06 and 3.9E-07 μCi/mL for Ra-226, also for three but different unfiltered samples.

Table 4-18
Concentrations of Radionuclides in Surface Runoff (unfiltered)

	Concentration (10^{-8} μCi/mL)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	32	300	26	0.26	non-detect
Minimum	2	170	2.9	0.15	non-detect
Average	15.3	230	12.9	0.203	non-detect
Std. Dev.	15.3	65.6	11.9	0.06	0.03

	Concentration ($10^{-8}\mu$Ci/mL)				
Parameter	Cs-137	Eu-152	Th-234	Ra-226	Ac-228
Maximum	0.25	0.63	19	17	1.40
Minimum	non-detect	non-detect	non-detect	12	non-detect
Average	non-detect	non-detect	6.86	15	0.517
Std. Dev.	0.333	0.662	10.7	2.65	0.787

Table 4-19
Concentrations of Radionuclides in Surface Runoff (filtered)

	Concentration (10^{-8} μCi/mL)				
Parameter	Gross alpha	Gross beta	K-40	Co-60	Ba-133
Maximum	18	610	8.2	0.22	0.02
Minimum	6.8	260	3.2	non-detect	non-detect
Average	11.2	453.3	5.37	non-detect	non-detect
Std. Dev.	6	177.9	2.57	0.29	4.63

	Concentration (10^{-8} μCi/mL)				
Parameter	Cs-137	Eu-152	Th-234	Ra-226	Ac-228[2]
Maximum	0.14	0.04	50	22	0.71
Minimum	non-detect	non-detect	3.40	4.2	non-detect
Average	non-detect	non-detect	31.1	11.8	0.129
Std. Dev.	0.411	0.832	24.5	9.17	0.511

b) Surface Water Runoff

Gross alpha and beta activity results for filtered and non-filtered water samples are shown in Tables 4.18 and 4.19 for three samples. Because of the varying amounts of suspended solids (117 to 315 mg/L) and insufficient sample volumes, the alpha and beta activity results were found to be internally inconsistent. However, beta activity results are believed to be more reliable than those for alpha activity, as beta activity measurements are less susceptible to the presence of suspended solids. As can be seen from these tables, beta activity results are higher for the filtered samples, as compared to non-filtered ones. The gross beta activity results vary from 17.0 to 61.0 pCi/L and from 0.2 to 3.2 pCi/L for alpha activity.

The inconsistent results are due to high amounts of suspended and dissolved solids which required the lab to prepare smaller sample volumes in order to meet mass-loading limits established by their procedures. In turn, the smaller sample size volumes resulted in comparably higher reported MPC values, as compared to samples with lesser amounts of solids. As a consequence, the results presented here primarily reflect the variability introduced by these limitations. As can be noted from Appendix 4 the comparison of water sample analyses must be based on the reported MDCs since sample results were at times below the respective MDCs.

The corresponding gamma spectroscopy analyses are also given in Tables 4-18 and 4-19. A review of the data and corresponding individual values indicates that, except for Th-234, all results are below analytical detection limits, typically <1.4E-08 μCi/mL for Co-60, <1.1E-08 μCi/mL for Cs-137, <2.3E-07 μCi/mL for Ra-226, and <4.0E-08 μCi/mL for Ac-228. For Th-234, the concentrations were noted to be just above the analytical detection limits, reported to be <1.9E-07 (non-filtered sample) and <4.0 E-07 and <5.0E-07 μCi/mL for two filtered samples.

These results are similar to those obtained from nine prior samples taken between July 25 and November 17, 1995. Using the highest laboratory results, the following concentrations were reported: Co-60, <9.1E-09 μCi/mL; Cs-137, <1.6E-07 μCi/mL; Ra-226 (Pb-214

or Bi-214), <6.5E-8 μCi/mL; Th-232 (Ac-228), <3.2E-08 μCi/mL; and U-238 (Th-234), <9.0E-08 μCi/mL. The results are included in Attachment 12, Volume 3.

c) Special water analyses

Table 4-20 presents the results of the alpha spectrometry and special analyses of two water samples, one of standing water, and the other of site runoff.

Table 4-20
Concentrations of Radionuclides in Standing and Runoff Water

	Concentration (10^{-8} μCi/mL)				
Sample ID	U-234	U-235	U-238	Ra-224	Ra-226
H2O-96-02-20-1 Runoff	0.19	0.01	0.05	0.20	0.04
SW-0496-EF-07-N14A St'd Water	0.407	0.02	0.233	0.00	0.00

	Concentration (pCi/g)				
Sample ID	Th-228	Th-230	Th-232	Sr-90	Tc-99
H2O-96-02-20-1 Runoff	0.03	0.03	0.04	non-detect	1.2
SW-0496-EF-07-N14A St'd Water	0.03	0.07	0.005	0.00	9.4

The data in the preceding table gives a single result of an alpha spectrometric analysis of standing water. The following concentrations were noted U-238, 4.65E-09 μCi/mL; Ra-226, 3.90E-10 μCi/mL; and 3.83E-10 μCi/mL for Th-232. For the remaining isotopes, the concentrations were noted to range from 1.35E-10 to 4.07E-09 μCi/mL; the isotopes include U-234, U-235, Ra-224, Th-228, and Th-230.

The results of the single sample of runoff water analyzed by alpha spectrometry also appear in this table. The following concentrations were noted U-238, 4.65E-10 μCi/mL;

Ra-226, 3.90E-10 μCi/mL; and 3.83E-10 μCi/mL for Th-232. For the remaining isotopes, the concentrations were noted to range from 1.35E-10 to 4.07E-09 μCi/mL; the isotopes include U-234, U-235, Ra-228, Th-228, and Th-230.

The presence of Sr-90 was reported to be at analytical detection limits ($\leq$1.8E-08 μCi/mL) based on the results of two samples; and the concentration of Tc-99 was found to be less than 9.4E-08 μCi/mL.

In addition to the special analyses reported in Table 4-20 six samples were analyzed for tritium. Tritium was found to be just above analytical detection limits, varying from 2.15E-07 to 3.15E-07 μCi/mL.

D. Significance of Water Samples

The water sample results shown in Tables 4.16 through 4.19 had very limited sensitivity because of the high concentrations of suspended and dissolved solids present in the samples. For example, the minimum detectable concentration for radium in water ranged between 17E-8 and 97E-8 μCi/mL. In comparison, the maximum effluent concentration allowed according to the NRC (10 CFR 20 Appendix B) is 6E-8. Since the sensitivities were often larger than the applicable limit the data is of little value. Nevertheless it is included for completeness.

The negative impact caused by the presence of suspended and dissolved solids can be seen when the alpha and gamma spectrometry results are compared for the one sample analyzed using both techniques; i.e., SW-0496-EF-07-N14A. The comparison is shown in the Table 4.21.

Table 4-21
Sensitivities for Alpha and Gamma Spectrometric Analyses of Standing Water

Radionuclide	Concentration in Water (10^{-8})	
Parent/daughter	Alpha Spectrometry	Gamma Spectrometry
U-238/Th234	0.233 $\pm$0.0337	370 $\pm$990
Th-232/Ac-228	0.272 $\pm$0.0151	12 $\pm$13

4.4 Quality Assurance

The following presents a summary of quality assurance and control measures implemented during the conduct of the final surveys, sampling activities, and as part of laboratory analyses.

4.4.1 Field Surveys

Duplicate radiation readings were obtained in 10% of the field measurements in support of the final radiation surveys. Duplicate measurements were made in the excavation, Screening Area, excavation perimeter, and both CRZs. The survey measurements were observed by Project QA/QC staff and their observations were recorded in field audit checklists (see Attachment 14, Volume 3).

A total of 114 such measurements were made and compared against their initial readings. Table A4-29 (Appendix 4) presents the paired measurements by area and also provides the following comparisons, ratio of the initial and duplicate measurement and relative error, for both individual measurements and aggregates by area. On average, relative errors were noted to range from -3.3% to +5.3%, over all areas. The most variability was associated with surface measurements, which is indicative of the influence of hot spots and difficulty in obtaining reproducible readings. Using a $\pm$20% as an acceptable threshold for variability, three measurements out of the 114 (or 2.6%) were noted to fall out this range. They were two readings for surface scans made in the excavation (grids No. O-14, -24% and M-12, -30.8%) and one for a perimeter 1-m ambient exposure rate reading in grid No. G-7 (+22.2%).

4.4.2 Laboratory Analysis

Duplicate soil and water samples were collected and sent for analysis. In total, 159 analytical results were provided for QA/QC purposes using 30 soil and water samples. Sampling collection activities were observed by Project QA/QC staff and their observations were recorded in field audit checklists (see Attachment 14, Volume 3). All samples shipped to the laboratories have been accounted for. In one instance, the glass jar of a single soil sample was found broken on receipt. However, the soil sample was recovered since the jar had been placed in a ziplock bag. The sample was No. SS-0496-ES-17-N12F, collected on April 3 and shipped on April 16, 1996. In a few other instances, the laboratories reported that the agreed upon detection limits could not be achieved because of insufficient sample volume. The laboratories reported such instances in case narratives for the appropriate sample batch, when needed. For water samples, the analyses, at times, were compromised by the presence of suspended solids found at relatively high concentrations. In such instances, the samples were filtered and the laboratories reported two set of data, unfiltered and filtered.

Tables A4-30 to A4-33 in Appendix 4 present analyses of paired laboratory results by sample codes and between two laboratories, along with the following comparisons, ratio of the initial and duplicate measurement and relative error, for individual measurements and in the aggregate. Overall, relative errors were noted to vary widely, by a factor of -11 to +17, over all samples. The most variability was associated with gamma spectroscopic analyses and the least with gross alpha and beta activity measurements. The variations are attributed to the heterogeneous distribution of the radioactivity in soil samples. On average, the variations have been +16.1% for gross alpha activity, -7.0% for gross beta activity, and +23.1% for gamma spectrometry results.

5.0 SUMMARY AND DISCUSSION

5.1 Summary

The results of the final radiation survey (summarized in the tables in Section 4) meet the survey objectives (set forth in Section 3). This can be shown by assessing the data using the three step approach identified in Section 3.1 for demonstrating completion of the survey objectives.

Step 1a: to demonstrate that the average exposure rate at 1-m above the ground in each 10m by 10m area is less than 10 μR/hr above background...

Assessment: The average background exposure rate is given in Section 4.1.1 as 6.8 μR/hr. The highest 1m exposure rate measured during the final radiation survey appears in Table 4.5 as 15 μR/hr. Since 15 is less than the background plus 10 μR/hr; i.e., 16.8 μR/hr, all radiation exposure rate measurements at 1m were found to meet this release criterion.

Step 1b: ... and that nowhere on the site is the exposure rate (including background) is greater than 30 μR/hr.

Assessment: The highest surface (5 cm) exposure rate measured during the final radiation survey appears in Table 4.5 as 22 μR/hr. Therefore, all of the 5 cm exposure rate measurements were found to meet this release criterion.

Step 2: to demonstrate that the average net concentration of each radioactive material in soil in each 10m by 10m area is lower than the corresponding release criterion listed in Table 2-1.

Assessment: Table 5-1, which has also been reproduced as Table ES-1 gives the average concentrations of radionuclides found in each of the areas assessed as part of the final radiation survey. Net concentrations are found by subtracting the corresponding background concentration (Column #3) from the measured concentration for any radionuclide. (For example, the net concentration of radium-226 on the excavation floor is 2.9-1.8 or 1.1 pCi/g.) All of the average net concentrations determined this way were found to be less than the corresponding values in Table 2-1. Therefore. all of the average net concentrations were found to meet this criterion. Furthermore, when the radionuclides are considered together using the "Rule of Fractions", the ratios (average concentration/limiting concentration) for each radionuclide when added sum to a value that is less than 1.0 for each of the six areas surveyed. This gives added assurance that the potential for the exposure of persons in the future will be a small fraction of the amount of radiation received by those persons from natural sources.

Step 3: to demonstrate that the maximum net concentration of each radioactive material in soil samples is lower than three times the corresponding release criterion listed in Table 2-1.

Assessment: Three measurements of individual samples were found to have net concentrations of one nuclide that was greater than the corresponding limit on the average given in Table 2-1. These are discussed in Section 4.3.2.a. The gross concentrations were reported as 19 pCi/g Cs-137, and 11, and 7.5 pCi/g Ra-226. The corresponding net concentrations are 18.72 pCi/g Cs-137, and 9.2, and 5.7 pCi/g Ra-226. None of these values is more than three times the limiting concentration given in Table 2-1. Therefore, all of the individual concentrations were found to meet this criterion.

5.2 Discussion

The remediation of the 26th Street disposal area and the adjacent marsh has been successful in removing the waste and radioactive materials such that the residual radioactive material meets the prerequisite established for the release of the site from further radiological controls. This does not mean that all radioactivity has been removed. A review of Table 5-1, for example, readily shows that there are some residual radioactive materials present in "greater-than-background" concentrations. Furthermore, there are of necessity some areas of the soil that are above the averages and not every handful of soil was sampled, especially soil that was not on the surface. Consequently, it may be possible to find some soil with still higher concentrations.

However, the possibility of finding higher levels of contamination is not likely, and the consequences are small. First, an extensive survey was conducted which included the scanning of all of the surfaces of the remediated areas. If there were large amounts of gamma emitting materials they would have been seen. Large amounts of non-gamma emitting radionuclides would not be expected either since sampling did not ever indicate the presence of disproportionately large amounts of non-gamma emitting radionuclides. Since they did not show up in the samples, they should not be expected elsewhere. Nor should there be significant amounts of hidden radionuclides. The average concentrations of radionuclides in the excavation subsurface soil were found to be lower than the corresponding averages at the excavation surface; i.e., the averages in Table 4.8 (excavation subsurface) are all less than those in Table 4.6 (excavation surface) except for K-40 which is not an issue. Finally, the potential dose that a person could receive is small because there are no credible scenarios which would place a person in a position to be at the precise location where a postulated high concentration of radioactive material remained, or to remain there long enough to get a significant dose, either by direct exposure, by inhaling enough dirt containing dilute radioactive materials that might be suspended by the wind, or by ingesting enough of the dirt.

To summarize, no further radiological controls of the site are justified, since the survey shows that the site meets the release criteria, and that any hot spots of radioactivity that might have been missed must be small, infrequent, and unlikely to cause any significant exposure to personnel.

Table 5-1
Summary Tabulation of Soil Radionuclide Concentrations and Ambient Radiation Exposure Rates#

Nuclide or Exp. Rate	Limit pCi/g or μR/hr*	Backgrnd	Excav. Floor	Excav. Side/ Perimeter	Excav. Sub-Surface	Excav. Sediment	Screening Area	Marsh Area
K-40	21	8.1	7.0	7.0	8.8	7.9	3.0	9.2
Co-60	8	---@	0.26	0.095	0.098	0.21	0.1	0.078
Sr-90	5	0.082	1.2	0.37	0.37	0.30	---	0.077
Ba-133	16	---	0.084	0.083	0.092	0.11	0.07	0.078
Cs-137	15	0.28	4.3	3.1	2.9	7.4	3.3	0.68
Eu-152	6	---	0.38	0.38	0.4	0.39	0.33	0.36
Th-234	10/35[a]	2.2	1.9	2.3	1.2	2.3	1.3	2.0
Ra-226	5/15[a]	1.8	2.9	2.1	3.4	2.4	1.0	1.9
Ac-228	5/15[a]	1.2	1.1	1.1	1.1	1.1	0.55	1.1
Gross β	---[b]	22	30	27	30	31	18	24
Gross α	---[b]	12	21	24	19	19	7	16
Exposr. Rate - μR/hr	10	7.0	10.4	7.5	---	---	6.5	8.1

\# All averages are quoted at the 95% upper confidence limit and include contributions from naturally occurring background radiation or radioactivity levels. All results are given in pCi/g - dry, except for exposure rates, which are expressed in μR/hr at 1-m above ground.

* U.S. Nuclear Regulatory Commission limits, based on Table 2-1, Sect. 2.0.

@ Data not applicable, not determined, or not assigned.

a Values for the top 15 cm of soil and soil at lower levels respectively

b No limits exist for gross alpha and beta concentrations in soil

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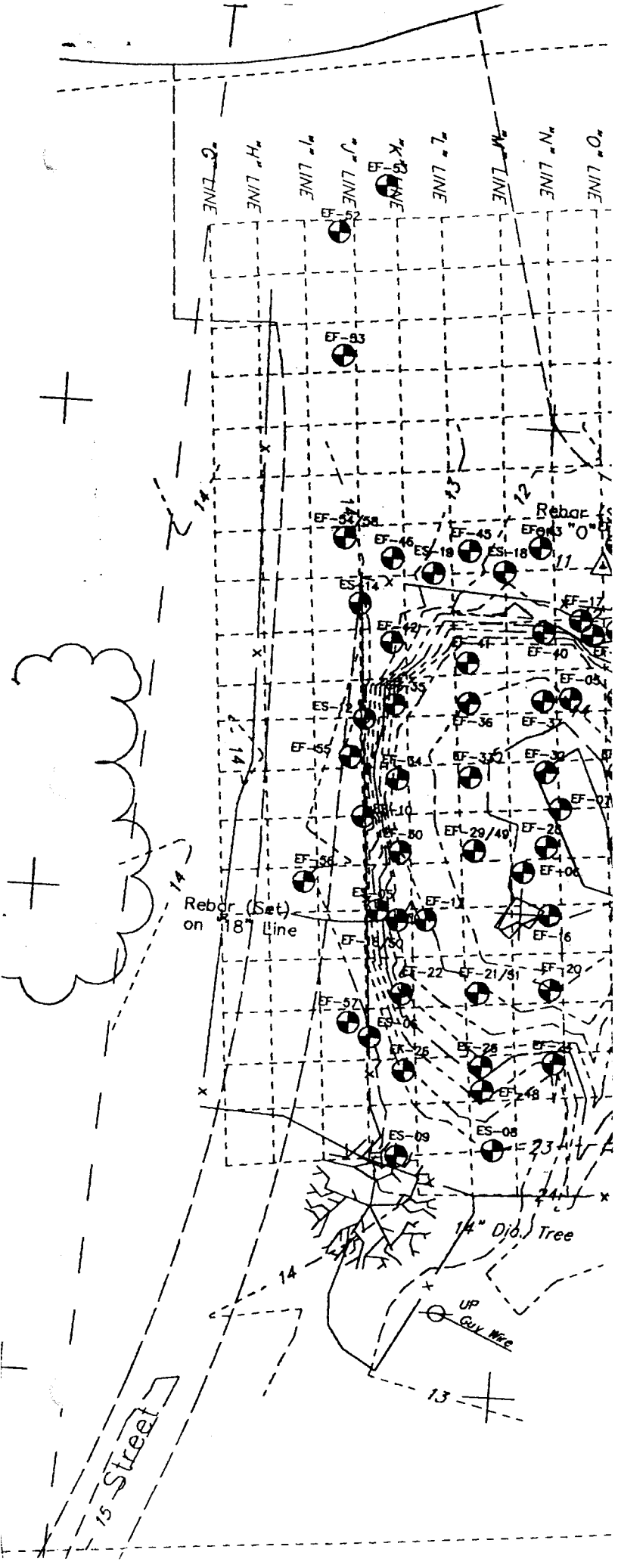

APERTURE CARD

Also Available on Aperture Card

N

NOTES

1. Hoizonal Datum WGS 84 in US Feet
2. Vertical Datum Mean Sea Level
   BENCHMARK
   Concrete Monument 11-1
   Elevation=16.57'
3. Basis of Bearing Grid

LEDGEND

Excavated Area in Marsh Area	
Sample Points	
Benchmark	
Concrete Monument	
PK Nail	
Well	
Utility Pole	
Treeline	
Traverse Line	
Fence	
Edge Pave	
Edge Stone	
Test Area	

BASE MAP ADAPTED FROM SURVEY BY RETTEW ASSOCIATES, INC. DRAWING NO. 951564-01 SH. 1 OF 1, DATED 4/16/96.

9809140323-1

EXHIBIT 1
EXISTING CONDITION SURVEY

26th STREET DISPOSAL SITE
ABERDEEN PROVING GROUND, MARYLAND.
EDGEWOOD AREA

DELIVERY ORDER NO. 0001
26th STREET DISPOSAL SITE
CONTRACT NO. DACA 31-94-D-0020

FOSTER WHEELER ENVIRONMENTAL CORPORATION
LIVINGSTON, NEW JERSEY

DEPT	DESIGNED	PREPARED	CHEKED	APPROVED	DATE
CE		JR			

SCALE:	DRAWING NUMBER:	SH. OF	REV
1"=30'-0"			

APPENDIX 1

PROJECT WASTES

A1.1 Waste excavated in 1995-1996

The waste excavated in 1995 and 1996 was placed in bags (1 cubic yard super sacks, UV treated woven polypropylene) with plastic inner liners (3 mils thick), metal boxes - B-12 (44 cubic feet) and B-25 (88 cubic feet), and steel drums. The waste consists of soils, rubble, wood, scrap metals, and burnt face mask charcoal canisters.

Military ordnance (UXO) were segregated and stored in separate containers and their disposition has been arranged by the appropriate military branch.

Tables A1-1 and A1-2 present summary descriptions of the waste, excluding UXO. Table A1-1 presents a breakdown of volumes, weights, and radiation levels by types of waste forms. Table A1-2 presents a breakdown by weight (lbs), distribution (%), and radiation levels over all waste forms. In Table A1-2, the radiation levels are ranked from lowest to highest, based on exposure rates measured on the surface of containers. Attachment 6, Volume 2 presents an inventory of the waste held at the Rad Storage Yard for interim storage during the project. Using nominal bag or box capacities, the total disposal volume is estimated to be 611 cubic yards (16,497 ft^3 or 467 m^3).

The total weight of all radiological waste (excavated from 1994-1996) contained in bags and B-12/B-25 boxes is about 1,280,000 pounds (640 tons), based on total gross weights, including the weight of the metal containers or bags. The weight of material excavated in 1995 and 1996 is approximately 790,000 pounds. The weights of an empty bag and B-12/B-25 metal box are 5 lbs and 373 lbs/763 lbs, respectively. On average, bags and boxes are filled to about 90% of capacity. The nominal density of the waste varies, about 1,400 lbs/yd^3 for soils held in bags and 19 to 62 lbs/ft^3 for all other waste held in boxes.

Other types of waste held in storage include contaminated personnel protective equipment and materials and equipment used to support project activities and operations. The associated waste volume is estimated to be about 8 cubic yards (1,100 ft^3 or 31 m^3). The weight of these waste contained in bags and boxes is estimated to be about 1,100 pounds.

Radiation exposure rates from bags and boxes were noted to vary from non-discernable levels above ambient background (ca. 5 to 12 μR/hr) to as high as 113 μR/hr, based on surface measurements. Most of the waste (about 99.7% by weight or 789,000 lbs) is characterized by radiation exposure rates under 50 μR/hr, with a corresponding nominal volume of about 609 cubic yards (16,447 ft^3 or 466 m^3).

The waste characterized by higher radiation levels, up to 7,800 μR/hr, is limited to small amounts or volumes. This waste is currently stored in one 55-gallon drum. Such items include small metallic objects, non-descript parts, wire filaments, parts of drums or metal containers, trash, and

small amounts of soils (solid and loose) and rocks. Table A1-3 presents a summary description of such wastes and Table A1-4 presents a radiological characterizations of the major radionuclides (see Attachment 6, Volume 2). A review of Table A1-4 indicates that the waste excavated during this phase of the removal action has similar radiological characteristics (i.e., radionuclide distributions and concentrations) as compared to the waste generated by Weston in 1994. Removable surface contamination levels on the outside of the bags, boxes, and drums are typically < 10 dpm/100 cm^2 for alpha activity and < 100 dpm/100 cm^2 for beta activity.

Table A1-1
Summary Description of Waste Generated in 1995-1996*

Waste Forms	Nominal Disposal Vol. (yd^3)	Actual Weight (lbs)	No. and Type of Container	Typical Surface Radiation Levels Range - μR/hr
Soil/Mulch	376	524,714	376 bags&	7 - 113
Metals	122	168,118	61 boxes#	7 - 50
Wood/other+	54	27,591	27 "	7 - 40
Canisters	24	31,830	12 "	< 14
Concrete/Stone	8	13,984	4 "	< 14
Liner/Plastics	4	2,253	2 "	< 14
Concrete/Rubble/ Wood	10	16,660	3	< 7
Metal	4	5,090	1	<7
PPE	8	1,100	(24 temp. boxes@)	< 7
Total	611	791,340	487	--

* Extracted from data presented in Attachment 6, Volume 2.
& Super sack, 1 cubic yard nominal capacity. Nominal density, 1,400 lbs/yd^3 for soils. Note: 40 1yd^3 bags were placed in 10 B-25 containers due to their mixed waste characteristics.
\# Metal box, B-12, 44 ft^3, nominal capacity B-25, 88ft^3 nominal capacity. Nominal density, 19 to 62 lbs/ft^3, for all other waste forms.
@ Temporarily packaged in plastic bags and stored in 4' x 4' x 4' wooden boxes. Weight is estimated. Number of boxes not included in total.
\+ As a category "Other" includes small amounts of plastics, liners, etc.

Table A1-2
Summary Breakdown of Waste Volume and Surface Radiation Exposure Rates for Waste Generated in 1995-1996*

Waste Forms@	Weight (lbs)	Distribution (%)	No. and Type of Container	Typical Surface Radiation Levels Range (μR/hr)
Soil/Mulch/Wood Liner/Plastic/Concrete Straw/Tarp/Stone Metals/Canisters	456,784	57.7	247 bags& and boxes#	$\leq$ 14
Soils	197,391	24.9	134 bags&	15 - 21
Soils	134,519	17.0	104 bags&	22 - 50
Soils	946	0.1	1 bag&	56
Soils	1,700	0.2	1 bag&	113
Total	791,340	100	487	--

* Extracted from data presented in Attachment 6, Volume 2.
& Super sack, 1 cubic yard, nominal capacity.
\# Metal box, B-12, 54 ft^3, nominal capacity.
@ Contaminated PPEs not included here, estimated weight is 1,100 lbs.

Table A1-3
Summary Description of Waste with Elevated Surface Radiation Exposure Rates or Activity Levels for Waste Generated in 1995-1996*

Waste Form	Description	Surface Scans Radiation Level Range (γ μR/hr)
Soil	soil, rock, stone, clay, slate, coal	30 - 1,900
Metals	pipe, filaments, drum lids	30 - 7,800
Others	trash, wood, jar, gasket	30 - 2,300

* Extracted from data presented in Attachment 6, Volume 2.

Table A1-4
Radiological Characterization of Waste Excavated in 1995-1996*

	Typical Waste Radionuclide Concentrations - pCi/g dry										
Sample ID No.	Gross Alpha	Gross Beta	K-40	Co-60	Ba-133	Cs-137	Eu-152	Ra-226	Pa-231	Th-232	Pa-234
96-1	170 ±8.8	300 ±6.9	<14	<1.4	18 ±3.0	12 ±5.8	840 ±360	7,800 ±2,100	24,000 ±2,700	<5.8	<16
96-2	1,800 ±28	6,900 ±32	<4.8	<0.5	<0.6	30 ±6.8	47 ±11	1,200 ±340	1,300 ±160	<2.2	<7.1
96-3	46 ±4.8	12,000 ±40	<7.9	<0.8	<1.7	18 ±3.0	200 ±29	1,700 ±420	5,400 ±580	<3.2	<33
96-4	31 ±4.1	42 ±3.3	7.5 ±3.3	<0.3	<0.4	4.2 ±0.8	45 ±9.9	340 ±110	850 ±120	<1.4	<4.7
96-5	74,000 ±180	40,000 ±76	160 ±41	3,700 ±750	11 ±2.1	23 ±4.9	580 ±150	4,300 ±1,400	13,000 ±1,600	2,600 ±460	<4.7 <27
96-6	96 ±6.6	93 ±4.4	<14	4,100 ±740	80 ±1.8	7.1 ±1.6	710 ±250	6,600 ±1,800	18,000 ±2,100	<9.4	<40
96-7	2,200 ±30	2,300 ±18	99 ±40	11,000 ±2,900	5.3 ±2.3	15 ±7.3	130 ±54	1,100 ±290	3,300 ±370	1,600 ±360	<70

* Data Chem analysis, lab report no. 96M-0188-01, -02, June 14, 1996 (Data Chem 1996b).
Note: The waste profile radionuclide concentrations (pCi/g) are as follows: U-Nat = 237.7, Th-232 = 1.1, Ra-226 = 23.4, Cs-137 = 39.7, Co-60 = 7.0, Sr-90= 157.

The characterization, repackaging (based on laboratory analyses), transportation, and disposal of the radioactive waste was completed by the U.S. Army Corps of Engineers and Directorate of Safety, Health, and Environment with another contractor. NRC Form 314 (Certificate of Disposition of Material) is not included with this submittal, but will be submitted once all radioactive wastes associated with this removal action have been properly disposed of. The radioactive waste was shipped to Envirocare of Utah, Inc., located in Clive, Utah. Wastes which do not meet the disposal site's acceptance criteria will be held in storage at Aberdeen Proving Ground until a regional disposal facility becomes operational or shipped to Barnwell, South Carolina for disposal.

A1.2 Waste excavated in 1994

The waste that has been excavated by Roy F. Weston, Inc. (Weston) was also stored in the Rad Storage Yard. The waste was generated during field activities conducted in 1994. Table A1-5 presents a summary description of this waste, based Weston field logs and report (Weston 1994) and analytical results from Teledyne Isotopes, AEHA, and Lockheed (Lockheed 1994, Teledyne 1994a,b,c,d, AEHA 1994, 1995).

Table A1-5
Summary Description of Waste Generated in 1994*

Waste Forms	Assumed Vol. (ft^3)#	Assumed Weight (lbs)@	Type of Container&	Typical Surface Radiation Levels Range (μR/hr)+
Soil	6,410	333,000	box	25 - 600
Metals	390	19,900	box	25 - 100
Mixture	600	31,200	box	60 - 575
PPE	43	900	box	25
Hot items	4	---	55 gal. drum	5,000 at 30 cm
Totals	7,447	385,000		

* Extracted from Weston data (Weston 1994). See inventory in Attachment 6, Volume 2.
\# Assuming a waste volume of 43 ft^3 per box.
@ Assuming a density of 52 lbs/ft^3 for soils, 51 lbs/ft^3 for metals, 52 lbs/ft^3 for mixtures, and 21 lbs/ft^3 for PPE.
& Wooden boxes, 4' x 4' x 4' with plastic liners.
\+ Converted from cpm using a conversion factor of 1,200 cpm = 6 μR/hr. Instrument used Ludlum Model 3 with a Model 44-2 NaI(Tl) 1" x 1" detector.

There were 149 boxes containing primarily soils, 9 containing scrap metals and other solids, 14 containing both soils and solids, and one containing contaminated PPE (see inventory in Attachment 6). However, this waste was be repackaged in B-12/B-25 boxes for disposal in 1996.

Typically, the boxes (4' x 4' x 4') were filled to about 2/3 of their capacity for an assumed waste volume of about 43 ft^3 per box. Some of the boxes have been repaired in 1995. A 30-gallon drum (later transferred into a 55-gallon drum) contained an unspecified volume of items exhibiting

elevated radiation levels. These items identified and segregated by Weston include metallic objects and other solids. The total volume of Weston's packaged radioactive waste is estimated to be 7,447 ft^3 (276 yd^3 or 211 m^3). The total weight is estimated to be about 490,000 lbs (245 tons).

Radiation exposure rates vary from non-discernable levels above ambient background (ca. 5 to 12 μR/hr) to as high a 600 μR/hr, based on surface measurements. Most of the waste of the volume (70%) is characterized by radiation exposure rates under 50 μRh. Four boxes, containing soils and mixtures of soils an solids, were reported to have higher radiation levels, ranging from 300 to 600 μR/hr. Removable surface contamination levels on the outside of the boxes were found to be low and within detection limits, typically <10 dpm/100 cm^2 for alpha activity and <100 dpm/100 cm^2 for beta activity.

A1.3 Shipped Waste to Envirocare

Waste was shipped to Envirocare of Utah, Inc. For disposal on two separate occasions. The first shipment was of 30 B-25 containers and one B-12 container via three flat bed trucks on 19 June 1996. The first shipment consisted of the repackaged Weston boxes of waste and PPE.

The second shipment was completed in January 1997 and consisted of all remaining radioactive waste except for the drum exhibiting elevated radiation levels. The second shipment consisted of sending all 336 $1yd^3$ soil bags (Note: 40 $1yd^3$ soil bags were placed in 10 B-25 containers due their mixed waste characteristics) in 4 gondola rail cars to Envirocare. 116 B-12 and 87 B-25 were shipped via eighteen flat bed trucks to Envirocare. Table A1-6 shows a summary of all waste shipped to Envirocare

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Table A1-6
Summary of Waste Shipped to Envirocare of Utah, Inc.

Type	No. of Containers
$1yd^3$ Soil Bags	336
B-12 Containers	117
B-25 Containers	117
Total	539

APPENDIX 2

BURN AREA MEASUREMENTS

The following presents survey measurement and soil sampling results for the Burn Area. The Burn Area is located on the western side of 26th Street, just beyond the excavation. See Figure 2-3. This study was performed on August 4-9, 1995 by EA Engineering, Science, and Technology (EA) for Foster Wheeler. The study involved drilling 17 boreholes, scanning each borehole with a gamma scintillation probe, and collecting 37 soil samples at various depths. One borehole was drilled for establishing background conditions. The borehole depths varied from 2 to 10 feet, depending on whether obstructions had been encountered. The samples were scanned for radioactivity in the field and subjected to gamma spectrometry analyses. The gamma scan of the boreholes were conducted using a Ludlum Model 2241 ratemeter connected to a 1" x 1" NaI (Tl) detector (Ludlum Model 44-2). The soil samples were scanned with dual phosphor alpha/beta detector (Ludlum Model 43-89) coupled to Ludlum ratemeter (Model 2223). The results of the EA study are summarized here and the full report (with laboratory results) are given in Attachment 13, Volume 3.

A2.1 Gamma Logging Results

The downhole gamma logging survey results revealed levels ranging from 11 to 29 μR/hr, with an average of 23 $\pm$ 4.8 μR/hr. For comparison, the results from the background borehole ranged from 12 to 26 μR/hr, with an average of 19 $\pm$ 7.0 μR/hr, based on measurements characterizing 5-depth intervals, 0-2', 2-4', 4-6', 6-8, and 8-10'.
The following tabulation summarizes the borehole gamma scan results (shown in uR/hr, unless otherwise noted) as a function of depth.

	Borehole Depth (feet)					
	0 - 2	2 - 4	4 - 6	6 - 8	8 - 10	Unit
High	27	29	29	28	22	μR/hr
Low	12	7	22	20	11	"
Average	23.7	24.0	25.9	23.2	18.1	"
Std. Dev.	3.7	5.7	2.3	2.4	3.7	"
COV	15.5	23.6	8.9	10.3	20.5	%
Average @ 95% conf. level	25.5	26.7	27.3	24.7	20.9	μR/hr
No. of data	14	14	9	9	7	n/a

As can be noted, the results are fairly consistent for the first four-depth intervals, varying only from 24.7 to 27.3 μR/hr (down to a depth to 8 feet). However, the readings for the last interval (8 - 10 feet) are lower (averaging at 20.9 μR/hr).

Gamma scans of the soil samples taken from each borehole did not reveal any radioactivity levels above background, ranging from 6.2 to 7.2 μR/hr. Similar observations were noted for alpha and beta scans of the samples, with the results being typically less than twice background.

A2.2 Radionuclide Concentrations

Gamma spectroscopy analyses were conducted on 37 samples to identify the presence of specific radionuclides. The analyses were conducted by Pace, Inc. The results indicated that Co-60, Cs-137, and Th-234 were found to be below analytical detection limits. For these three radionuclides, the analytical detection limits were reported to range from 0.16 to 1.7 pCi/g for Co-60, 0.13 to 1.4 pCi/g for Cs-137, and 3.8 to 10 pCi/g for Th-234. The presence of Pb-212 (Th-232 decay chain) was reported to be typically <1.0 pCi/g.

APPENDIX 3
ORGANIZATION AND RESPONSIBILITIES

On October 14, 1994, Foster Wheeler Environmental Corporation (FWENC) was authorized to resume work on this project under Contract No. DACA31-94-D-0020. FWENC updated the Site Specific Work Plan and revised the Radiological Health and Safety Plan, Radiological Field Characterization Plan, Radiological Waste Management Plan, and Radiological Quality Assurance Plan. FWENC issued these documents on March 17, 1995 to the U.S. Army Corps of Engineers, Baltimore District environmental Remediation Resident Office (Foster 1995). Subsequently, the Aberdeen Proving Ground Directorate of Safety, Health, and Environment (DSHE) submitted these documents to the NRC for approval. The NRC issued an amendment (No. 37) to the Aberdeen Proving Ground license on June 13, 1995, thereby authorizing the resumption of the removal work. Following a mobilization phase, the field work was started on July 5, 1995 and continued on to this date. Figure 3-1 presents the project organizational chart.

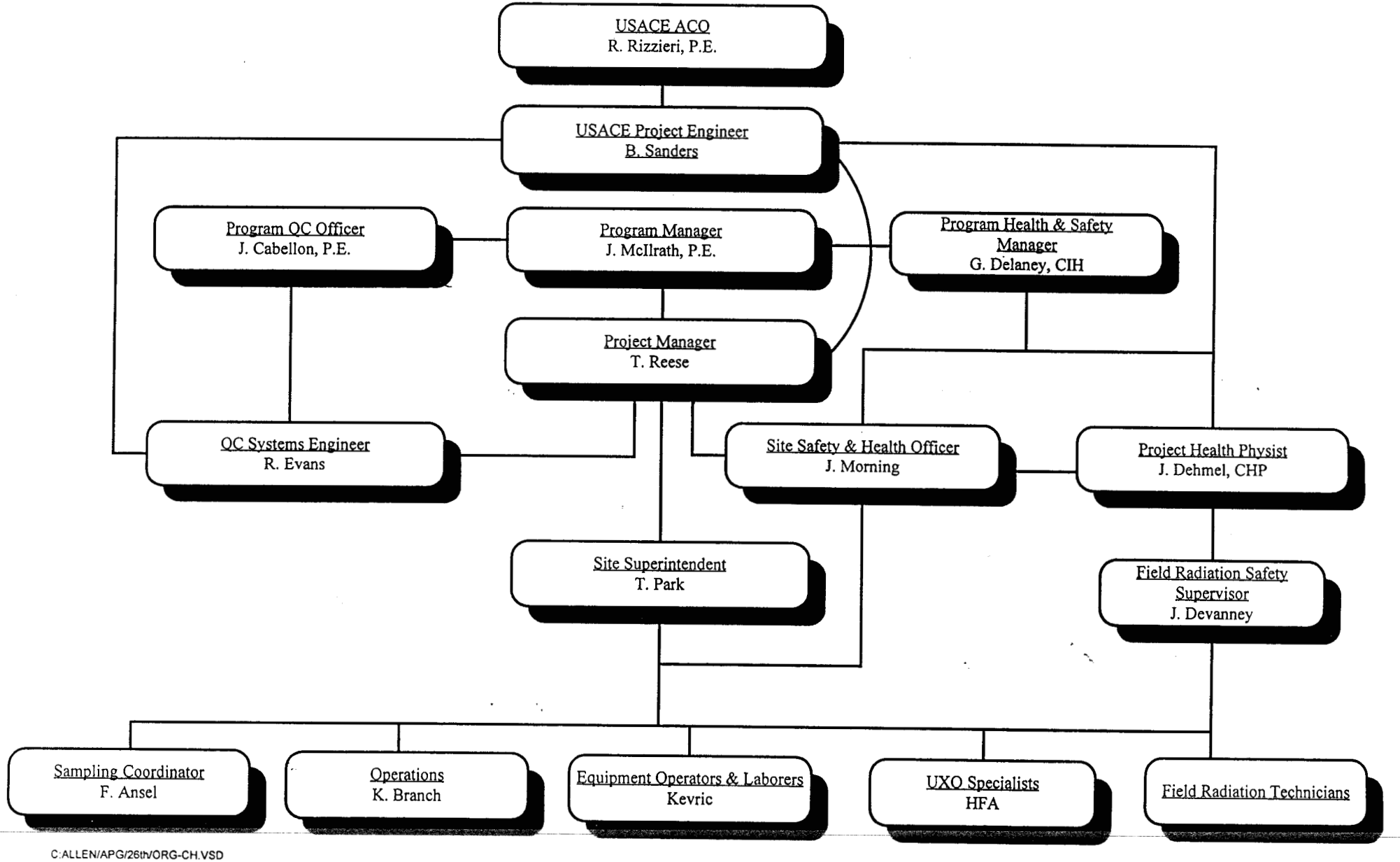
The work was managed by FWENC, using subcontractors for specific services, including technical support and manpower. FWENC was been responsible for specific phases of the field work, including project management, excavation and packaging of the waste from the 26th Street Disposal Site, occupational health and safety under NRC and OSHA regulations, selection of qualified contractors and personnel, personnel training, project scheduling and cost control under FWENC's contract, and QA/QC. Personnel from other organizations working or accessing any the designated sites were required to observe all radiological requirements for each designated site or field activity.

All radiological functions were coordinated with the Foster Wheeler Site Safety & Health Officer and Field Radiation Safety Supervisor. Visitors were not allowed access to any radiologically controlled areas unless they met the requirements of the H&S Plan, regarding training and medical qualifications. All contacts with the NRC and MDE were exclusively managed by the Aberdeen Proving Ground Radiation Protection Officer, with the Directorate of Safety, Health, and Environment. Furthermore, all contacts with the APG RPO were first coordinated through the Environmental Remediation Resident Office, of the U.S. Army Corps of Engineers, Baltimore District.

The characterization, repackaging transportation, and disposal of radioactive waste at the Envirocare facility in Clive, Utah was completed by FWENC in January, 1997.

Two field audits were conducted, one by the Foster Wheeler Project QC Officer and one by the NRC. Representatives from the ACOE and DSHE (APG RPO) were present during the NRC audit. In both cases, the audits emphasized operational issues, radiation monitoring, personnel safety, and record keeping. The results of the NRC inspection and Foster Wheeler audits are presented in Attachment 7, Volume 2.

Figure 3-1
Foster Wheeler Project Organizational Chart



C:ALLEN/APG/26th/ORG-CH.VSD

APPENDIX 4
RESULTS OF INDIVIDUAL RADIATION MEASUREMENTS

Table A4-1	Background Surface Soil Gross Alpha and Beta Activity						
Sample Code	Beta Activity (pCi/g)				Alpha Activity (pCi/g)		
No. SS-96-01	Activity	+/-Error	MDC		Activity	+/-Error	MDC
BG-06	21.00	2.90	4.40		13.00	2.70	3.20
BG-07	22.00	2.80	4.10		8.30	2.20	2.70
BG-08	22.00	2.50	3.40		8.70	2.30	2.70
BG-09	17.00	2.40	3.60		11.00	2.60	3.00
BG-10	15.00	2.40	3.70		10.00	2.30	2.50
BG-11	17.00	2.50	3.60		9.00	2.20	2.10
No. of data points:	6				6		
Maximum value:	22.00	2.90	4.40		13.00	2.70	3.20
Minimum value:	15.00	2.40	3.40		8.30	2.20	2.10
Average activity:	19.00	2.59	3.82		10.00	2.39	2.72
Std. Deviation:	3.03				1.77		
Coef. of variation (%):	15.96				17.65		
Ave. @ 95% confid. level:	21.5				11.5		

All samples analyzed by Data Chem, lab report no. 96R-0036-02, May 6, 1996. See Attach. 10, Vol. 2.

Table A4-2		Background Surface Soil Radionuclide Concentrations (1 of 2)							
Sample Code		K-40 Conc. (pCi/g)			Data	Co-60 Conc. (pCi/g)			Data
No. SS-96-01		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
BG-06		6.40E+00	1.90E+00	5.60E-01	6.40E+00	1.60E-02	3.80E-02	7.42E-02	7.42E-02
BG-07		9.40E+00	2.90E+00	4.20E-01	9.40E+00	1.90E-02	3.00E-02	5.90E-02	5.90E-02
BG-08		8.30E+00	3.30E+00	4.90E-01	8.30E+00	-2.60E-03	3.80E-02	6.90E-02	6.90E-02
BG-09		5.60E+00	1.60E+00	4.40E-01	5.60E+00	-5.90E-03	3.30E-02	5.80E-02	5.80E-02
BG-10		5.00E+00	1.20E+00	5.80E-01	5.00E+00	1.90E-02	3.00E-02	6.10E-02	6.10E-02
BG-11		5.30E+00	1.70E+00	6.30E-01	5.30E+00	5.50E-03	3.40E-02	6.40E-02	6.40E-02
No. of data points:		6			6	6			6
Maximum value:		9.40E+00	3.30E+00	6.30E-01	9.40E+00	1.90E-02	3.80E-02	7.42E-02	7.42E-02
Minimum value:		5.00E+00	1.20E+00	4.20E-01	5.00E+00	-5.90E-03	3.00E-02	5.80E-02	5.80E-02
Average activity:		6.67E+00	2.23E+00	5.26E-01	6.67E+00	8.50E-03	3.40E-02	6.45E-02	6.42E-02
Std. Deviation:		1.79E+00			1.79E+00	1.11E-02			6.31E-03
Coef. of variation (%):		2.68E+01			2.68E+01	1.31E+02			9.82E+00
Ave. @ 95% confid. level:		8.14E+00			8.14E+00	1.76E-02			6.94E-02
(for t 0.05,5)	2.015								
Sample analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0036-01, May 17, 1996.									
See Attach. 10, Vol. 2.									
Sample Code		Ba-133 Conc. (pCi/g)			Data	Cs-137 Conc. (pCi/g)			Data
No. SS-96-01		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
BG-06		1.60E-02	4.20E-02	6.80E-02	6.80E-02	4.80E-01	1.50E-01	7.90E-02	4.80E-01
BG-07		6.90E-03	3.90E-02	6.20E-02	6.20E-02	-3.00E-02	3.80E-02	6.40E-02	6.40E-02
BG-08		5.50E-02	4.70E-02	8.00E-02	8.00E-02	3.50E-03	5.00E-02	8.90E-02	8.90E-02
BG-09		2.50E-03	3.70E-02	5.70E-02	5.70E-02	6.70E-02	4.60E-02	8.60E-02	8.60E-02
BG-10		2.40E-02	4.50E-02	7.10E-02	7.10E-02	4.30E-02	4.50E-02	8.60E-02	8.60E-02
BG-11		2.00E-02	4.10E-02	6.70E-02	6.70E-02	1.10E-01	8.10E-02	8.10E-02	1.10E-01
No. of data points:		6			6	6			6
Maximum value:		5.50E-02	4.70E-02	8.00E-02	8.00E-02	4.80E-01	1.50E-01	8.90E-02	4.80E-01
Minimum value:		2.50E-03	3.70E-02	5.70E-02	5.70E-02	-3.00E-02	3.80E-02	6.40E-02	6.40E-02
Average activity:		2.07E-02	4.20E-02	6.79E-02	6.75E-02	1.12E-01	7.87E-02	8.13E-02	1.53E-01
Std. Deviation:		1.86E-02			7.87E-03	1.87E-01			1.61E-01
Coef. of variation (%):		8.98E+01			1.17E+01	1.66E+02			1.06E+02
Ave. @ 95% confid. level:		3.60E-02			7.40E-02	2.66E-01			2.85E-01
(for t 0.05,5)	2.015								
Sample analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0036-01, May 17, 1996.									
See Attach. 10, Vol. 2.									

Table A4-2		Background Surface Soil Radionuclide Concentrations (2 of 2)							
Sample Code		Eu-152 Conc. (pCi/g)			Data	Th-234 Conc. (pCi/g)			Data
No. SS-96-01		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
BG-06		3.20E-01	2.10E-01	4.30E-01	4.30E-01	1.00E+00	2.90E+00	8.20E-01	1.00E+00
BG-07		5.70E-02	1.40E-01	2.70E-01	2.70E-01	1.90E+00	5.10E+00	1.40E+00	1.90E+00
BG-08		1.40E-01	1.90E-01	3.70E-01	3.70E-01	1.60E+00	4.60E+00	2.50E+00	2.50E+00
BG-09		-9.60E-03	1.60E-01	2.90E-01	2.90E-01	2.60E-01	1.00E+00	7.00E-01	7.00E-01
BG-10		1.90E-01	1.40E-01	3.20E-01	3.20E-01	1.50E+00	4.30E+00	2.20E+00	2.20E+00
BG-11		1.40E-01	1.50E-01	3.20E-01	3.20E-01	6.60E-01	1.90E+00	8.00E-01	8.00E-01
No. of data points:		6			6	6			6
Maximum value:		3.20E-01	2.10E-01	4.30E-01	4.30E-01	1.90E+00	5.10E+00	2.50E+00	2.50E+00
Minimum value:		-9.60E-03	1.40E-01	2.70E-01	2.70E-01	2.60E-01	1.00E+00	7.00E-01	7.00E-01
Average activity:		1.40E-01	1.67E-01	3.38E-01	3.33E-01	1.15E+00	3.62E+00	1.57E+00	1.52E+00
Std. Deviation:		1.13E-01			5.82E-02	6.23E-01			7.78E-01
Coef. of variation (%):		8.12E+01			1.75E+01	5.40E+01			5.13E+01
Ave. @ 95% confid. level:		2.33E-01			3.81E-01	1.67E+00			2.16E+00
(for t 0.05,5)	2.015								
Sample analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0036-01, May 17, 1996.									
See Attach. 10, Vol. 2.									

Sample Code		Ra-226 Conc. (pCi/g)			Data	Ac-228 Conc. (pCi/g)			Data
No. SS-96-01		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
BG-06		2.30E+00	1.10E+00	7.60E-01	2.30E+00	1.10E+00	3.20E-01	5.00E-01	1.10E+00
BG-07		1.60E+00	8.70E-01	7.10E-01	1.60E+00	1.00E+00	3.20E-01	2.40E-01	1.00E+00
BG-08		1.30E+00	8.30E-01	8.60E-01	1.30E+00	1.40E+00	4.50E-01	2.80E-01	1.40E+00
BG-09		9.20E-01	6.40E-01	7.10E-01	9.20E-01	6.70E-01	2.70E-01	2.20E-01	6.70E-01
BG-10		1.10E+00	8.00E-01	8.00E-01	1.10E+00	9.20E-01	2.80E-01	4.50E-01	9.20E-01
BG-11		1.30E+00	9.00E-01	8.60E-01	1.30E+00	6.60E-01	2.90E-01	2.70E-01	6.60E-01
No. of data points:		6			6	6			6
Maximum value:		2.30E+00	1.10E+00	8.60E-01	2.30E+00	1.40E+00	4.50E-01	5.00E-01	1.40E+00
Minimum value:		9.20E-01	6.40E-01	7.10E-01	9.20E-01	6.60E-01	2.70E-01	2.20E-01	6.60E-01
Average activity:		1.42E+00	8.68E-01	7.86E-01	1.42E+00	9.58E-01	3.27E-01	3.44E-01	9.58E-01
Std. Deviation:		4.87E-01			4.87E-01	2.79E-01			2.79E-01
Coef. of variation (%):		3.43E+01			3.43E+01	2.92E+01			2.92E+01
Ave. @ 95% confid. level:		1.82E+00			1.82E+00	1.19E+00			1.19E+00
(for t 0.05,5)	2.015								
Sample analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0036-01, May 17, 1996.									
See Attach. 10, Vol. 2.									

Table A4-3		Excavation Ambient and Perimeter Radiation Survey Results - uR/h (1 of 3)						
Grid No	Low	High	Average		Grid No	Low	High	Average
K-23	7	10	9		M-16	9	13	11
L-23	7	10	9		0-16	8	10	9
M-23	7	10	9		P-16	7	10	9
N-23	8	11	10		P-15	8	11	10
J-22	8	13	11		0-15	8	12	10
K-22	6	9	8		N-15	10	13	12
L-22	8	10	9		M-15	8	11	10
M-22	7	10	9		L-15	9	14	12
N-22	7	10	9		K-15	9	13	11
0-22	8	10	9		J-15	9	12	11
O-21	8	11	10		Wall-15	7	10	9
N-21	8	10	9		Wall-14	8	10	9
M-21	9	12	11		J-14	8	12	10
L-21	8	13	11		K-14	9	13	11
K-21	7	11	9		L-14	9	13	11
J-21	7	11	9		M-14	12	15	14
J-20	6	9	8		N-14	10	14	12
K-20	7	11	9		O-14	7	11	9
L-20	7	9	8		P-14	8	12	10
M-20	7	10	9		P-13	8	10	9
N-20	8	12	10		O-13	10	13	12
O-20	8	10	9		N-13	12	16	14
O-19	9	11	10		M-13	11	15	13
N-19	8	10	9		L-13	10	14	12
M-19	8	12	10		K-13	10	14	12
L-19	10	13	12		J-13	10	13	12
K-19	9	13	11		Wall-13	9	12	11
J-19	7	9	8		Wall-12	8	10	9
J-18	7	10	9		J-12	12	14	13
K-18	9	13	11		K-12	12	16	14
L-18	10	13	12		L-12	11	15	13
M-18	10	14	12		M-12	12	15	14
N-18	9	14	12		N-12	12	16	14
O-18	8	11	10		O-12	8	12	10
P-17	6	9	8		P-12	10	11	11
O-17	8	10	9		N-11	7	10	9
N-17	9	11	10		M-11	9	12	11
M-17	13	16	15		L-11	8	10	9
L-17	11	15	13		K-11	7	10	9
K-17	9	13	11		J-11	8	10	9
J-17	8	11	10		K-10	8	10	9
Wall-17	7	10	9		L-10	7	9	8
Wall-16	8	10	9		M-10	5	8	7
J-16	8	12	10		N-10	8	10	9
K-16	11	14	13					
L-16	10	14	12					
Based on survey conducted on March 12, 1996. See Attach. 9, Vol. 2.								

Table A4-3 Excavation Ambient and Perimeter Radiation Survey Results - uR/h (2 of 3)

Statistical Summary		
No. of data points:		90
Maximum value:		15
Minimum value:		7
Average:		10.13
Std Deviation:		1.74
Coef. of variation (%):		17.14
Ave. @ 95% confid. level:		10.44
(for t 0.05, 89	1.665	

Table A4-3	Excavation Ambient and Perimeter Radiation Survey Results - uR/h (3 of 3)		
	Perimeter Ambient Radiation Exposure Rates - uR/h		
Grid No.	Low	High	Average
I-23	6	10	8
H-22	5	8	7
G-22	5	8	7
F-21	5	9	7
F-20	5	8	7
F-19	5	8	7
F-18	5	8	7
F-17	6	9	8
F-16	5	8	7
F-15	5	9	7
G-15	6	9	8
G-14	7	10	9
G-13	6	9	8
G-12	5	7	6
G-11	4	6	5
G-10	3	5	4
G-9	3	6	5
G-8	3	5	4
G-7	3	6	5
G-6	3	5	4
Q-13	7	10	9
Q-12	7	9	8
Q-14	7	10	9
Q-15	8	10	9
Q-16	7	11	9
Q-17	7	9	8
Q-18	7	9	8
P-18	6	9	8
P-19	7	10	9
P-20	5	8	7
P-21	7	11	9
P-22	7	10	9
P-23	6	10	8
P-24	6	9	8
O-23/24	7	10	9
N-23/24	7	11	9
M-23/24	6	10	8
L-23/24	8	11	10
K-23/24	7	9	8
J-23	6	9	8

Grid No.	Low	High	Average
G-5	3	5	4
H-4	4	6	5
I-4	4	6	5
J-4	4	6	5
K-5	3	5	4
K-6	4	6	5
K-4	4	6	5
K-7	5	7	6
K-8	6	8	7
K-9	7	9	8
L-9	8	10	9
M-9	7	9	8
N-10	7	9	8
O-11	7	9	8
O-10	6	8	7
P-9	8	10	9
Q-9	8	10	9
V-11	8	10	9
V-12	8	10	9
R-13	7	9	8
R-10	8	10	9

Statistical Summary		
No. of data points:		61
Maximum value:		10
Minimum value:		4
Average:		7
Std Deviation:		1.62
Coef. of variation (%):		22.64
Ave. @ 95% confid. level:		7.49
(for t 0.05, 60	1.671	

Based on survey conducted on May 2, 1996. See Attach. 9, Vol. 2.

Table A4-4		Excavation Surface Radiation Survey Results - uR/h (1 of 4)						
Grid No.	Low	High	Average		Grid No.	Low	High	Average
J-23	9	11	10		J-21	10	15	13
	9	11	10			7	10	9
	8	10	9			12	26	19
K-23	10	13	12			9	13	11
	9	11	10		K-21	11	14	13
	9	11	10			11	14	13
	7	9	8			11	13	12
L-23	9	12	11			11	14	13
	7	10	9		L-21	12	14	13
	7	10	9			11	14	13
	9	11	10			11	13	12
M-23	10	11	11			11	14	13
	10	12	11		M-21	9	15	12
	10	12	11			11	16	14
	9	12	11			10	12	11
N-23	10	12	11			10	15	13
	9	12	11		N-21	9	12	11
	9	11	10			10	13	12
	8	12	10			9	11	10
O-23	11	15	13			9	11	10
J-22	9	15	12		O-21	10	12	11
	12	23	18			10	13	12
	9	12	11			10	11	11
	12	22	17			10	11	11
K-22	7	11	9		J-20	8	10	9
	8	15	12			7	9	8
	8	10	9			10	13	12
	9	12	11			9	14	12
L-22	7	9	8		K-20	11	13	12
	11	16	14			11	15	13
	8	11	10			11	16	14
	9	13	11			11	15	13
M-22	9	12	11		L-20	11	14	13
	9	12	11			11	14	13
	10	12	11			11	13	12
	9	12	11			11	13	12
N-22	8	13	11		M-20	11	14	13
	10	13	12			11	13	12
	9	16	13			11	14	13
	8	13	11			10	12	11
O-22	10	13	12		N-20	11	13	12
	11	12	12			10	14	12
	9	11	10			9	11	10
	10	13	12			10	12	11

Based on surveys conducted on March 13, 14,18, 20, and 26, 1996. See Attach. 9, Vol. 2.

Table A4-4		Excavation Surface Radiation Survey Results - uR/h (2 of 4)						
Grid No	Low	High	Average		Grid No	Low	High	Average
O-20	10	13	12		J-17	7	13	10
	10	13	12			6	10	8
	9	11	10			11	15	13
	10	12	11			10	13	12
J-19	6	11	9		K-17	9	14	12
	6	8	7			11	14	13
	8	11	10			12	16	14
	7	13	10			11	15	13
K-19	9	13	11		L-17	13	19	16
	9	13	11			12	17	15
	11	13	12			13	19	16
	9	13	11			13	16	15
L-19	12	15	14		M-17	12	27	20
	10	13	12			14	29	22
	11	15	13			12	29	21
	10	13	12			19	25	22
M-19	11	13	12		N-17	12	16	14
	11	13	12			12	18	15
	10	13	12		O-17	10	13	12
	11	13	12			9	11	10
N-19	11	13	12			8	10	9
	10	13	12		P-17	10	11	11
	10	12	11			8	10	9
	9	13	11			9	11	10
O-19	10	13	12		J-16	7	14	11
	10	12	11			7	14	11
	10	13	12			11	15	13
	9	12	11			12	14	13
J-18	6	10	8		K-16	11	16	14
	9	16	13			14	26	20
	10	14	12			14	20	17
	10	15	13			14	19	17
K-18	9	13	11		L-16	14	20	17
	13	27	20			14	24	19
	11	14	13			14	18	16
	11	13	12			15	29	22
L-18	10	14	12		M-16	13	20	17
	11	13	12			8	14	11
	11	16	14			15	22	19
	13	16	15			8	11	10
M-18	11	13	12		O-16	9	11	10
	11	14	13			10	21	16
	14	22	18			9	13	11
						9	12	11

Based on surveys conducted on March 13, 14,18, 20, and 26, 1996. See Attach. 9, Vol. 2.

Table A4-4		Excavation Surface Radiation Survey Results - uR/h (3 of 4)						
Grid No.	Low	High	Average		Grid No.	Low	High	Average
P-16	9	12	11		N-14	16	27	22
	9	11	10			15	18	17
	9	12	11			14	16	15
	9	11	10			14	18	16
J15	8	11	10		O-14	10	17	14
	7	12	10			11	16	14
	9	13	11			10	14	12
	11	13	12			11	16	14
K-15	10	14	12		P-14	10	13	12
	10	21	16			11	13	12
	10	15	13			11	12	12
	11	20	16			11	12	12
L-15	12	16	14		J-13	7	14	11
	12	19	16			8	17	13
	10	15	13			10	13	12
	10	14	12			13	18	16
M-15	7	12	10		K-13	10	15	13
	11	22	17			14	18	16
N-15	12	17	15			12	16	14
	16	19	18			13	20	17
	11	32	22		L-13	12	19	16
O-15	11	21	16			15	20	18
	9	13	11			11	22	17
	10	14	12			16	21	19
	10	14	12		M-13	15	22	19
P-15	11	13	12			15	22	19
	10	13	12			14	18	16
	9	12	11			16	21	19
	9	12	11		N-13	15	17	16
J-14	9	31	20			16	21	19
	11	23	17			15	20	18
	10	12	11			15	29	22
	10	13	12		O-13	13	18	16
K-14	11	19	15			13	16	15
	11	15	13			12	15	14
	12	18	15			12	16	14
	11	15	13		P-13	11	13	12
L-14	11	18	15			11	15	13
	11	16	14			9	13	11
	12	18	15			11	13	12
	12	17	15		J-12	8	22	15
M-14	14	24	19			8	11	10
	12	16	14			9	14	12
	13	21	17			8	11	10
	14	17	16					

Based on surveys conducted on March 13, 14,18, 20, and 26, 1996. See Attach. 9, Vol. 2.

Table A4-4	Excavation Surface Radiation Survey Results - uR/h (4 of 4)							
Grid No.	Low	High	Average		Grid No.	Low	High	Average
K-12	15	27	21		K-10	10	13	12
	8	27	18			10	13	12
	15	17	16			9	11	10
	15	19	17			9	11	10
L-12	15	18	17		L-10	8	12	10
	13	17	15			8	11	10
	14	19	17			7	9	8
	13	17	15			8	10	9
M-12	14	23	19		M-10	8	9	9
	15	20	18					
	16	20	18					
	12	19	16					
N-12	15	19	17					
	12	20	16		Statistical Summary			
	11	25	18					
	12	22	17		No. of data points:			315
0-12	12	14	13		Maximum value:			22
	12	14	13		Minimum value:			7
	13	16	15		Average:			12.86
	13	16	15		Std Deviation:			3.04
P-12	13	16	15		Coef. of variation (%):			23.61
	13	16	15		Ave. @ 95% confid. level:			13.14
J-11	8	10	9		(for t 0.05, 314)		1.652	
	10	13	12					
	8	11	10					
	8	11	10					
K-11	11	20	16					
	8	13	11					
	12	21	17					
	10	13	12					
L-11	10	16	13					
	11	12	12					
	11	15	13					
	13	20	17					
M-11	13	20	17					
	8	14	11					
	10	11	11					
	9	12	11					
N-11	10	15	13					
	9	13	11					
	10	15	13					
	10	12	11					

Based on surveys conducted on March 13, 14,18, 20, and 26, 1996. See Attach. 9, Vol. 2.

Table A4-5	Excavation Submerged Areas Radiation Survey Results - K cpm (1 of 2)						
Grid No.	Low	High	Average	Grid No.	Reading	Grid No.	Reading
M-18	2.00	3.50	2.75	M-15	1.40	N-17	2.80
	2.00	2.90	2.45		1.50		2.60
	2.10	4.20	3.15		1.60		2.90
M-17	3.00	3.30	3.15		2.30		2.00
N-17	2.80	4.40	3.60	N-15	2.50		2.60
	2.70	3.30	3.00		2.90		3.40
	2.80	3.60	3.20		2.50		2.70
	2.90	2.40	2.65		2.10		
O-17	2.60	3.00	2.80		2.00		
	2.30	3.30	2.80		2.40		
	2.10	2.40	2.25		3.80		
P-17	1.50	2.10	1.80	M-16	2.80		
M-16	2.60	3.90	3.25		2.70		
	2.10	2.90	2.50		3.20		
N-16	1.90	3.90	2.90		3.00		
	2.20	3.70	2.95		3.70		
	2.90	3.60	3.25		3.20		
	2.30	3.90	3.10		2.60		
O-16	1.50	3.60	2.55		2.60		
	2.80	3.30	3.05		3.60		
	1.50	2.10	1.80		3.30		
P-16	1.50	2.10	1.80		3.20		
M-15	2.10	2.60	2.35		3.40		
	2.30	4.00	3.15		4.80		
N-15	2.30	3.60	2.95		6.00		
	2.80	3.90	3.35		3.30		
	2.20	3.70	2.95		4.60		
M-14	2.80	3.50	3.15		3.40		
	2.90	4.50	3.70		3.10		
N-14	2.20	5.60	3.90		6.00		
K14			2.00		5.00		
			2.40		4.30		
L14			2.70	O-16	2.60		
			3.60		5.00		
			4.20		5.80		
			4.20		3.80		
			2.60		2.50		
L-15			2.70		2.10		
			2.80		1.70		
			3.30		2.40		
			3.80		3.30		
M-14			5.40	P-16	1.50		
M-15			3.40		1.50		
			5.40	M-17	2.40		
			3.40		2.90		
			2.80				

Based on surveys conducted on Jan. 25, and March 9, 1996. See Attach. 9, Vol. 2.

Table A4-5 Excavation Submerged Areas Radiation Survey Results - K cpm (2 of 2)

Statistical Summary		
No. of data points:		98
Maximum value:		6.00
Minimum value:		1.40
Average:		3.06
Std Deviation:		0.96
Coef. of variation (%):		3.14E+01
Ave. @ 95% confid. level:		3.22E+00
(for t 0.05, 97	1.657	

Table A4-6 Marsh Area Radiation Survey Results - January 1996

Ambient Radiation Exposure Rates - uR/h

Grid No.	Reading	Grid No.	Reading	Grid No.	Reading
A'-1	6.00	A-6	8.00	A-12	9.00
B'-1	7.00	B-6	8.00	B-12	9.00
C'-1	7.00	C-6	8.00	C-12	7.00
D'-1	7.00	D-6	7.00	D-12	7.00
E'-1	7.00	E-6	8.00	E-12	7.00
F'-1	7.00	F-6	8.00	F-12	7.00
G'-1	7.00	G-6	8.00	A-13	9.00
A-1	7.00	H-6	8.00	B-13	8.00
B-1	6.00	A-7	9.00	C-13	9.00
C-1	6.00	B-7	8.00	D-13	9.00
D-1	7.00	C-7	7.00	E-13	9.00
E-1	7.00	D-7	7.00	F-13	8.00
F-1	7.00	E-7	8.00	A-14	9.00
G-1	10.00	F-7	8.00	B-14	9.00
A-2	7	G-7	9.00	C-14	9.00
B-2	7.00	H-7	9.00	D-14	9.00
C-2	7.00	A-8	9.00	E-14	9.00
D-2	7.00	B-8	10.00	F-14	9.00
E-2	7.00	C-8	8.00	A"-2	7.00
F-2	7.00	D-8	8.00	A"-3	8.00
G-2	8.00	E-8	8.00	A"-4	9.00
A-3	7.00	F-8	8.00	A"-5	8.00
B-3	7.00	G-8	8.00	A"-6	8.00
C-3	7.00	H-8	8.00	A"-7	8.00
D-3	7.00	A-9	10.00	A"-8	8.00
E-3	7.00	B-9	10.00	A"-9	9.00
F-3	8.00	C-9	7.00	A"-10	9.00
G-3	8.00	D-9	8.00	A"-11	8.00
H-3	8.00	E-9	8.00		
A-4	8.00	F-9	8.00		
B-4	7.00	G-9	8.00		
C-4	7.00	H-9	8.00		
D-4	7.00	A-10	10.00		
E-4	7.00	B-10	9.00		
F-4	8.00	C-10	9.00		
G-4	8.00	D-10	8.00		
H-4	9.00	E-10	8.00		
A-5	8.00	F-10	8.00		
B-5	7.00	G-10	8.00		
C-5	7.00	A-11	10.00		
D-5	8.00	B-11	9.00		
E-5	8.00	C-11	8.00		
F-5	8.00	D-11	9.00		
G-5	8.00	E-11	8.00		
H-5	9.00	F-11	7.00		

Based on surveys conducted on Jan. 26, 1996.

See Attach. 9, Vol. 2.

Statistical Summary		
No. of data points:		118
Maximum value:		10.00
Minimum value:		6.00
Average:		7.95
Std Deviation:		0.91
Coef. of variation (%):		1.15E+01
Ave. @ 95% confid. level:		8.09E+00
for t 0.05, 117	1.659	

Table A4-7

Marsh Area Radiation Survey Results - March 1996

Ambient Radiation Exposure Rates - uR/h

Grid No.	Reading	Grid No.	Reading	Grid No.	Reading
D-14	9	F-6	7	D-3	8
	7		7		6
C-14	9		8		6
	7	G-6	8		7
D-13	7		8	B-2	7
	8		7		6
	9		7		6
C-13	7	F-5	7		7
	9		8	C-2	7
A-9	8	G-5	8		7
	10		6		6
	10		8		6
B-9	10	B-5	8	D-2	8
	11		8		7
	8		6		8
A-8	10		7		6
	8	C-5	7	B-1	7
	10		6		7
B-8	10		8		7
	8		8	C-1	6
	10	D-5	7		6
	8		6		7
F-9	8		6	D-1	8
	8	B-4	7		7
	8		7		6
G-9	9		7		
	7	C-4	7		
	7		8		
	7		7		
F-8	7		6		
	8	D-4	6		
	8		8		
G-8	9		6		
	9		7		
	7	B-3	7		
	7		6		
F-7	7		7		
	8		7		
	8	C-3	6		
G-7	9		6		
	8		7		
	7		7		
	7				

Based on surveys conducted on March 19, 1996.
See Attach. 9, Vol. 2.

Statistical Summary

No. of data points:		110
Maximum value:		11
Minimum value:		6
Average:		7
Std Deviation:		1.13
Coef. of variation (%):		15.16
Ave. @ 95% confid. level:		7.63
for t 0.05, 109	1.666	

Table A4-8 Screening Area Ambient and Surface Radiation Survey Results - uR/hr (1 of 4)

Ambient Radiation Exposure Rates - uR/h

Grid No.	Low	High	Average
J-6	4	6	5
I-6	4	6	5
H-6	4	6	5
H-7	4	6	5
I-7	4	6	5
J-7	4	6	5
J-8	4	6	5
I-8	4	6	5
H-8	4	6	5
H-9	5	7	6
I-9	5	6	6
J-9	6	8	7
J-10	7	9	8
I-10	5	6	6
H-10	6	8	7
H-11	5	7	6
I-11	5	8	7
J-11	5	8	7
J-12	6	9	8
I-12	5	8	7
H12	5	8	7
H13	5	7	6
I-13	5	7	6
I-14	5	7	6
H-14	5	8	7
H-15	5	7	6
I-15	6	8	7
I-16	6	8	7
H-16	5	7	6
G-16	6	9	8
G-17	6	8	7
H-17	5	8	7
I-17	6	8	7
I-18	5	7	6
H-18	5	7	6
G-18	5	7	6
G-17	5	8	7
H-19	5	7	6
I-19	5	7	6

Grid No.	Low	High	Average
I-20	5	8	7
H-20	5	8	7
G-20	5	7	6
G-21	5	7	6
H-21	6	8	7
J-21	7	10	9
I-22	8	10	9
J-22	7	9	8

Statistical Summary

No. of data points:		47
Maximum value:		9
Minimum value:		5
Average:		6
Std Deviation:		0.96
Coef. of variation (%):		15.23
Ave. @ 95% confid. level:		6.53
(for t 0.05, 46	1.68	

Based on survey conducted on May 2, 1996. See Attach. 9, Vol. 2.

Table A4-8 Screening Area Ambient and Surface Radiation Survey Results - uR/hr (2 of 4)

Surface Radiation Exposure Rates - uR/h (1 of 3)

Grid No.	Low	High	Average		Grid No.	Low	High	Average
H-11	6	9	8		J-8	6	10	8
	6	9	8			5	6	6
	6	8	7			5	6	6
	6	8	7			6	8	7
I-11	6	8	7		I-8	5	6	6
	6	8	7			5	6	6
	6	7	7			5	6	6
	7	9	8			5	6	6
I-12	6	8	7		H-8	6	9	8
	6	8	7			6	10	8
	7	9	8			5	6	6
	7	9	8			5	6	6
H-12	7	9	8		H-9	7	9	8
	7	9	8			7	8	8
	6	8	7			5	6	6
	6	8	7			5	6	6
I-13	6	7	7		J-6	5	6	6
	6	7	7			5	6	6
	6	7	7			5	6	6
	6	7	7			4	5	5
I-9	6	8	7		I-6	5	6	6
	6	7	7			5	6	6
	6	7	7			5	6	6
	6	8	7			5	6	6
J-9	7	9	8		H-6	6	9	8
	7	10	9			6	9	8
	8	10	9			5	6	6
	8	10	9			5	6	6
J-10	8	10	9		H-7	6	10	8
	8	11	10			6	9	8
	8	10	9			5	7	6
	9	11	10			5	6	6
I-10	6	7	7		I-7	5	6	6
	6	7	7			5	6	6
	6	9	8			5	6	6
	6	7	7			5	6	6
H-10	6	9	8		H-13	6	10	8
	8	10	9			6	7	7
	5	6	6			6	7	7
	6	8	7			6	7	7
J-7	5	6	6		G-13	8	10	9
	5	6	6			9	11	10
	5	6	6		G-14	9	11	10
	5	6	6			9	11	10

Based on survey conducted on May 2, 1996. See Attach. 9, Vol. 2.

Table A4-8 Screening area Ambient and Surface Radiation Survey Results - uR/hr (3 of 4)

Surface Radiation Exposure Rates - uR/h (2 of 3)

Grid No	Low	High	Average		Grid No	Low	High	Average
H-14	6	7	7		G-18	8	11	10
	6	8	7			7	9	8
	6	8	7			6	8	7
	6	7	7			6	8	7
I-14	5	7	6		H-18	6	8	7
	6	7	7			6	8	7
	5	7	6			6	8	7
	5	7	6			6	8	7
I-15	5	7	6		I-18	6	8	7
	5	7	6			6	8	7
	6	8	7			6	8	7
	6	8	7			6	8	7
H-15	5	7	6		I-19	7	9	8
	6	7	7			7	9	8
	6	7	7			7	9	8
	5	7	6			6	8	7
G-15	9	11	10		H-19	6	8	7
	9	11	10			6	7	7
	9	11	10			6	9	8
	9	11	10			7	9	8
G-16	9	10	10		G-19	7	9	8
	10	11	11			7	9	8
	9	10	10			6	8	7
	9	11	10			6	8	7
H-16	5	7	6		F-19	7	9	8
	5	7	6			7	9	8
	5	7	6		F-20	8	10	9
	5	7	6			8	10	9
I-16	5	7	6		G-20	7	9	8
	6	8	7			8	10	9
	5	7	6			6	8	7
	5	7	6			6	8	7
I-17	5	7	6		H-20	6	8	7
	5	7	6			6	8	7
	6	8	7			6	8	7
	6	8	7			7	10	9
H-17	5	7	6		I-20	7	9	8
	5	7	6			6	8	7
	5	7	6			6	8	7
	5	7	6			7	10	9
G-17	7	10	9		I-21	8	11	10
	9	11	10			8	11	10
	9	11	10			8	11	10
	5	9	7			9	11	10

Based on survey conducted on May 2, 1996. See Attach. 9, Vol. 2.

Table A4-8 Screening Area Ambient and Surface Radiation Survey Results - uR/hr (4 of 4)

Surface Radiation Exposure Rates - uR/h (3 of 3)

Grid No.	Low	High	Average
H-21	6	8	7
	6	8	7
	7	9	8
	7	10	9
G-21	6	8	7
	6	8	7
	6	8	7
	6	8	7
F-21	8	10	9
	8	10	9
I-22	9	11	10
	9	12	11
	9	12	11
H-22	7	8	8

Statistical Summary

No. of data points:			190
Maximum value:			11
Minimum value:			5
Average:			7.26
Std Deviation:			1.39
Coef. of variation (%):			19.11
Ave. @ 95% confid. level:			7.42
(for t 0.05, 189)		1.656	

Based on survey conducted on May 2, 1996. See Attach. 9, Vol. 2.

Table A4-9	CRZ Areas Ambient and Surface Radiation Survey Results - uR/h (1 of 3)							
	North CRZ - Ambient					South CRZ - Ambient		
Grid No.	Low	High	Average		Grid No.	Low	High	Average
O-10	9	10	10		K-23	7	8	8
O-11	9	11	10		K-24	8	10	9
P-10	9	10	10		K-25	8	10	9
P-11	8	10	9		J-24	8	9	9
P-12	9	11	10		J-25	9	11	10
P-13	8	10	9		J-26	8	9	9
Q-11	9	10	10		I-24	8	9	9
Q-12	8	10	9		I-25	10	12	11
Q-13	8	10	9		I-26	8	9	9
R-12	8	10	9		I-27	9	10	10
R-13	8	10	9		H-25	8	9	9
					H-26	8	9	9

Based on surveys conducted on June 5 and 7, 1996. See Attach. 9, Vol. 2.

Statistical Summary					Statistical Summary			
No. of data points:			11		No. of data points:			12
Maximum value:			10		Maximum value:			11
Minimum value:			9		Minimum value:			8
Average:			9.32		Average:			8.92
Std Deviation:			0.40		Std Deviation:			0.90
Coef. of variation (%):			4.34		Coef. of variation (%):			10.10
Ave. @ 95% confid. level:			9.54		Ave. @ 95% confid. level:			9.38
(for t 0.05, 10	1.812				(for t 0.05, 11	1.782		

Table A4-9	CRZ Areas Ambient and Surface Radiation Survey Results - uR/h (2 of 3)							
	North CRZ - Surface					South CRZ - Surface		
	Low	High	Average		Grid No.	Low	High	Average
O-10	9	11	10		J-24	8	9	9
	9	11	10			8	9	9
P-10	9	11	10			8	10	9
	9	11	10			7	9	8
O-11	10	12	11		I-24	8	10	9
	10	12	11			8	10	9
	11	13	12			8	9	9
	11	13	12			8	10	9
P-11	9	11	10		I-25	8	11	10
	8	10	9			9	12	11
	8	10	9			8	10	9
	8	10	9			8	10	9
Q-11	9	11	10		I-26	8	9	9
	8	10	9			8	10	9
	8	11	10			8	10	9
	9	11	10			8	9	9
P-12	10	12	11		I-27	9	10	10
	10	16	13			9	10	10
	10	12	11			9	10	10
	10	12	11			9	10	10
Q-12	8	11	10		K-23	7	10	9
	8	11	10			7	10	9
	9	11	10			7	9	8
	10	11	11			8	10	9
R-12	8	11	10		K-24	8	10	9
	8	11	10			8	10	9
	9	11	10			7	10	9
	9	11	10			8	9	9
P-13	8	10	9		K-25	8	10	9
	8	10	9			8	10	9
Q-13	8	11	10			8	10	9
	8	11	10			8	10	9
R-13	8	11	10		J-26	8	9	9
	8	11	10			7	9	8
						8	10	9
						8	9	9
					J-25	9	11	10
						9	11	10
						9	10	10
						9	11	10

Based on surveys conducted on June 5 and 7, 1996. See Attach. 9, Vol. 2.

Table A4-9	CRZ Areas Ambient and Surface Radiation Survey Results - uR/h (3 of 3)							
	North CRZ - Surface					South CRZ - Surface		
	Statistical Summary					Statistical Summary		
No. of data points:			34		No. of data points:			40
Maximum value:			13		Maximum value:			11
Minimum value:			9		Minimum value:			8
Average:			10.06		Average:			8.98
Std Deviation:			0.96		Std Deviation:			0.57
Coef. of variation (%):			9.54		Coef. of variation (%):			6.30
Ave. @ 95% confid. level:			10.34		Ave. @ 95% confid. level:			9.13
for t 0.05, 33	1.693				for t 0.05, 39	1.685		

Table A4-10	Excavation Floor Surface Soil Gross Alpha and Beta Activity						
Sample Code	Beta Activity (pCi/g)				Alpha Activity (pCi/g)		
No. SS-0496-	Activity	+/-Error	MDC		Activity	+/-Error	MDC
EF-47-N13C	42.00	2.60	2.60		25.00	2.90	2.30
EF-48-L22A	23.00	2.90	3.70		11.00	2.20	2.20
EF-15-019B	22.00	3.10	4.70		17.00	3.00	2.90
EF-16-M19C	23.00	2.60	3.40		22.00	3.10	1.90
EF-17-L19B	25.00	2.70	3.50		16.00	2.80	2.50
EF-18-J19C	25.00	3.00	4.10		17.00	3.00	2.80
EF-20-M20D	38.00	3.40	4.60		28.00	3.70	3.30
EF-24-M22C	26.00	3.00	4.30		21.00	3.30	2.80
EF-25-L22B	26.00	2.70	3.60		21.00	3.30	2.80
EF-27-017A	23.00	2.70	3.80		18.00	3.20	3.10
EF-33-L16B	32.00	3.00	3.90		27.00	3.50	2.60
EF-35-J14D	18.00	2.60	3.80		19.00	3.10	2.20
EF-36-L14A	23.00	2.70	3.70		21.00	3.10	2.60
EF-37-M14D	26.00	2.60	3.30		21.00	3.20	2.70
EF-39-013B	24.00	3.10	4.60		16.00	2.90	2.90
EF-41-L13A	27.00	2.70	3.50		17.00	2.80	1.90
EF-42-J13C	27.00	2.70	3.50		18.00	2.90	2.40
EF-44-011A	23.00	2.90	4.20		12.00	2.70	2.80
EF-43-M11D	18.00	2.90	4.50		14.00	2.90	3.20
EF-46-J11D	20.00	2.90	4.30		11.00	2.50	2.80
EF-45-L11A	25.00	3.20	4.20		17.00	3.70	3.50
EF-31-016B	35.00	3.80	4.90		19.00	4.10	4.40
EF-26-J22C	23.00	4.00	6.00		10.00	4.20	6.50
EF-28-M17D	43.00	4.20	5.40		20.00	3.90	3.80
EF-30-J17D	26.00	3.50	4.80		15.00	3.70	4.00
EF-40-M13C	41.00	4.00	5.00		34.00	5.30	4.90
EF-19-020A	24.00	3.70	5.30		16.00	4.10	4.70
EF-21-L20A	26.00	3.30	4.20		17.00	3.70	3.30
EF-22-J20D	22.00	2.50	2.90		13.00	2.30	2.20
EF-23-022B	28.00	3.00	3.80		13.00	2.40	2.20
EF-32-M16C	27.00	2.60	3.00		11.00	2.30	2.20
EF-29-L17A	23.00	3.10	4.00		13.00	2.90	3.30
EF-38-014A	30.00	2.80	3.30		14.00	2.70	2.90
EF-34-J16C	63.00	3.70	4.00		46.00	4.60	4.30
No. of data points:	34				34		
Maximum value:	63.00	4.20	6.00		46.00	5.30	6.50
Minimum value:	18.00	2.50	2.60		10.00	2.20	1.90
Average activity:	27.85	3.10	4.14		18.53	3.31	3.23
Std. Deviation:	8.84				7.17		
Coef. of variation (%):	31.72				38.72		
Ave. @ 95% confid. level:	30.4				20.6		
All samples analyzed by Data Chem, lab report no. 96R-0037-01, April 26, 1996, and 96R-0039-02, May 8, 1996.							
See Attach. 10, Vol. 2.							

Table A4-11	Excavation Side Surface Soil Gross Alpha and Beta Activity						
Sample Code	Beta Activity (pCi/g)				Alpha Activity (pCi/g)		
No. SS-0496-	Activity	+/-Error	MDC		Activity	+/-Error	MDC
ES-15-P12F	29.00	3.50	4.40		21.00	3.90	3.40
ES-18-LM11F	33.00	3.30	3.70		22.00	3.90	3.40
ES-19-K11F	33.00	4.00	5.40		14.00	3.30	3.30
ES-12-J14/15F	34.00	3.60	4.40		56.00	6.10	3.40
ES-17-N12F	28.00	3.00	3.70		27.00	3.20	2.50
ES-06-J21F	33.00	2.90	3.50		19.00	3.10	2.80
ES-09-J23F	19.00	2.60	3.80		12.00	2.70	3.10
ES-11-P16F	17.00	2.60	3.90		12.00	2.50	2.60
ES-10-J16/17F	15.00	2.50	3.80		14.00	2.70	2.20
ES-05-J18/19F*	9.90	2.80	4.00		4.30	4.30	4.30
ES-07-023F	21.00	2.90	3.70		11.00	2.40	2.50
ES-08-LM23F	18.00	2.60	3.30		9.00	2.40	2.70
ES-13-P14F	19.00	2.60	3.30		14.00	2.90	3.30
ES-14-J12F	23.00	2.70	3.30		12.00	2.50	2.60
No. of data points:	14				14		
Maximum value:	34.00	4.00	5.40		56.00	6.10	4.30
Minimum value:	9.90	2.50	3.30		4.30	2.40	2.20
Average activity:	23.71	3.00	3.91		17.66	3.42	3.05
Std. Deviation:	7.88				12.47		
Coef. of variation (%):	33.25				70.62		
Ave. @ 95% confid. level:	27.4				23.6		

* Sample alpha activity result (0.54+/-2.8 pCi/g) substituted with its MDC value.

All samples analyzed by Data Chem, lab report no. 96R-0039-02, 96R-0039-05, and 96R-0040-2, May 8, 1996.

See Attach. 10, Vol. 2.

Table A4-12	Excavation Subsurface Soil Gross Alpha and Beta Activity						
Sample Code	Beta Activity (pCi/g)				Alpha Activity (pCi/g)		
No. SU-0496-	Activity	+/-Error	MDC		Activity	+/-Error	MDC
EF-01-N16/17	32.00	2.60	2.90		17.00	2.60	2.20
EF-02-M18B	19.00	3.10	4.00		13.00	2.90	3.30
EF-03-M18B-QA/QC*	19.90	2.31	1.56		18.50	3.16	2.27
EF-04-N14A	20.00	2.70	3.40		13.00	2.70	3.00
No. of data points:	4				4		
Maximum value:	32.00	3.10	4.00		18.50	3.16	3.30
Minimum value:	19.00	2.31	1.56		13.00	2.60	2.20
Average activity:	22.73	2.69	3.10		15.38	2.85	2.73
Std. Deviation:	6.20				2.81		
Coef. of variation (%):	27.28				18.28		
Ave. @ 95% confid. level:	30				18.7		

* Sample analyzed by Quantera, all others analyzed by Data Chem.

Data Chem lab report no. 96R-0040-02, May 8, 1996. Quantera lab report no. APG01, May 2, 1996.

See Attach. 10, Vol. 2 and Attach. 14, Vol. 3.

Table A4-13		Excavation Floor Surface Soil Radionuclide Concentrations (1 of 4)							
Sample Code		K-40 Conc. (pCi/g)			Data	Co-60 Conc. (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-47-N13C	Bias high	7.80E+00	2.60E+00	8.40E-01	7.80E+00	2.90E-02	5.90E-02	1.10E-01	1.10E-01
EF-48-L22A	Bias low	7.70E+00	2.40E+00	5.00E-01	7.70E+00	-8.50E-03	3.90E-02	6.90E-02	6.90E-02
EF-15-019B		7.10E+00	1.40E+00	4.80E-01	7.10E+00	8.90E-03	2.50E-02	5.20E-02	5.20E-02
EF-16-M19C		6.90E+00	2.10E+00	3.60E-01	6.90E+00	1.20E-02	2.60E-02	4.90E-02	4.90E-02
EF-17-L19B		7.80E+00	2.10E+00	4.20E-01	7.80E+00	1.20E-02	2.90E-02	5.60E-02	5.60E-02
EF-18-J19C		8.50E+00	2.60E+00	4.80E-01	8.50E+00	9.70E-02	4.20E-02	6.80E-02	9.70E-02
EF-20-M20D		9.30E+00	3.50E+00	4.60E-01	9.30E+00	-1.40E-02	3.20E-02	5.20E-02	5.20E-02
EF-24-M22C		6.60E+00	1.90E+00	6.30E-01	6.60E+00	-1.20E-02	3.60E-02	6.30E-02	6.30E-02
EF-25-L22B		7.60E+00	2.20E+00	3.30E-01	7.60E+00	-1.40E-02	2.80E-02	4.60E-02	4.60E-02
EF-27-017A		6.70E+00	1.90E+00	7.60E-01	6.70E+00	7.60E-03	4.00E-02	7.70E-02	7.70E-02
EF-33-L16B		4.50E+00	1.50E+00	5.50E-01	4.50E+00	1.80E-01	7.30E-02	5.00E-02	1.80E-01
EF-35-J14D		5.60E+00	2.20E+00	5.60E-01	5.60E+00	9.20E-02	5.40E-02	9.30E-02	9.30E-02
EF-36-L14A		3.50E+00	1.30E+00	8.30E-01	3.50E+00	9.00E-02	4.90E-02	9.90E-02	9.90E-02
EF-37-M14D		9.20E+00	1.70E+00	4.10E-01	9.20E+00	1.90E-02	3.10E-02	6.00E-02	6.00E-02
EF-39-013B		5.70E+00	2.00E+00	8.20E-01	5.70E+00	8.80E-02	6.50E-02	1.30E-01	1.30E-01
EF-41-L13A		6.50E+00	1.80E+00	5.10E-01	6.50E+00	8.70E-01	5.90E-02	1.00E-01	8.70E-01
EF-42-J13C		7.30E+00	1.50E+00	5.00E-01	7.30E+00	-2.90E-03	3.40E-02	6.20E-02	6.20E-02
EF-44-011A		4.60E+00	1.60E+00	5.80E-01	4.60E+00	1.00E-02	3.80E-02	7.30E-02	7.30E-02
EF-43-M11D		4.00E+00	1.20E+00	5.30E-01	4.00E+00	3.70E-02	2.90E-02	5.90E-02	5.90E-02
EF-46-J11D		3.50E+00	1.20E+00	4.40E-01	3.50E+00	1.40E-01	5.30E-02	4.30E-02	1.40E-01
EF-45-L11A		5.20E+00	1.90E+00	1.10E+00	5.20E+00	5.10E-02	5.70E-02	1.20E-01	1.20E-01
EF-31-016B		5.80E+00	1.60E+00	8.70E-01	5.80E+00	6.80E-01	2.10E-01	9.50E-02	6.80E-01
EF-26-J22C		4.80E+00	1.60E+00	6.30E-01	4.80E+00	2.30E-01	8.40E-02	5.60E-02	2.30E-01
EF-28-M17D		3.50E+00	1.10E+00	5.10E-01	3.50E+00	5.40E-01	1.60E-01	7.50E-02	5.40E-01
EF-30-J17D		3.60E+00	1.50E+00	5.80E-01	3.60E+00	1.90E-01	1.00E-01	7.20E-02	1.90E-01
EF-40-M13C		1.10E+01	3.50E+00	8.10E-01	1.10E+01	1.10E-01	8.80E-02	1.50E-01	1.50E-01
EF-19-020A		9.30E+00	3.60E+00	6.50E-01	9.30E+00	-2.60E-03	3.40E-02	6.50E-02	6.50E-02
EF-21-L20A		9.10E+00	2.50E+00	5.70E-01	9.10E+00	5.00E-03	3.20E-02	6.00E-02	6.00E-02
EF-22-J20D		6.50E+00	1.40E+00	5.60E-01	6.50E+00	1.20E-02	3.70E-02	6.90E-01	6.90E-01
EF-23-022B		1.00E+01	3.00E+00	4.70E-01	1.00E+01	2.10E-02	3.40E-02	6.70E-02	6.70E-02
EF-32-M16C		1.10E+00	8.80E-01	7.80E-01	1.10E+00	2.70E-01	1.00E-01	7.80E-02	2.70E-01
EF-29-L17A		7.40E+00	1.50E+00	5.60E-01	7.40E+00	1.20E-01	7.00E-02	5.30E-02	1.20E-01
EF-38-014A		2.40E+00	9.70E-01	4.10E-01	2.40E+00	3.30E-01	9.60E-02	5.50E-01	5.50E-01
EF-34-J16C		3.90E+00	1.30E+00	8.10E-01	3.90E+00	4.00E-01	1.40E-01	8.40E-02	4.00E-01
No. of data points:		34			34	34			34
Maximum value:		11.00	3.60	1.10	11.00	0.87	0.21	0.69	0.87
Minimum value:		1.10	0.88	0.33	1.10	-0.01	0.03	0.04	0.05
Average activity:		6.29	2.04	0.62	6.29	0.14	0.07	0.17	0.19
Std. Deviation:		2.34			2.34	0.21			0.22
Coef. of variation (%):		37.25			37.25	154.44			112.49
Ave. @ 95% confid. level:		6.97E+00			6.97E+00	1.96E-01			2.56E-01
(for t 0.05,33)	1.693								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0037-02, 96R-0039-01, and 96R-0040-01, May 17, 1996. See Attach. 10, Vol. 2 and Attach. 12, Vol. 3.

Table A4-13		Excavation Floor Surface Soil Radionuclide Concentrations (2 of 4)							
Sample Code		Ba-133 Conc. (pCi/g)			Data	Cs-137 Conc. (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-47-N13C	Bias high	1.40E-02	6.10E-02	9.80E-02	9.80E-02	4.90E-01	1.50E-01	1.20E-01	4.90E-01
EF-48-L22A	Bias low	1.50E-02	4.80E-02	7.80E-02	7.80E-02	5.00E-01	1.40E-01	7.40E-02	5.00E-01
EF-15-019B		2.40E-02	4.10E-02	6.50E-02	6.50E-02	5.20E-01	1.20E-01	7.20E-02	5.20E-01
EF-16-M19C		2.10E-02	2.90E-02	4.90E-02	4.90E-02	3.20E-01	9.20E-02	6.00E-02	3.20E-01
EF-17-L19B		-3.80E-02	4.50E-02	6.40E-02	6.40E-02	6.90E+00	1.40E+00	5.80E-02	6.90E+00
EF-18-J19C		2.20E-02	3.60E-02	5.80E-02	5.80E-02	8.20E-01	1.70E-01	5.00E-02	8.20E-01
EF-20-M20D		2.00E-02	3.70E-02	6.00E-02	6.00E-02	-1.30E-02	4.00E-02	6.80E-02	6.80E-02
EF-24-M22C		-4.00E-03	4.60E-02	6.90E-02	6.90E-02	4.50E-01	1.60E-01	7.40E-02	4.50E-01
EF-25-L22B		9.40E-03	3.20E-02	5.10E-02	5.10E-02	1.70E-02	3.10E-02	5.60E-02	5.60E-02
EF-27-017A		-1.70E-01	6.40E-02	8.40E-02	8.40E-02	1.10E+00	2.80E-01	8.90E-02	1.10E+00
EF-33-L16B		1.90E-02	4.10E-02	6.50E-02	6.50E-02	3.80E+00	7.10E-01	7.10E-02	3.80E+00
EF-35-J14D		2.00E-02	4.60E-02	7.40E-02	7.40E-02	8.70E-01	4.20E-01	6.90E-02	8.70E-01
EF-36-L14A		-3.80E-02	5.50E-02	7.70E-02	7.70E-02	2.20E+00	5.10E-01	7.20E-02	2.20E+00
EF-37-M14D		1.10E-02	3.70E-02	5.70E-02	5.70E-02	3.00E-01	9.50E-02	6.30E-02	3.00E-01
EF-39-013B		-8.30E-03	7.50E-02	1.20E-01	1.20E-01	2.20E+00	4.40E-01	1.30E-01	2.20E+00
EF-41-L13A		-1.40E-02	4.00E-02	6.00E-02	6.00E-02	1.70E+00	3.80E-01	7.30E-02	1.70E+00
EF-42-J13C		-1.70E-02	4.90E-02	7.10E-02	7.10E-02	1.30E+00	2.50E-01	7.40E-02	1.30E+00
EF-44-011A		-2.50E-02	5.00E-02	7.50E-02	7.50E-02	1.30E+00	2.70E-01	7.60E-02	1.30E+00
EF-43-M11D		3.00E-03	3.40E-02	5.30E-02	5.30E-02	6.30E-01	1.60E-01	6.50E-02	6.30E-01
EF-46-J11D		5.90E-03	3.50E-02	5.50E-02	5.50E-02	1.40E+00	2.80E-01	6.00E-02	1.40E+00
EF-45-L11A		3.30E-02	5.80E-02	9.50E-02	9.50E-02	1.50E+00	3.70E-01	1.20E-01	1.50E+00
EF-31-016B		-5.80E-03	1.00E-01	1.50E-01	1.50E-01	1.10E+01	1.90E+00	1.70E-01	1.10E+01
EF-26-J22C		-1.00E-01	6.50E-02	9.40E-02	9.40E-02	1.00E+01	1.90E+00	8.00E-02	1.00E+01
EF-28-M17D		-5.20E-02	7.20E-02	1.00E-01	1.00E-01	1.90E+01	3.90E+00	9.30E-02	1.90E+01
EF-30-J17D		2.90E-02	6.10E-02	9.80E-02	9.80E-02	3.50E+00	1.70E+00	9.20E-02	3.50E+00
EF-40-M13C		-2.10E-03	6.40E-02	9.40E-02	9.40E-02	3.40E-01	1.10E-01	1.10E-01	3.40E-01
EF-19-020A		5.50E-03	5.00E-02	7.90E-02	7.90E-02	3.10E-01	1.80E-01	9.00E-02	3.10E-01
EF-21-L20A		-8.50E-04	4.40E-02	6.60E-02	6.60E-02	2.70E-01	9.80E-02	8.60E-02	2.70E-01
EF-22-J20D		2.90E-02	3.80E-02	6.10E-02	6.10E-02	1.60E+00	2.90E-01	6.80E-02	1.60E+00
EF-23-022B		-9.80E-02	5.00E-02	6.80E-02	6.80E-02	4.20E-01	1.10E-01	7.00E-02	4.20E-01
EF-32-M16C		2.20E-02	7.10E-02	1.10E-01	1.10E-01	1.00E+01	2.10E+00	9.20E-02	1.00E+01
EF-29-L17A		-4.60E-02	4.60E-02	6.10E-02	6.10E-02	2.60E+00	4.50E-01	6.80E-02	2.60E+00
EF-38-014A		-2.70E-02	5.40E-02	7.60E-02	7.60E-02	6.80E+00	1.20E+00	8.50E-02	6.80E+00
EF-34-J16C		1.30E-02	6.60E-02	1.00E-01	1.00E-01	9.00E+00	2.00E+00	9.00E-02	9.00E+00
No. of data points:		34			34	34			34
Maximum value:		0.03	0.10	0.15	0.15	19.00	3.90	0.17	19.00
Minimum value:		-0.17	0.03	0.05	0.05	-0.01	0.03	0.05	0.06
Average activity:		-0.01	0.05	0.08	0.08	3.03	1.08	0.09	3.04
Std. Deviation:		0.04			0.02	4.28			4.28
Coef. of variation (%):		-445.37			28.68	141.12			140.87
Ave. @ 95% confid. level:		2.85E-03			8.40E-02	4.28E+00			4.28E+00
(for t 0.05,33)	1.693								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0037-02, 96R-0039-01, and 96R-0040-01, May 17, 1996. See Attach. 10, Vol. 2 and Attach. 12, Vol. 3.

Table A4-13		Excavation Floor Surface Soil Radionuclide Concentrations (3 of 4)							
Sample Code		Eu-152 Conc. (pCi/g)			Data	Th-234 Conc. (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-47-N13C	Bias high	4.10E-01	2.50E-01	5.20E-01	5.20E-01	2.10E+00	5.60E+00	1.20E+00	2.10E+00
EF-48-L22A	Bias low	1.50E-01	1.80E-01	3.60E-01	3.60E-01	1.20E+00	3.30E+00	9.20E-01	1.20E+00
EF-15-019B		4.30E-01	1.40E-01	2.60E-01	4.30E-01	9.70E-01	2.90E+00	2.00E+00	2.00E+00
EF-16-M19C		-4.10E-02	1.30E-01	2.20E-01	2.20E-01	3.30E-01	1.00E+00	6.50E-01	6.50E-01
EF-17-L19B		7.60E-02	1.50E-01	2.80E-01	2.80E-01	9.10E-01	2.50E+00	7.00E-01	9.10E-01
EF-18-J19C		7.30E-02	1.30E-01	2.50E-01	2.50E-01	1.40E+00	4.00E+00	6.70E-01	1.40E+00
EF-20-M20D		1.40E-01	1.50E-01	2.90E-01	2.90E-01	1.20E+00	3.40E+00	2.00E+00	2.00E+00
EF-24-M22C		1.30E-01	2.00E-01	3.90E-01	3.90E-01	9.30E-01	2.60E+00	7.50E-01	9.30E-01
EF-25-L22B		1.80E-01	1.40E-01	2.70E-01	2.70E-01	1.10E+00	2.90E+00	6.70E-01	1.10E+00
EF-27-017A		1.00E-01	2.30E-01	4.40E-01	4.40E-01	7.90E-01	2.30E+00	9.30E-01	9.30E-01
EF-33-L16B		1.40E-01	1.60E-01	2.90E-01	2.90E-01	1.50E+00	4.30E+00	1.40E+00	1.50E+00
EF-35-J14D		6.90E-03	1.50E-01	2.80E-01	2.80E-01	1.80E+00	4.90E+00	2.30E+00	2.30E+00
EF-36-L14A		2.10E-01	1.80E-01	3.70E-01	3.70E-01	2.20E+00	5.80E+00	7.50E-01	2.20E+00
EF-37-M14D		1.50E-01	1.40E-01	2.50E-01	2.50E-01	1.50E+00	4.00E+00	2.10E+00	2.10E+00
EF-39-013B		1.00E-01	2.80E-01	5.30E-01	5.30E-01	1.30E+00	3.70E+00	1.30E+00	1.30E+00
EF-41-L13A		1.50E-02	1.60E-01	3.00E-01	3.00E-01	1.30E+00	3.40E+00	7.80E-01	1.30E+00
EF-42-J13C		1.40E-01	1.60E-01	3.40E-01	3.40E-01	-4.50E-03	1.50E+00	2.30E+00	2.30E+00
EF-44-011A		1.50E-01	2.10E-01	4.00E-01	4.00E-01	9.00E-01	2.50E+00	8.70E-01	9.00E-01
EF-43-M11D		2.50E-02	1.30E-01	2.50E-01	2.50E-01	1.10E+00	3.00E+00	6.50E-01	1.10E+00
EF-46-J11D		2.30E-02	1.20E-01	2.40E-01	2.40E-01	7.60E-01	2.40E+00	1.30E+00	1.30E+00
EF-45-L11A		-3.20E-02	2.50E-02	4.60E-01	4.60E-01	1.20E+00	3.30E+00	1.00E+00	1.20E+00
EF-31-016B		-1.50E-02	2.90E-01	5.00E-01	5.00E-01	3.40E+00	9.30E+00	4.10E+00	4.10E+00
EF-26-J22C		5.60E-02	1.40E-01	2.80E-01	2.80E-01	1.90E-01	1.10E+00	1.00E+00	1.00E+00
EF-28-M17D		1.50E-01	2.00E-01	4.00E-01	4.00E-01	1.10E+00	3.00E+00	9.50E-01	1.10E+00
EF-30-J17D		1.30E-01	1.80E-01	3.70E-01	3.70E-01	2.40E+00	6.50E+00	3.00E+00	3.00E+00
EF-40-M13C		3.70E-01	2.80E-01	5.60E-01	5.60E-01	3.80E+00	1.00E+01	1.40E+00	3.80E+00
EF-19-020A		-9.60E-04	1.40E-01	2.80E-01	2.80E-01	7.80E-01	2.70E+00	2.90E+00	2.90E+00
EF-21-L20A		-1.10E-01	1.80E-01	3.00E-01	3.00E-01	1.10E+00	2.90E+00	6.90E-01	1.10E+00
EF-22-J20D		7.70E-02	1.60E-01	3.10E-01	3.10E-01	8.70E-01	2.50E+00	1.90E+00	1.90E+00
EF-23-022B		2.50E-01	1.70E-01	3.50E-01	3.50E-01	1.30E+00	3.50E+00	8.70E-01	1.30E+00
EF-32-M16C		5.70E-02	1.80E-01	3.60E-01	3.60E-01	1.30E+00	3.40E+00	9.30E-01	1.30E+00
EF-29-L17A		3.20E-01	2.40E-01	3.70E-01	3.70E-01	2.70E-01	1.40E+00	2.00E+00	2.00E+00
EF-38-014A		1.80E-01	1.70E-01	3.50E-01	3.50E-01	8.40E-01	2.30E+00	8.70E-01	8.70E-01
EF-34-J16C		6.10E-01	4.70E-01	5.30E-01	6.10E-01	5.70E-01	1.90E+00	1.10E+00	1.10E+00
No. of data points:		34			34	34			34
Maximum value:		0.61	0.47	0.56	0.61	3.80	10.00	4.10	4.10
Minimum value:		-0.11	0.03	0.22	0.22	0.00	1.00	0.65	0.65
Average activity:		0.14	0.20	0.36	0.36	1.25	4.03	1.60	1.65
Std. Deviation:		0.15			0.10	0.80			0.83
Coef. of variation (%):		109.67			27.71	63.96			50.28
Ave. @ 95% confid. level:		1.80E-01			3.88E-01	1.48E+00			1.89E+00
(for t 0.05,33)	1.693								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0037-02, 96R-0039-01, and 96R-0040-01, May 17, 1996. See Attach. 10, Vol. 2 and Attach. 12, Vol. 3.

Table A4-13		Excavation Floor Surface Soil Radionuclide Concentrations (4 of 4)							
Sample Code		Ra-226 Conc. (pCi/g)			Data	Ac-228 Conc. (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-47-N13C	Bias high	3.90E+00	1.90E+00	1.10E+00	3.90E+00	1.50E+00	5.10E-01	3.30E-01	1.50E+00
EF-48-L22A	Bias low	1.70E+00	1.10E+00	9.30E-01	1.70E+00	9.60E-01	3.20E-01	2.70E-01	9.60E-01
EF-15-019B		9.70E-01	7.50E-01	7.50E-01	9.70E-01	9.50E-01	3.00E-01	2.10E-01	9.50E-01
EF-16-M19C		8.70E-01	7.30E-01	6.30E-01	8.70E-01	7.90E-01	2.70E-01	3.80E-01	7.90E-01
EF-17-L19B		1.90E+00	1.10E+00	7.10E-01	1.90E+00	9.30E-01	3.10E-01	1.90E-01	9.30E-01
EF-18-J19C		1.80E+00	9.10E-01	6.70E-01	1.80E+00	1.10E+00	3.20E-01	2.10E-01	1.10E+00
EF-20-M20D		9.40E-01	7.80E-01	7.80E-01	9.40E-01	1.10E+00	3.80E-01	2.30E-01	1.10E+00
EF-24-M22C		1.20E+00	7.80E-01	8.10E-01	1.20E+00	1.00E+00	2.80E-01	4.70E-01	1.00E+00
EF-25-L22B		1.50E+00	8.40E-01	6.40E-01	1.50E+00	9.70E-01	2.80E-01	1.70E-01	9.70E-01
EF-27-017A		1.40E+00	1.00E+00	8.50E-01	1.40E+00	1.00E+00	3.50E-01	2.80E-01	1.00E+00
EF-33-L16B		3.40E+00	1.30E+00	8.10E-01	3.40E+00	7.30E-01	2.50E-01	3.80E-01	7.30E-01
EF-35-J14D		1.10E+00	9.10E-01	8.80E-01	1.10E+00	5.60E-01	3.10E-01	4.30E-01	5.60E-01
EF-36-L14A		2.50E+00	1.30E+00	8.30E-01	2.50E+00	5.20E-01	2.80E-01	4.00E-01	5.20E-01
EF-37-M14D		1.00E+00	7.20E-01	7.30E-01	1.00E+00	1.30E+00	3.10E-01	2.00E-01	1.30E+00
EF-39-013B		1.50E+00	1.40E+00	1.40E+00	1.50E+00	1.20E+00	4.20E-01	6.90E-01	1.20E+00
EF-41-L13A		1.70E+00	1.10E+00	7.10E-01	1.70E+00	1.00E+00	3.00E-01	2.10E-01	1.00E+00
EF-42-J13C		2.20E+00	1.00E+00	8.20E-01	2.20E+00	1.20E+00	3.20E-01	2.30E-01	1.20E+00
EF-44-011A		1.50E+00	1.10E+00	9.60E-01	1.50E+00	7.80E-01	2.70E-01	4.90E-01	7.80E-01
EF-43-M11D		1.20E+00	3.70E-01	5.90E-01	1.20E+00	5.80E-01	2.20E-01	2.10E-01	5.80E-01
EF-46-J11D		1.10E+00	9.60E-01	7.20E-01	1.10E+00	6.50E-01	2.10E-01	3.30E-01	6.50E-01
EF-45-L11A		1.40E+00	1.20E+00	1.20E+00	1.40E+00	1.20E+00	4.60E-01	3.70E-01	1.20E+00
EF-31-016B		2.80E+00	2.10E+00	1.60E+00	2.80E+00	6.90E-01	4.60E-01	6.60E-01	6.90E-01
EF-26-J22C		1.40E+00	1.20E+00	1.10E+00	1.40E+00	6.40E-01	2.80E-01	4.60E-01	6.40E-01
EF-28-M17D		3.20E+00	1.60E+00	1.20E+00	3.20E+00	6.60E-01	2.90E-01	4.60E-01	6.60E-01
EF-30-J17D		1.50E+00	1.10E+00	1.10E+00	1.50E+00	7.30E-01	3.70E-01	5.10E-01	7.30E-01
EF-40-M13C		6.00E+00	2.20E+00	1.30E+00	6.00E+00	2.90E+00	7.40E-01	3.50E-01	2.90E+00
EF-19-020A		1.40E+00	9.60E-01	9.70E-01	1.40E+00	1.10E+00	3.90E-01	2.70E-01	1.10E+00
EF-21-L20A		1.30E+00	8.80E-01	7.50E-01	1.30E+00	1.20E+00	3.60E-01	5.10E-01	1.20E+00
EF-22-J20D		1.10E+00	7.90E-01	7.80E-01	1.10E+00	1.00E+00	3.00E-01	4.40E-01	1.00E+00
EF-23-022B		1.90E+00	1.30E+00	8.40E-01	1.90E+00	1.20E+00	3.50E-01	2.30E-01	1.20E+00
EF-32-M16C		1.90E+00	1.30E+00	1.20E+00	1.90E+00	4.20E-01	2.90E-01	4.20E-01	4.20E-01
EF-29-L17A		1.10E+00	8.80E-01	8.20E-01	1.10E+00	8.00E-01	3.00E-01	4.40E-01	8.00E-01
EF-38-014A		7.50E+00	2.70E+00	1.90E+00	7.50E+00	3.90E-01	2.80E-01	3.80E-01	3.90E-01
EF-34-J16C		1.10E+01	3.70E+00	1.20E+00	1.10E+01	6.50E-01	3.50E-01	4.40E-01	6.50E-01
No. of data points:		34			34	34			34
Maximum value:		11.00	3.70	1.90	11.00	2.90	0.74	0.69	2.90
Minimum value:		0.87	0.37	0.59	0.87	0.39	0.21	0.17	0.39
Average activity:		2.26	1.39	0.99	2.26	0.95	0.35	0.38	0.95
Std. Deviation:		2.10			2.10	0.44			0.44
Coef. of variation (%):		92.71			92.71	45.81			45.81
Ave. @ 95% confid. level:		2.87E+00			2.87E+00	1.08E+00			1.08E+00
(for t 0.05,33)	1.693								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0037-02, 96R-0039-01, and 96R-0040-01, May 17, 1996. See Attach. 10, Vol. 2 and Attach. 12, Vol. 3.

Table A4-14		Excavation Side Surface Soil Radionuclide Concentrations (1 of 4)							
Sample Code		K-40 Conc. (pCi/g)			Data	Co-60 Conc. (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
ES-15-P12F		8.50E+00	1.90E+00	7.60E-01	8.50E+00	2.40E-02	5.70E-02	1.10E-01	1.10E-01
ES-18-LM11		6.10E+00	1.90E+00	4.70E-01	6.10E+00	9.40E-02	5.10E-02	6.50E-02	9.40E-02
ES-19-K11F		6.40E+00	1.90E+00	6.60E-01	6.40E+00	9.40E-03	4.00E-02	7.70E-02	7.70E-02
ES-12-J14/15F		4.10E+00	1.70E+00	7.30E-01	4.10E+00	4.70E-02	4.70E-02	9.90E-02	9.90E-02
ES-17-N12F		9.50E+00	3.10E+00	7.20E-01	9.50E+00	-4.40E-02	5.00E-02	7.80E-02	7.80E-02
ES-06-J21F		3.70E+00	1.60E+00	3.90E-01	3.70E+00	1.80E-01	7.60E-02	5.20E-02	1.80E-01
ES-09-J23F		6.50E+00	1.80E+00	4.60E-01	6.50E+00	1.50E-02	3.30E-02	6.20E-02	6.20E-02
ES-11-P16F		5.80E+00	1.10E+00	3.60E-01	5.80E+00	-1.10E-02	2.20E-02	3.80E-02	3.80E-02
ES-10-J16/17F		3.10E+00	1.00E+00	4.30E-01	3.10E+00	5.60E-03	2.50E-02	4.70E-02	4.70E-02
ES-05-J18/19F		3.00E+00	1.10E+00	3.90E-01	3.00E+00	2.90E-03	2.40E-02	4.50E-02	4.50E-02
ES-07-O23F		9.90E+00	3.00E+00	5.60E-01	9.90E+00	-8.10E-03	4.10E-02	7.10E-02	7.10E-02
ES-08-LM23F		6.30E+00	1.80E+00	4.20E-01	6.30E+00	3.90E-03	3.10E-02	5.70E-02	5.70E-02
ES-13-P14F		6.80E+00	2.10E-01	3.80E-01	6.80E+00	1.20E-02	3.30E-02	6.30E-02	6.30E-02
ES-14-J12F		4.10E+00	1.30E+00	4.30E-01	4.10E+00	7.10E-02	3.70E-02	7.20E-02	7.20E-02
No. of data points:		14			14	14			14
Maximum value:		9.90	3.10	0.76	9.90	0.18	0.08	0.11	0.18
Minimum value:		3.00	0.21	0.36	3.00	-0.04	0.02	0.04	0.04
Average activity:		5.99	1.82	0.53	5.99	0.03	0.04	0.07	0.08
Std. Deviation:		2.23			2.23	0.06			0.04
Coef. of variation (%):		37.30			37.30	193.74			46.02
Ave. @ 95%	Ave. @ 95%	7.04E+00			7.04E+00	5.50E-02			9.51E-02
(for t 0.05,13)	1.771								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no.96R-0037-02, 96R-0039-01, 96R-0039-04, and 96R-0040-01, May 17, 1996. See Attach. 10, Vol. 2 and Attach. 12, Vol. 3.

Table A4-14	Excavation Side Surface Soil Radionuclide Concentrations (2 of 4)							
Sample Code	Ba-133 Conc. (pCi/g)			Data	Cs-137 Conc. (pCi/g)			Data
No. SS-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
ES-15-P12F	5.30E-04	6.10E-02	9.30E-02	9.30E-02	4.00E-01	1.30E-01	1.30E-01	4.00E-01
ES-18-LM11	3.50E-02	4.70E-02	7.40E-02	7.40E-02	2.00E+00	3.80E-01	6.70E-02	2.00E+00
ES-19-K11F	-4.80E-03	4.50E-02	7.00E-02	7.00E-02	3.60E-01	1.10E-01	9.60E-02	3.60E-01
ES-12-J14/15F	-6.50E-03	6.20E-02	9.40E-02	9.40E-02	5.40E-01	2.90E-01	9.20E-02	5.40E-01
ES-17-N12F	-4.90E-01	1.10E-01	9.50E-02	9.50E-02	3.70E-03	6.90E-02	1.20E-01	1.20E-01
ES-06-J21F	8.00E-03	8.40E-02	1.30E-01	1.30E-01	1.20E+01	5.40E+00	1.00E-01	1.20E+01
ES-09-J23F	3.30E-02	3.40E-02	5.70E-02	5.70E-02	5.50E-01	1.50E-01	6.40E-02	5.50E-01
ES-11-P16F	-4.40E-03	3.30E-02	5.00E-02	5.00E-02	2.10E-01	8.00E-02	5.60E-02	2.10E-01
ES-10-J16/17F	6.50E-03	3.20E-02	5.10E-02	5.10E-02	3.10E-01	7.80E-02	5.70E-02	3.10E-01
ES-05-J18/19F	5.40E-04	3.40E-02	5.40E-02	5.40E-02	4.20E-02	4.60E-02	4.60E-02	4.60E-02
ES-07-O23F	3.10E-02	4.70E-02	7.80E-02	7.80E-02	7.80E-01	1.70E-01	8.70E-02	7.80E-01
ES-08-LM23F	-2.70E-01	6.00E-02	4.80E-02	4.80E-02	8.70E-01	4.20E-01	6.90E-02	8.70E-01
ES-13-P14F	-1.30E-02	3.70E-02	5.50E-02	5.50E-02	3.80E-01	9.90E-02	6.50E-02	3.80E-01
ES-14-J12F	-5.70E-03	3.80E-02	5.90E-02	5.90E-02	3.60E+00	6.50E-01	5.90E-02	3.60E+00
No. of data points:	14			14	14			14
Maximum value:	0.04	0.11	0.13	0.13	12.00	5.40	0.13	12.00
Minimum value:	-0.49	0.03	0.05	0.05	0.00	0.05	0.05	0.05
Average activity:	-0.05	0.06	0.08	0.07	1.57	1.47	0.08	1.58
Std. Deviation:	0.15			0.02	3.15			3.14
Coef. of variation (%):	-304.19			33.07	199.87			198.51
Ave. @ 95% confid. level:	2.14E-02			8.33E-02	3.06E+00			3.07E+00
(for t 0.05,13) 1.771								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no.96R-0037-02, 96R-0039-01, 96R-0039-04, and 96R-0040-01, May 17, 1996. See Attach. 10, Vol. 2 and Attach. 12, Vol. 3.

Table A4-14	Excavation Side Surface Soil Radionuclide Concentrations (3 of 4)							
Sample Code	Eu-152 Conc. (pCi/g)			Data	Th-234 Conc. (pCi/g)			Data
No. SS-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
ES-15-P12F	1.70E-01	2.30E-01	4.70E-01	4.70E-01	2.50E+00	6.90E+00	3.10E+00	3.10E+00
ES-18-LM11	1.10E-02	1.70E-01	3.20E-01	3.20E-01	8.70E-01	2.40E+00	8.30E-01	8.70E-01
ES-19-K11F	-8.50E-02	1.90E-01	3.30E-01	3.30E-01	1.40E+00	3.70E+00	9.30E-01	1.40E+00
ES-12-J14/15F	7.70E-02	2.10E-01	4.30E-01	4.30E-01	2.10E+00	5.80E+00	3.00E+00	3.00E+00
ES-17-N12F	9.40E-02	2.80E-01	5.20E-01	5.20E-01	4.50E+00	1.20E+01	2.60E+00	4.50E+00
ES-06-J21F	1.20E-01	1.80E-01	3.70E-01	3.70E-01	2.60E+00	7.00E+00	3.10E+00	3.10E+00
ES-09-J23F	9.50E-02	1.50E-01	2.90E-01	2.90E-01	9.90E-01	2.70E+00	5.90E-01	9.90E-01
ES-11-P16F	-1.10E-02	1.30E-01	2.40E-01	2.40E-01	8.40E-01	2.50E+00	1.70E+00	1.70E+00
ES-10-J16/17F	1.70E-01	1.20E-01	2.50E-01	2.50E-01	2.50E-01	7.80E-01	5.10E-01	5.10E-01
ES-05-J18/19F	9.60E-02	1.50E-01	2.90E-01	2.90E-01	3.30E-01	1.00E+00	5.40E-01	5.40E-01
ES-07-O23F	8.80E-02	1.90E-01	3.70E-01	3.70E-01	9.50E-01	2.70E+00	8.70E-01	9.50E-01
ES-08-LM23F	7.90E-02	1.50E-01	2.80E-01	2.80E-01	1.00E+00	2.80E+00	7.00E-01	1.00E+00
ES-13-P14F	1.60E-01	1.70E-01	3.30E-01	3.30E-01	2.00E+00	5.40E+00	1.40E+00	2.00E+00
ES-14-J12F	9.00E-02	1.40E-01	2.60E-01	2.60E-01	3.90E-01	1.20E+00	6.20E-01	6.20E-01
No. of data points:	14			14	14			14
Maximum value:	0.17	0.28	0.52	0.52	4.50	12.00	3.10	4.50
Minimum value:	-0.09	0.12	0.24	0.24	0.25	0.78	0.51	0.51
Average activity:	0.08	0.18	0.35	0.34	1.48	5.03	1.77	1.73
Std. Deviation:	0.07			0.08	1.16			1.23
Coef. of variation (%):	85.94			24.91	78.69			71.14
Ave. @ 95% confid. level:	1.16E-01			3.79E-01	2.03E+00			2.32E+00
(for t 0.05,13) 1.771								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no.96R-0037-02, 96R-0039-01, 96R-0039-04, and 96R-0040-01, May 17, 1996. See Attach. 10, Vol. 2 and Attach. 12, Vol. 3.

Table A4-14	Excavation Side Surface Soil Radionuclide Concentrations (4 of 4)							
Sample Code	Ra-226 Conc. (pCi/g)			Data	Ac-228 Conc. (pCi/g)			Data
No. SS-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
ES-15-P12F	1.50E+00	1.20E+00	1.20E+00	1.50E+00	1.40E+00	5.30E-01	3.60E-01	1.40E+00
ES-18-LM11	2.20E+00	1.20E+00	8.50E-01	2.20E+00	9.70E-01	3.10E-01	1.90E-01	9.70E-01
ES-19-K11F	1.40E+00	1.00E+00	8.70E-01	1.40E+00	1.10E+00	4.20E-01	2.90E-01	1.10E+00
ES-12-J14/15F	3.00E+00	1.30E+00	9.30E-01	3.00E+00	6.20E-01	2.80E-01	4.80E-01	6.20E-01
ES-17-N12F	3.30E+00	1.80E+00	1.30E+00	3.30E+00	1.90E+00	4.80E-01	3.60E-01	1.90E+00
ES-06-J21F	2.10E+00	1.50E+00	1.20E+00	2.10E+00	4.30E-01	2.80E-01	4.00E-01	4.30E-01
ES-09-J23F	9.70E-01	6.60E-01	6.50E-01	9.70E-01	8.20E-01	2.50E-01	3.70E-01	8.20E-01
ES-11-P16F	1.00E+00	5.30E-01	6.00E-01	1.00E+00	9.10E-01	2.50E-01	3.80E-01	9.10E-01
ES-10-J16/17F	5.30E-01	5.50E-01	5.90E-01	5.90E-01	4.90E-01	2.10E-01	3.00E-01	4.90E-01
ES-05-J18/19F	3.00E-01	6.70E-01	6.30E-01	6.30E-01	4.00E-01	2.10E-01	3.20E-01	4.00E-01
ES-07-O23F	2.80E+00	1.40E+00	8.00E-01	2.80E+00	1.20E+00	3.30E-01	2.20E-01	1.20E+00
ES-08-LM23F	1.60E+00	8.10E-01	6.00E-01	1.60E+00	1.10E+00	3.10E-01	1.90E-01	1.10E+00
ES-13-P14F	1.40E+00	3.40E+00	7.00E-01	1.40E+00	7.70E-01	3.40E-01	4.20E-01	7.70E-01
ES-14-J12F	1.40E+00	8.00E-01	6.90E-01	1.40E+00	5.30E-01	2.20E-01	3.20E-01	5.30E-01
No. of data points:	14			14	14			14
Maximum value:	3.30	3.40	1.30	3.30	1.90	0.53	0.48	1.90
Minimum value:	0.30	0.53	0.59	0.59	0.40	0.21	0.19	0.40
Average activity:	1.68	1.40	0.86	1.71	0.90	0.33	0.34	0.90
Std. Deviation:	0.90			0.86	0.42			0.42
Coef. of variation (%):	53.63			50.33	46.61			46.61
Ave. @ 95% confid. level:	2.10E+00			2.11E+00	1.10E+00			1.10E+00
(for t 0.05,13) 1.771								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no.96R-0037-02, 96R-0039-01, 96R-0039-04, and 96R-0040-01, May 17, 1996. See Attach. 10, Vol. 2 and Attach. 12, Vol. 3.

Table A4-15	Excavation Subsurface Soil Radionuclide Concentrations (1 of 2)							
Sample Code	K-40 Conc. (pCi/g)			Data	Co-60 Conc. (pCi/g)			Data
No. SU-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-01-N16/17	9.20E+00	2.70E+00	5.50E-01	9.20E+00	7.50E-02	5.40E-02	8.70E-02	8.70E-02
EF-02-M18B	6.10E+00	2.20E+00	7.30E-01	6.10E+00	9.50E-02	7.00E-02	8.10E-02	9.50E-02
EF-03-M18B QA/QC	6.66E+00	9.82E-01	3.95E-01	6.66E+00	3.52E-02	4.82E-02	4.63E-02	4.63E-02
EF-04-N14A	6.10E+00	1.90E+00	5.10E-01	6.10E+00	3.00E-04	3.00E-02	5.60E-02	5.60E-02
No. of data points:	4			4	4			4
Maximum value:	9.20	2.70	0.73	9.20	0.10	0.07	0.09	0.10
Minimum value:	6.10	0.98	0.40	6.10	0.00	0.03	0.05	0.05
Average activity:	7.02	2.04	0.56	7.02	0.05	0.05	0.07	0.07
Std. Deviation:	1.48			1.48	0.04			0.02
Coef. of variation (%):	21.10			21.10	82.06			33.17
Ave. @ 95% confid. level:	8.76E+00			8.76E+00	1.01E-01			9.88E-02
(for t 0.05,3) 2.353								
Sample analyzed via gamma spectroscopy by Quantera, all others analyzed by Data Chem.								
Data Chem lab report no. 96R-0040-01, May 17, 1996. Quantera lab report no. APG01, May 2, 1996.								
See Attach. 10, Vol. 2 and Attach. 14, Vol. 3.								

Sample Code	Ba-133 Conc. (pCi/g)			Data	Cs-137 Conc. (pCi/g)			Data
No. SU-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-01-N16/17	-7.00E-03	4.60E-02	7.20E-02	7.20E-02	8.30E-01	1.80E-01	8.20E-02	8.30E-01
EF-02-M18B	-1.60E-02	5.80E-02	9.00E-02	9.00E-02	3.30E+00	6.20E-01	1.00E-01	3.30E+00
EF-03-M18B QA/QC	2.47E-02	2.32E-02	3.51E-02	3.51E-02	8.67E-02	5.18E-02	4.12E-02	8.67E-02
EF-04-N14A	-2.10E-01	5.80E-02	6.10E-02	6.10E-02	1.60E-01	7.40E-02	6.50E-02	1.60E-01
No. of data points:	4			4	4			4
Maximum value:	0.02	0.06	0.09	0.09	3.30	0.62	0.10	3.30
Minimum value:	-0.21	0.02	0.04	0.04	0.09	0.05	0.04	0.09
Average activity:	-0.05	0.05	0.07	0.06	1.09	0.33	0.08	1.09
Std. Deviation:	0.11			0.02	1.51			1.51
Coef. of variation (%):	-204.94			35.60	137.83			137.83
Ave. @ 95% confid. level:	7.35E-02			9.16E-02	2.87E+00			2.87E+00
(for t 0.05,3) 2.353								
Sample analyzed via gamma spectroscopy by Quantera, all others analyzed by Data Chem.								
Data Chem lab report no. 96R-0040-01, May 17, 1996. Quantera lab report no. APG01, May 2, 1996.								
See Attach. 10, Vol. 2 and Attach. 14, Vol. 3.								

Table A4-15	Excavation Subsurface Soil Radionuclide Concentrations (2 of 2)							
Sample Code	Eu-152 Conc. (pCi/g)			Data	Th-234 Conc. (pCi/g)			Data
No. SU-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-01-N16/17	1.10E-01	1.60E-01	3.10E-01	3.10E-01	1.10E+00	2.90E+00	9.00E-01	1.10E+00
EF-02-M18B	9.60E-02	2.10E-01	4.10E-01	4.10E-01	8.90E-01	2.60E+00	1.00E+00	1.00E+00
EF-03-M18B QA/QC	1.07E-01	1.26E-01	2.24E-01	2.24E-01	8.58E-01	4.04E-01	2.16E-01	8.58E-01
EF-04-N14A	-9.00E-04	1.50E-01	2.80E-01	2.80E-01	1.10E+00	3.10E+00	8.00E-01	1.10E+00
No. of data points:	4			4	4			4
Maximum value:	0.11	0.21	0.41	0.41	1.10	3.10	1.00	1.10
Minimum value:	0.00	0.13	0.22	0.22	0.86	0.40	0.22	0.86
Average activity:	0.08	0.16	0.31	0.31	0.99	2.50	0.79	1.01
Std. Deviation:	0.05			0.08	0.13			0.11
Coef. of variation (%):	67.88			25.48	13.29			11.29
Ave. @ 95% confid. level:	1.40E-01			3.98E-01	1.14E+00			1.15E+00
(for t 0.05,3) 2.353								
Sample analyzed via gamma spectroscopy by Quantera, all others analyzed by Data Chem.								
Data Chem lab report no. 96R-0040-01, May 17, 1996. Quantera lab report no. APG01, May 2, 1996.								
See Attach. 10, Vol. 2 and Attach. 14, Vol. 3.								

Sample Code	Ra-226 Conc. (pCi/g)			Data	Ac-228 Conc. (pCi/g)			Data
No. SU-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-01-N16/17	2.40E+00	1.20E+00	8.50E-01	2.40E+00	9.80E-01	3.40E-01	2.40E-01	9.80E-01
EF-02-M18B	3.30E+00	1.70E+00	1.10E+00	3.30E+00	1.10E+00	4.10E-01	6.20E-01	1.10E+00
EF-03-M18B QA/QC	5.80E-01	6.90E-02	6.74E-02	5.80E-01	9.26E-01	1.34E-01	1.40E-01	9.26E-01
EF-04-N14A	2.10E+00	1.10E+00	7.30E-01	2.10E+00	6.40E-01	2.80E-01	2.10E-01	6.40E-01
No. of data points:	4			4	4			4
Maximum value:	3.30	1.70	1.10	3.30	1.10	0.41	0.62	1.10
Minimum value:	0.58	0.07	0.07	0.58	0.64	0.13	0.14	0.64
Average activity:	2.10	1.18	0.79	2.10	0.91	0.31	0.36	0.91
Std. Deviation:	1.13			1.13	0.20			0.20
Coef. of variation (%):	54.01			54.01	21.40			21.40
Ave. @ 95% confid. level:	3.43E+00			3.43E+00	1.14E+00			1.14E+00
(for t 0.05,3) 2.353								
Sample analyzed via gamma spectroscopy by Quantera, all others analyzed by Data Chem.								
Data Chem lab report no. 96R-0040-01, May 17, 1996. Quantera lab report no. APG01, May 2, 1996.								
See Attach. 10, Vol. 2 and Attach. 14, Vol. 3.								

Table A4-18	Marsh Surface and Subsurface Soil Gross Alpha and Beta Activity						
Sample Code No.	Beta Activity (pCi/g)				Alpha Activity (pCi/g)		
SB-0496- & depth	Activity	+/-Error	MDC		Activity	+/-Error	MDC
MA-34-G/H-2, 0-6"	22.00	2.60	3.60		15.00	2.60	2.50
MA-35-D/C-2, 0-6"	26.00	2.50	3.20		14.00	2.70	2.60
MA-36-D/C-2, 6-24"	24.00	4.00	6.60		15.00	2.70	2.50
MA-37-D/C-4.5, 0-6"	25.00	2.50	3.30		15.00	2.60	1.90
MA-38-G-6, 0-6"	26.00	2.60	3.30		15.00	2.60	2.30
MA-39-G-6, 6-24"	20.00	2.90	4.50		19.00	3.40	3.80
MA-40-G-8, 0-6"	28.00	2.90	3.90		19.00	3.10	2.60
MA-41-B-9, 0-6"	24.00	2.80	3.90		14.00	3.10	4.00
MA-42-B-9, 6-24"	26.00	2.70	3.50		16.00	2.90	2.90
MA-43-H/G-11, 0-6"	16.00	2.40	3.70		11.00	2.40	2.40
MA-44-D/C-11, 0-6"	19.00	2.90	4.40		16.00	3.00	2.70
MA-45-D-13, 0-6"	22.00	2.60	3.70		17.00	2.80	2.10
MA-46-D-13, 6-24"	14.00	2.70	4.30		9.20	2.30	2.70
MA-47-H/G-14, 0-6"	20.00	2.50	3.40		12.00	2.30	1.90
MA-48-H/G-16, 0-6"	18.00	2.40	3.30		7.20	2.00	2.30
MA-49-D/C-16, 0-6"	21.00	2.70	3.90		10.00	2.40	2.70
No. of data points:	16				16		
Maximum value:	28.00	4.00	6.60		19.00	3.40	4.00
Minimum value:	14.00	2.40	3.20		7.20	2.00	1.90
Average activity:	21.94	2.76	3.99		14.03	2.70	2.68
Std. Deviation:	3.96				3.36		
Coef. of variation (%):	18.04				23.95		
Ave. @ 95% confid. level:	23.7				15.5		

All samples analyzed by Data Chem, lab report no. 96R-0036-02, May 6, 1996. See Attach. 10, Vol. 2.

Table A4-17	Marsh Surface and Subsurface Soil Radionuclide Concentrations (1 of 4)							
Sample Code	K-40 Conc. (pCi/g)			Data	Co-60 Conc. (pCi/g)			Data
No. SB-0496- & depth	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
MA-34-G/H-2, 0-6"	8.60E+00	1.70E+00	6.50E-01	8.60E+00	1.50E-02	4.10E-02	7.90E-02	7.90E-02
MA-35-D/C-2, 0-6"	1.20E+01	3.60E+00	7.10E-01	1.20E+01	1.70E-02	4.80E-02	9.20E-02	9.20E-02
MA-36-D/C-2, 6-24"	9.60E+00	2.60E+00	6.30E-01	9.60E+00	-5.40E-02	4.20E-02	5.90E-02	5.90E-02
MA-37-D/C-4.5, 0-6"	1.00E+01	3.20E+00	6.00E-01	1.00E+01	-3.20E-02	4.40E-02	7.30E-02	7.30E-02
MA-38-G-6, 0-6"	1.10E+01	4.30E+00	5.40E-01	1.10E+01	6.20E-02	4.50E-02	9.30E-02	9.30E-02
MA-39-G-6, 6-24"	1.00E+01	2.70E+00	7.00E-01	1.00E+01	1.10E-02	3.90E-02	7.50E-02	7.50E-02
MA-40-G-8, 0-6"	1.10E+01	3.20E+00	4.40E-01	1.10E+01	1.00E-02	3.50E-02	6.60E-02	6.60E-02
MA-41-B-9, 0-6"	5.80E+00	1.70E+00	5.10E-01	5.80E+00	1.20E-02	3.40E-02	6.60E-02	6.60E-02
MA-42-B-9, 6-24"	9.90E+00	3.00E+00	4.40E-01	9.90E+00	-1.90E-02	3.40E-02	5.90E-02	5.90E-02
MA-43-H/G-11, 0-6"	4.70E+00	1.90E+00	4.20E-01	4.70E+00	-2.90E-03	4.00E-02	7.40E-02	7.40E-02
MA-44-D/C-11, 0-6"	5.40E+00	1.90E+00	7.60E-01	5.40E+00	1.40E-02	5.90E-02	1.10E-01	1.10E-01
MA-45-D-13, 0-6"	6.00E+00	1.30E+00	5.30E-01	6.00E+00	3.80E-03	3.30E-02	6.20E-02	6.20E-02
MA-46-D-13, 6-24"	6.50E+00	2.00E+00	4.90E-01	6.50E+00	3.40E-03	2.80E-02	5.10E-02	5.10E-02
MA-47-H/G-14, 0-6"	5.80E+00	1.60E+00	4.20E-01	5.80E+00	-2.30E-02	3.60E-02	5.90E-02	5.90E-02
MA-48-H/G-16, 0-6"	5.50E+00	1.80E+00	4.00E-01	5.50E+00	1.50E-04	3.00E-02	5.70E-02	5.70E-02
MA-49-D/C-16, 0-6"	7.50E+00	2.90E+00	5.00E-01	7.50E+00	-1.60E-02	2.90E-02	4.80E-02	4.80E-02
No. of data points:	16			16	16			16
Maximum value:	1.20E+01	4.30E+00	7.60E-01	1.20E+01	6.20E-02	5.90E-02	1.10E-01	1.10E-01
Minimum value:	4.70E+00	1.30E+00	4.00E-01	4.70E+00	-5.40E-02	2.80E-02	4.80E-02	4.80E-02
Average activity:	8.08E+00	2.60E+00	5.58E-01	8.08E+00	9.06E-05	3.93E-02	7.20E-02	7.02E-02
Std. Deviation:	2.43E+00			2.43E+00	2.59E-02			1.68E-02
Coef. of variation (%):	3.01E+01			3.01E+01	2.85E+04			2.39E+01
Ave. @ 95% confid. level:	9.15E+00			9.15E+00	1.14E-02			7.75E-02
(for t 0.05,15) 1.753								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0036-01, May 17, 1996.

See Attach. 10, Vol. 2.

Table A4-17	Marsh Surface and Subsurface Soil Radionuclide Concentrations (2 of 4)							
Sample Code	Ba-133 Conc. (pCi/g)			Data	Cs-137 Conc. (pCi/g)			Data
No. SB-0496- & depth	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
MA-34-G/H-2, 0-6"	3.20E-03	5.50E-02	8.30E-02	8.30E-02	4.90E-01	1.40E-01	8.60E-02	4.90E-01
MA-35-D/C-2, 0-6"	9.80E-03	5.60E-02	9.00E-02	9.00E-02	5.70E-01	1.70E-01	1.10E-01	5.70E-01
MA-36-D/C-2, 6-24"	4.20E-02	4.40E-02	7.40E-02	7.40E-02	1.90E-01	9.00E-02	8.00E-02	1.90E-01
MA-37-D/C-4.5, 0-6"	-4.40E-03	5.20E-02	7.90E-02	7.90E-02	8.80E-01	1.90E-01	8.10E-02	8.80E-01
MA-38-G-6, 0-6"	2.70E-03	5.70E-02	8.70E-02	8.70E-02	2.30E-01	1.40E-01	9.00E-02	2.30E-01
MA-39-G-6, 6-24"	-6.80E-03	4.70E-02	7.00E-02	7.00E-02	1.70E-01	1.10E-01	8.40E-02	1.70E-01
MA-40-G-8, 0-6"	2.20E-02	3.90E-02	6.50E-02	6.50E-02	3.60E-02	4.70E-02	8.50E-02	8.50E-02
MA-41-B-9, 0-6"	-2.30E-01	6.00E-02	5.90E-02	5.90E-02	1.40E+00	3.20E-01	7.30E-02	1.40E+00
MA-42-B-9, 6-24"	-1.60E-02	4.10E-02	6.00E-02	6.00E-02	1.30E-01	6.00E-02	7.30E-02	1.30E-01
MA-43-H/G-11, 0-6"	-2.50E-02	6.30E-02	9.20E-02	9.20E-02	1.10E+00	5.10E-01	8.40E-02	1.10E+00
MA-44-D/C-11, 0-6"	-2.60E-01	8.20E-02	9.20E-02	9.20E-02	1.30E+00	3.30E-01	9.80E-02	1.30E+00
MA-45-D-13, 0-6"	-2.50E-02	4.40E-02	6.30E-02	6.30E-02	3.20E-01	1.00E-01	6.90E-02	3.20E-01
MA-46-D-13, 6-24"	6.90E-03	3.40E-02	5.40E-02	5.40E-02	5.60E-02	3.60E-02	6.20E-02	6.20E-02
MA-47-H/G-14, 0-6"	-1.90E-02	3.80E-02	5.50E-02	5.50E-02	2.00E-01	8.80E-02	6.50E-02	2.00E-01
MA-48-H/G-16, 0-6"	-1.60E-02	3.50E-02	5.20E-02	5.20E-02	5.20E-01	1.30E-01	6.20E-02	5.20E-01
MA-49-D/C-16, 0-6"	-5.50E-02	4.40E-02	6.80E-02	6.80E-02	1.50E-01	1.10E-01	7.60E-02	1.50E-01
No. of data points:	16			16	16			16
Maximum value:	4.20E-02	8.20E-02	9.20E-02	9.20E-02	1.40E+00	5.10E-01	1.10E-01	1.40E+00
Minimum value:	-2.60E-01	3.40E-02	5.20E-02	5.20E-02	3.60E-02	3.60E-02	6.20E-02	6.20E-02
Average activity:	-3.57E-02	5.09E-02	7.27E-02	7.14E-02	4.84E-01	2.02E-01	8.09E-02	4.87E-01
Std. Deviation:	8.48E-02			1.41E-02	4.49E-01			4.46E-01
Coef. of variation (%):	-2.38E+02			1.98E+01	9.29E+01			9.15E+01
Ave. @ 95% confid. level:	1.49E-03			7.76E-02	6.81E-01			6.83E-01
(for t 0.05,15) 1.753								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0036-01, May 17, 1996.

See Attach. 10, Vol. 2.

Table A4-17	Marsh Surface and Subsurface Soil Radionuclide Concentrations (3 of 4)							
Sample Code	Eu-152 Conc. (pCi/g)			Data	Th-234 Conc. (pCi/g)			Data
No. SB-0496- & depth	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
MA-34-G/H-2, 0-6"	8.60E-02	1.80E-01	3.70E-01	3.70E-01	1.30E+00	3.80E+00	2.70E+00	2.70E+00
MA-35-D/C-2, 0-6"	1.60E-01	2.40E-01	4.70E-01	4.70E-01	9.00E-01	2.50E+00	1.20E+00	1.20E+00
MA-36-D/C-2, 6-24"	5.40E-02	1.60E-01	3.10E-01	3.10E-01	8.30E-01	2.30E+00	8.90E-01	8.90E-01
MA-37-D/C-4.5, 0-6"	7.90E-02	1.90E-01	3.70E-01	3.70E-01	2.30E+00	6.20E+00	1.90E+00	2.30E+00
MA-38-G-6, 0-6"	-4.10E-02	2.10E-01	3.80E-01	3.80E-01	8.40E-01	3.10E+00	2.90E+00	2.90E+00
MA-39-G-6, 6-24"	2.00E-01	1.60E-01	3.50E-01	3.50E-01	1.50E+00	4.10E+00	8.30E-01	1.50E+00
MA-40-G-8, 0-6"	1.90E-02	1.60E-01	2.90E-01	2.90E-01	1.00E+00	2.80E+00	8.30E-01	1.00E+00
MA-41-B-9, 0-6"	-6.70E-02	1.40E-01	2.30E-01	2.30E-01	6.40E-01	1.90E+00	7.10E-01	7.10E-01
MA-42-B-9, 6-24"	4.70E-02	1.60E-01	3.10E-01	3.10E-01	1.60E+00	4.60E+00	1.50E+00	1.60E+00
MA-43-H/G-11, 0-6"	3.10E-02	1.70E-01	3.40E-01	3.40E-01	2.70E+00	7.20E+00	2.90E+00	2.90E+00
MA-44-D/C-11, 0-6"	1.60E-01	2.30E-01	4.60E-01	4.60E-01	7.20E-01	2.10E+00	9.80E-01	9.80E-01
MA-45-D-13, 0-6"	-6.80E-03	1.70E-01	3.20E-01	3.20E-01	1.60E-01	1.60E+00	2.30E+00	2.30E+00
MA-46-D-13, 6-24"	1.80E-01	1.30E-01	2.80E-01	2.80E-01	5.70E-01	1.70E+00	6.70E-01	6.70E-01
MA-47-H/G-14, 0-6"	8.50E-02	1.70E-01	3.20E-01	3.20E-01	7.80E-01	2.20E+00	7.20E-01	7.80E-01
MA-48-H/G-16, 0-6"	-2.90E-02	1.40E-01	2.60E-01	2.60E-01	6.50E-01	2.10E+00	1.30E+00	1.30E+00
MA-49-D/C-16, 0-6"	3.40E-02	1.40E-01	2.80E-01	2.80E-01	2.80E-01	1.40E+00	2.10E+00	2.10E+00
No. of data points:	16			16	16			16
Maximum value:	2.00E-01	2.40E-01	4.70E-01	4.70E-01	2.70E+00	7.20E+00	2.90E+00	2.90E+00
Minimum value:	-6.70E-02	1.30E-01	2.30E-01	2.30E-01	1.60E-01	1.40E+00	6.70E-01	6.70E-01
Average activity:	6.20E-02	1.75E-01	3.40E-01	3.34E-01	1.05E+00	3.50E+00	1.72E+00	1.61E+00
Std. Deviation:	8.07E-02			6.58E-02	6.88E-01			8.02E-01
Coef. of variation (%):	1.30E+02			1.97E+01	6.56E+01			4.97E+01
Ave. @ 95% confid. level:	9.73E-02			3.63E-01	1.35E+00			1.97E+00
(for t 0.05,15) 1.753								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0036-01, May 17, 1996.

See Attach. 10, Vol. 2.

Table A4-17	Marsh Surface and Subsurface Soil Radionuclide Concentrations (4 of 4)							
Sample Code	Ra-226 Conc. (pCi/g)			Data	Ac-228 Conc. (pCi/g)			Data
No. SB-0496- & depth	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
MA-34-G/H-2, 0-6"	2.10E+00	1.00E+00	9.20E-01	2.10E+00	1.10E+00	4.20E-01	5.90E-01	1.10E+00
MA-35-D/C-2, 0-6"	1.30E+00	1.20E+00	1.20E+00	1.30E+00	1.20E+00	4.30E-01	3.40E-01	1.20E+00
MA-36-D/C-2, 6-24"	2.40E+00	1.20E+00	7.20E-01	2.40E+00	1.70E+00	4.20E-01	2.60E-01	1.70E+00
MA-37-D/C-4.5, 0-6"	2.30E+00	1.40E+00	9.20E-01	2.30E+00	9.20E-01	3.60E-01	3.40E-01	9.20E-01
MA-38-G-6, 0-6"	1.30E+00	8.20E-01	1.00E+00	1.30E+00	1.20E+00	5.20E-01	2.70E-01	1.20E+00
MA-39-G-6, 6-24"	2.00E+00	1.00E+00	8.40E-01	2.00E+00	1.00E+00	3.20E-01	2.60E-01	1.00E+00
MA-40-G-8, 0-6"	1.40E+00	9.00E-01	8.10E-01	1.40E+00	1.10E+00	2.80E-01	2.20E-01	1.10E+00
MA-41-B-9, 0-6"	1.30E+00	8.30E-01	7.50E-01	1.30E+00	6.20E-01	2.70E-01	4.20E-01	6.20E-01
MA-42-B-9, 6-24"	3.00E+00	1.30E+00	1.20E+00	3.00E+00	9.10E-01	2.70E-01	2.40E-01	9.10E-01
MA-43-H/G-11, 0-6"	9.30E-01	1.00E+00	8.40E-01	9.30E-01	4.90E-01	3.20E-01	5.10E-01	5.10E-01
MA-44-D/C-11, 0-6"	1.60E+00	1.10E+00	1.00E+00	1.60E+00	5.90E-01	3.20E-01	5.00E-01	5.90E-01
MA-45-D-13, 0-6"	2.00E+00	1.00E+00	7.80E-01	2.00E+00	1.10E+00	3.20E-01	2.20E-01	1.10E+00
MA-46-D-13, 6-24"	8.10E-01	7.00E-01	7.10E-01	8.10E-01	7.00E-01	3.00E-01	1.90E-01	7.00E-01
MA-47-H/G-14, 0-6"	1.30E+00	6.70E-01	8.90E-01	1.30E+00	9.20E-01	3.10E-01	2.00E-01	9.20E-01
MA-48-H/G-16, 0-6"	1.30E+00	7.70E-01	6.80E-01	1.30E+00	8.10E-01	2.20E-01	2.10E-01	8.10E-01
MA-49-D/C-16, 0-6"	1.20E+00	8.20E-01	7.50E-01	1.20E+00	8.30E-01	2.90E-01	2.10E-01	8.30E-01
No. of data points:	16			16	16			16
Maximum value:	3.00E+00	1.40E+00	1.20E+00	3.00E+00	1.70E+00	5.20E-01	5.90E-01	1.70E+00
Minimum value:	8.10E-01	6.70E-01	6.80E-01	8.10E-01	4.90E-01	2.20E-01	1.90E-01	5.10E-01
Average activity:	1.64E+00	1.00E+00	8.89E-01	1.64E+00	9.49E-01	3.44E-01	3.35E-01	9.51E-01
Std. Deviation:	5.98E-01			5.98E-01	2.95E-01			2.93E-01
Coef. of variation (%):	3.64E+01			3.64E+01	3.11E+01			3.08E+01
Ave. @ 95% confid. level:	1.90E+00			1.90E+00	1.08E+00			1.08E+00
(for t 0.05,15) 1.753								

All samples analyzed via gamma spectroscopy by Data Chem, lab report no. 96R-0036-01, May 17, 1996.

See Attach. 10, Vol. 2.

Table A4-18	Screening Area Surface Soil Gross Alpha and Beta Activity							
Sample Code	Beta Activity (pCi/g)			Data	Alpha Activity (pCi/g)			Data
No. SS-0596-EF-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
52-I5C	0.47	2.20	3.70	3.70	-0.92	1.80	3.30	3.30
53-I7D	-0.31	2.60	4.40	4.40	1.40	2.10	3.20	3.20
54-I11C	19.00	3.70	5.30	19.00	6.30	2.60	3.10	6.30
55-I15D	1.70	2.30	3.80	3.80	0.84	1.80	2.90	2.90
56-H18C	4.20	2.50	3.90	4.20	2.90	2.50	3.60	3.60
57-I21A	24.00	2.90	3.20	24.00	10.00	2.80	2.40	10.00
58-I11C-QA/QC	18.00	3.10	4.20	18.00	3.60	2.30	3.00	3.60
No. of data points:	7			7	7			7
Maximum value:	24.00	3.70	5.30	24.00	10.00	2.80	3.60	10.00
Minimum value:	-0.31	2.20	3.20	3.70	-0.92	1.80	2.40	2.90
Average activity:	9.58	2.80	4.12	11.01	3.45	2.30	3.09	4.70
Std. Deviation:	10.32			8.92	3.68			2.60
Coef. of variation (%):	107.76			80.95	106.94			55.29
Ave. @ 95% conf. level:	17.16			17.56	6.15			6.61
(for t, 0.05,6) 1.943								

All samples analyzed by Data Chem, lab report no. 96M-0163-01, May 28, 1996.

See Attach. 10, Vol. 2.

Table A4-19		Screening Area Surface Soil Radionuclide Concentrations (1 of 2)							
Sample Code		K-40 Conc. (pCi/g)			Data	Co-60 Conc. (pCi/g)			Data
No. SS-0596-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-52-I5C		1.00E+00	3.90E-01	3.00E-01	1.00E+00	2.80E-02	2.30E-02	4.80E-02	4.80E-02
EF-53-I7D		7.10E-01	4.10E-01	3.10E-01	7.10E-01	-7.40E-03	2.00E-02	3.50E-02	3.50E-02
EF-54-I11C		2.60E+00	1.00E+00	5.10E-01	2.60E+00	7.70E-02	6.60E-02	1.00E-01	1.00E-01
EF-55-I15D		8.80E-01	6.40E-01	3.60E-01	8.80E-01	7.60E-03	2.40E-02	4.60E-02	4.60E-02
56-H18C		3.10E+00	8.90E-01	3.20E-01	3.10E+00	2.10E-02	2.30E-02	4.60E-02	4.60E-02
57-I21A		3.50E+00	1.20E+00	4.80E-01	3.50E+00	1.40E-01	7.30E-02	6.50E-02	1.40E-01
58-I11C-QA/QC		3.20E+00	1.10E+00	5.20E-01	3.20E+00	7.20E-02	4.70E-02	8.70E-02	8.70E-02
No. of data points:		7			7	7			7
Maximum value:		3.50	1.20	0.52	3.50	0.14	0.07	0.10	0.14
Minimum value:		0.71	1.20	0.30	0.71	-0.01	0.02	0.04	0.04
Average activity:		2.14	0.86	0.41	2.14	0.05	0.04	0.06	0.07
Std. Deviation:		1.23			1.23	0.05			0.04
Coef. of variation (%):		57.32			57.32	105.91			53.79
Ave. @ 95% confid. level:		3.04E+00			3.04E+00	8.59E-02			1.00E-01
(for t 0.05,6)	1.943								
Sample analyzed via gamma spectroscopy by Data Chem.									
Data Chem lab report no. 96M-0163-02, May 28, 1996.									
See Attach. 10, Vol. 2.									
Sample Code		Ba-133 Conc. (pCi/g)			Data	Cs-137 Conc. (pCi/g)			Data
No. SS-0596-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-52-I5C		-3.90E-02	2.50E-02	3.70E-02	3.70E-02	8.30E-04	2.70E-02	4.80E-02	4.80E-02
EF-53-I7D		-9.30E-03	2.60E-02	3.90E-02	3.90E-02	1.50E-02	2.60E-02	4.80E-02	4.80E-02
EF-54-I11C		3.10E-02	4.80E-02	7.80E-02	7.80E-02	2.00E+00	4.70E-01	8.40E-02	2.00E+00
EF-55-I15D		-1.80E-02	2.50E-02	4.30E-02	4.30E-02	2.60E-01	7.50E-02	4.20E-02	2.60E-01
56-H18C		-4.70E-03	2.20E-02	3.40E-02	3.40E-02	1.80E-02	2.70E-02	5.10E-02	5.10E-02
57-I21A		-1.30E-02	5.90E-02	8.80E-02	8.80E-02	6.50E+00	1.20E+00	8.10E-02	6.50E+00
58-I11C-QA/QC		-5.40E-03	4.40E-02	6.50E-02	6.50E-02	2.10E+00	4.90E-01	6.60E-02	2.10E+00
No. of data points:		7			7	7			7
Maximum value:		0.03	0.06	0.09	0.09	6.50	1.20	0.08	6.50
Minimum value:		-0.04	0.02	0.03	0.03	0.00	0.03	0.04	0.05
Average activity:		-0.01	0.04	0.06	0.05	1.56	0.52	0.06	1.57
Std. Deviation:		0.02			0.02	2.37			2.36
Coef. of variation (%):		-250.74			39.96	152.45			150.11
Ave. @ 95% confid. level:		7.02E-03			7.10E-02	3.30E+00			3.31E+00
(for t 0.05,6)	1.943								
Sample analyzed via gamma spectroscopy by Data Chem.									
Data Chem lab report no. 96M-0163-02, May 28, 1996.									
See Attach. 10, Vol. 2.									

Table A4-19	Screening Area Surface Soil Radionuclide Concentrations (2 of 2)							
Sample Code	Eu-152 Conc. (pCi/g)			Data	Th-234 Conc. (pCi/g)			Data
No. SS-0596-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-52-I5C	9.10E-03	1.10E-01	2.10E-01	2.10E-01	3.00E-01	9.30E-01	4.30E-01	4.30E-01
EF-53-I7D	2.60E-03	1.10E-01	2.00E-01	2.00E-01	6.90E-02	1.00E+00	1.30E+00	1.30E+00
EF-54-I11C	6.60E-02	2.00E-01	3.80E-01	3.80E-01	5.50E-01	1.60E+00	1.00E+00	1.00E+00
EF-55-I15D	2.50E-02	8.80E-02	1.80E-01	1.80E-01	4.10E-01	1.10E+00	5.10E-01	5.10E-01
56-H18C	9.30E-03	9.80E-02	1.80E-01	1.80E-01	8.30E-02	4.60E-01	3.60E-01	3.60E-01
57-I21A	1.40E-01	2.00E-01	3.50E-01	3.50E-01	2.00E+00	5.60E+00	1.80E+00	2.00E+00
58-I11C-QA/QC	1.40E-01	1.60E-01	3.30E-01	3.30E-01	3.30E-01	1.00E+00	6.70E-01	6.70E-01
No. of data points:	7			7	7			7
Maximum value:	0.14	0.20	0.38	0.38	2.00	5.60	1.80	2.00
Minimum value:	0.00	0.09	0.18	0.18	0.07	0.46	0.36	0.36
Average activity:	0.06	0.14	0.27	0.26	0.53	2.34	1.00	0.90
Std. Deviation:	0.06			0.09	0.67			0.59
Coef. of variation (%):	109.12			33.60	125.04			66.01
Ave. @ 95% confid. level:	1.01E-01			3.26E-01	1.03E+00			1.33E+00
(for t 0.05,6) 1.943								
Sample analyzed via gamma spectroscopy by Data Chem.								
Data Chem lab report no. 96M-0163-02, May 28, 1996.								
See Attach. 10, Vol. 2.								

Sample Code	Ra-226 Conc. (pCi/g)			Data	Ac-228 Conc. (pCi/g)			Data
No. SS-0596-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-52-I5C	3.30E-01	4.50E-01	4.10E-01	4.10E-01	3.10E-01	1.70E-01	2.40E-01	3.10E-01
EF-53-I7D	3.90E-01	6.00E-01	4.90E-01	4.90E-01	2.40E-01	1.50E-01	2.30E-01	2.40E-01
EF-54-I11C	1.00E+00	7.90E-01	8.30E-01	1.00E+00	2.00E-01	1.90E-01	3.60E-01	3.60E-01
EF-55-I15D	3.90E-01	4.30E-01	4.80E-01	4.80E-01	3.50E-01	1.70E-01	2.50E-01	3.50E-01
56-H18C	3.70E-01	4.30E-01	4.20E-01	4.20E-01	4.50E-01	1.50E-01	2.50E-01	4.50E-01
57-I21A	5.20E-01	1.10E+00	1.10E+00	1.10E+00	6.90E-01	2.30E-01	4.20E-01	6.90E-01
58-I11C-QA/QC	1.30E+00	9.60E-01	7.10E-01	1.30E+00	6.10E-01	2.10E-01	3.60E-01	6.10E-01
No. of data points:	7			7	7			7
Maximum value:	1.30	1.10	1.10	1.30	0.69	0.23	0.42	0.69
Minimum value:	0.33	0.43	0.41	0.41	0.20	0.15	0.23	0.24
Average activity:	0.61	0.73	0.68	0.74	0.41	0.18	0.31	0.43
Std. Deviation:	0.38			0.38	0.19			0.16
Coef. of variation (%):	61.95			50.73	45.57			38.24
Ave. @ 95% confid. level:	8.94E-01			1.02E+00	5.43E-01			5.51E-01
(for t 0.05,6) 1.943								
Sample analyzed via gamma spectroscopy by Data Chem.								
Data Chem lab report no. 96M-0163-02, May 28, 1996.								
See Attach. 10, Vol. 2.								

Table A4-20	Surface Water Runoff Gross Alpha and Beta Activity						
			Filtered Water Samples*				
Sample Code	Beta Activity (pCi/L)				Alpha Activity (pCi/L)		
No. H2O-	Activity	+/-Error	MDC		Activity	+/-Error	MDC
95-11-29-1&	49.00	1.30	0.73		0.68	0.68	0.68
96-01-19-1#	26.00	1.10	1.10		0.89	0.89	0.89
96-02-20-1	61.00	2.40	2.10		1.80	0.89	1.40
No. of data points:	3				3		
Maximum value:	61.00	2.40	2.10		1.80	0.89	1.40
Minimum value:	26.00	1.10	0.73		0.68	0.68	0.68
Average activity:	45.33	1.70	1.43		1.12	0.83	1.04
Std. Deviation:	17.79				0.60		
Coef. of variation (%):	39.23				53.00		
Ave. @ 95% confid. level:	75.3				2.1		

* Samples filtered through 0.45 um filters (Gelman A/E) under vacuum.
& Alpha activity result (0.22+/-0.35 pCi/L) substituted with its MDC.
# Alpha activity result (0.55+/-0.49 pCi/L) substituted with its MDC.
Data Chem lab report no. 96R-0035-04, April 18, 1996.
See Attach. 12, Vol. 3.

			Non-Filtered Water Samples				
Sample Code	Beta Activity (pCi/L)			Alpha Activity (pCi/L)			Solids*
No. H2O-	Activity	+/-Error	MDC	Activity	+/-Error	MDC	(mg/L)
95-11-29-1	17.00	1.10	1.10	1.20	0.63	1.00	315
96-01-19-1&	30.00	3.20	4.60	3.20	3.20	3.20	117
96-02-20-1#	22.00	0.59	0.33	0.20	0.20	0.20	256
No. of data points:	3			3			3
Maximum value:	30.00	3.20	4.60	3.20	3.20	3.20	315.00
Minimum value:	17.00	0.59	0.33	0.20	0.20	0.20	117.00
Average activity:	23.00	1.98	2.74	1.53	1.89	1.94	229.33
Std. Deviation:	6.56			1.53			101.66
Coef. of variation (%):	28.51			99.62			44.33
Ave. @ 95% confid. level:	34.1			4.1			401

& Alpha activity result (-0.41+/-1.6 pCi/L) substituted with its MDC.
# Alpha activity result (0.19+/-0.12pCi/L) substituted with its MDC.
Data Chem lab report no. 96R-0035-01, April 18, 1996.
See Attach. 12, Vol. 3.

Table A4-21 Excavation Surface Water Runoff (filtered) Radionuclide Concentrations (1 of 2)

Sample Code		K-40 Conc. (uCi/mL)			Data	Co-60 Conc. (uCi/mL)			Data
No. H2O-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
95-11-29-1		8.20E-08	7.10E-08	1.50E-07	1.50E-07	-4.20E-10	5.40E-09	1.00E-08	1.00E-08
96-01-19-1		3.20E-08	7.70E-08	1.30E-07	1.30E-07	2.20E-09	8.00E-09	1.40E-08	1.40E-08
96-02-20-1		4.70E-08	6.00E-08	1.10E-07	1.10E-07	-3.60E-09	6.60E-09	9.50E-09	9.50E-09
No. of data points:		3			3	3			3
Maximum value:		8.20E-08	7.70E-08	1.50E-07	1.50E-07	2.20E-09	8.00E-09	1.40E-08	1.40E-08
Minimum value:		3.20E-08	6.00E-08	1.10E-07	1.10E-07	-3.60E-09	5.40E-09	9.50E-09	9.50E-09
Average activity:		5.37E-08	6.97E-08	1.31E-07	1.30E-07	-6.07E-10	6.75E-09	1.13E-08	1.12E-08
Std. Deviation:		2.57E-08			2.00E-08	2.90E-09			2.47E-09
Coef. of variation (%):		4.78E+01			1.54E+01	-4.79E+02			2.21E+01
Ave. @ 95% confid. level:		9.69E-08			1.64E-07	4.29E-09			1.53E-08
(for t 0.05,2)	2.92								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0035-05, May 17, 1996.

Samples filtered through 0.45um filters (Gelman A/E) under vacuum.

See Attach. 12, Vol. 3.

Sample Code		Ba-133 Conc. (uCi/mL)			Data	Cs-137 Conc. (uCi/mL)			Data
No. H2O-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
95-11-29-1		-8.30E-08	7.20E-09	1.10E-08	1.10E-08	1.40E-09	5.30E-09	1.00E-08	1.00E-08
96-01-19-1		-6.20E-09	6.20E-09	1.00E-08	1.00E-08	-2.30E-10	5.50E-09	8.90E-09	8.90E-09
96-02-20-1		2.10E-10	5.60E-09	1.00E-08	1.00E-08	-6.40E-09	6.10E-09	8.10E-09	8.10E-09
No. of data points:		3			3	3			3
Maximum value:		2.10E-10	7.20E-09	1.10E-08	1.10E-08	1.40E-09	6.10E-09	1.00E-08	1.00E-08
Minimum value:		-8.30E-08	5.60E-09	1.00E-08	1.00E-08	-6.40E-09	5.30E-09	8.10E-09	8.10E-09
Average activity:		-2.97E-08	6.37E-09	1.03E-08	1.03E-08	-1.74E-09	5.64E-09	9.03E-09	9.00E-09
Std. Deviation:		4.63E-08			5.77E-10	4.11E-09			9.54E-10
Coef. of variation (%):		-1.56E+02			5.59E+00	-2.36E+02			1.06E+01
Ave. @ 95% confid. level:		4.84E-08			1.13E-08	5.19E-09			1.06E-08
(for t 0.05,2)	2.92								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0035-05, May 17, 1996.

Samples filtered through 0.45um filters (Gelman A/E) under vacuum.

See Attach. 12, Vol. 3.

Table A4-21 Excavation Surface Water Runoff (filtered) Radionuclide Concentrations (2 of 2)

Sample Code		Eu-152 Conc. (uCi/mL)			Data	Th-234 Conc. (uCi/mL)			Data
No. H2O-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
95-11-29-1		-5.30E-09	2.50E-08	4.70E-08	4.70E-08	5.00E-07	1.60E-06	2.20E-07	5.00E-07
96-01-19-1		3.80E-10	3.20E-08	5.20E-08	5.20E-08	3.40E-08	1.30E-07	1.30E-07	1.30E-07
96-02-20-1		-1.60E-08	3.40E-08	4.90E-08	4.90E-08	4.00E-07	1.10E-06	2.10E-07	4.00E-07
No. of data points:		3			3	3			3
Maximum value:		3.80E-10	3.40E-08	5.20E-08	5.20E-08	5.00E-07	1.60E-06	2.20E-07	5.00E-07
Minimum value:		-1.60E-08	2.50E-08	4.70E-08	4.70E-08	3.40E-08	1.30E-07	1.30E-07	1.30E-07
Average activity:		-6.97E-09	3.06E-08	4.94E-08	4.93E-08	3.11E-07	1.12E-06	1.91E-07	3.43E-07
Std. Deviation:		8.32E-09			2.52E-09	2.45E-07			1.91E-07
Coef. of variation (%):		-1.19E+02			5.10E+00	7.88E+01			5.57E+01
Ave. @ 95% confid. level:		7.05E-09			5.36E-08	7.25E-07			6.66E-07
(for t 0.05,2)	2.92								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0035-05, May 17, 1996.

Samples filtered through 0.45um filters (Gelman A/E) under vacuum.

See Attach. 12, Vol. 3.

Sample Code		Ra-226 Conc. (uCi/mL)			Data	Ac-228 Conc. (uCi/mL)			Data
No. H2O-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
95-11-29-1		9.30E-08	1.60E-07	2.30E-07	2.30E-07	7.10E-09	1.70E-08	3.30E-08	3.30E-08
96-01-19-1		2.20E-07	1.10E-07	2.00E-07	2.20E-07	-7.40E-10	2.40E-08	3.70E-08	3.70E-08
96-02-20-1		4.20E-08	1.70E-07	1.60E-07	1.60E-07	-2.50E-09	2.10E-08	3.20E-08	3.20E-08
No. of data points:		3			3	3			3
Maximum value:		2.20E-07	1.70E-07	2.30E-07	2.30E-07	7.10E-09	2.40E-08	3.70E-08	3.70E-08
Minimum value:		4.20E-08	1.10E-07	1.60E-07	1.60E-07	-2.50E-09	1.70E-08	3.20E-08	3.20E-08
Average activity:		1.18E-07	1.49E-07	1.99E-07	2.03E-07	1.29E-09	2.09E-08	3.41E-08	3.40E-08
Std. Deviation:		9.17E-08			3.79E-08	5.11E-09			2.65E-09
Coef. of variation (%):		7.75E+01			1.86E+01	3.97E+02			7.78E+00
Ave. @ 95% confid. level:		2.73E-07			2.67E-07	9.90E-09			3.85E-08
(for t 0.05,2)	2.92								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0035-05, May 17, 1996.

Samples filtered through 0.45um filters (Gelman A/E) under vacuum.

See Attach. 12, Vol. 3.

Table A4-22 Excavation Surface Water Runoff (non-filtered) Radionuclide Concentrations (1 of 2)

Sample Code		K-40 Conc. (uCi/ml.)			Data	Co-60 Conc. (uCi/ml.)			Data
No. H2O-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
95-11-29-1		9.70E-08	1.10E-07	8.60E-08	9.70E-08	1.50E-09	5.30E-09	1.10E-08	1.10E-08
96-01-19-1		2.60E-07	8.80E-08	1.90E-07	2.60E-07	2.60E-09	6.60E-09	1.20E-08	1.20E-08
96-02-20-1		2.90E-08	6.80E-08	1.20E-07	1.20E-07	2.00E-09	7.00E-09	1.20E-08	1.20E-08
No. of data points:		3			3	3			3
Maximum value:		2.60E-07	1.10E-07	1.90E-07	2.60E-07	2.60E-09	7.00E-09	1.20E-08	1.20E-08
Minimum value:		2.90E-08	6.80E-08	8.60E-08	9.70E-08	1.50E-09	5.30E-09	1.10E-08	1.10E-08
Average activity:		1.29E-07	9.03E-08	1.39E-07	1.59E-07	2.03E-09	6.34E-09	1.17E-08	1.17E-08
Std. Deviation:		1.19E-07			8.82E-08	5.51E-10			5.77E-10
Coef. of variation (%):		9.23E+01			5.55E+01	2.71E+01			4.95E+00
Ave. @ 95% confid. level:		3.29E-07			3.08E-07	2.96E-09			1.26E-08
(for t 0.05,2)	2.92								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0035-02, May 17, 1996.

See Attach. 12, Vol. 3.

Sample Code		Ba-133 Conc. (uCi/mL)			Data	Cs-137 Conc. (uCi/ml.)			Data
No. H2O-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
95-11-29-1		-3.00E-09	7.30E-09	1.20E-08	1.20E-08	-2.30E-09	5.90E-09	1.00E-08	1.00E-08
96-01-19-1		-3.10E-09	6.90E-09	1.20E-08	1.20E-08	2.50E-09	5.70E-09	1.10E-08	1.10E-08
96-02-20-1		-3.70E-09	6.20E-09	1.10E-08	1.10E-08	-3.90E-09	5.40E-09	9.10E-09	9.10E-09
No. of data points:		3			3	3			3
Maximum value:		-3.00E-09	7.30E-09	1.20E-08	1.20E-08	2.50E-09	5.90E-09	1.10E-08	1.10E-08
Minimum value:		-3.70E-09	6.20E-09	1.10E-08	1.10E-08	-3.90E-09	5.40E-09	9.10E-09	9.10E-09
Average activity:		-3.27E-09	6.82E-09	1.17E-08	1.17E-08	-1.23E-09	5.67E-09	1.01E-08	1.00E-08
Std. Deviation:		3.79E-10			5.77E-10	3.33E-09			9.50E-10
Coef. of variation (%):		-1.16E+01			4.95E+00	-2.70E+02			9.47E+00
Ave. @ 95% confid. level:		-2.63E-09			1.26E-08	4.38E-09			1.16E-08
(for t 0.05,2)	2.92								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0035-02, May 17, 1996.

See Attach. 12, Vol. 3.

Table A4-22 Excavation Surface Water Runoff (non-filtered) Radionuclide Concentrations (2 of 2)

Sample Code		Eu-152 Conc. (uCi/mL)			Data	Th-234 Conc. (uCi/mL)			Data
No. H2O-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
95-11-29-1		6.30E-09	2.60E-08	5.40E-08	5.40E-08	-9.30E-09	2.50E-07	3.80E-07	3.80E-07
96-01-19-1		-6.90E-09	3.40E-08	5.10E-08	5.10E-08	1.90E-07	5.30E-07	1.70E-07	1.90E-07
96-02-20-1		-1.20E-09	3.10E-08	5.80E-08	5.80E-08	2.50E-08	1.70E-07	1.30E-07	1.30E-07
No. of data points:		3			3	3			3
Maximum value:		6.30E-09	3.40E-08	5.80E-08	5.80E-08	1.90E-07	5.30E-07	3.80E-07	3.80E-07
Minimum value:		-6.90E-09	2.60E-08	5.10E-08	5.10E-08	-9.30E-09	1.70E-07	1.30E-07	1.30E-07
Average activity:		-6.00E-10	3.05E-08	5.44E-08	5.43E-08	6.86E-08	3.52E-07	2.52E-07	2.33E-07
Std. Deviation:		6.62E-09			3.51E-09	1.07E-07			1.31E-07
Coef. of variation (%):		-1.10E+03			6.46E+00	1.55E+02			5.59E+01
Ave. @ 95% confid. level:		1.06E-08			6.03E-08	2.48E-07			4.53E-07
(for t 0.05,2)	2.92								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0035-02, May 17, 1996.

See Attach. 12, Vol. 3.

Sample Code		Ra-226 Conc. (uCi/mL)			Data	Ac-228 Conc. (uCi/mL)			Data
No. H2O-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
95-11-29-1		1.60E-07	1.20E-07	2.20E-07	2.20E-07	1.40E-08	1.80E-08	3.70E-08	3.70E-08
96-01-19-1		1.20E-07	1.20E-07	2.10E-07	2.10E-07	2.60E-09	2.50E-08	4.00E-08	4.00E-08
96-02-20-1		1.70E-07	1.10E-07	2.00E+07	2.00E+07	-1.10E-09	2.30E-08	3.50E-08	3.50E-08
No. of data points:		3			3	3			3
Maximum value:		1.70E-07	1.20E-07	2.00E+07	2.00E+07	1.40E-08	2.50E-08	4.00E-08	4.00E-08
Minimum value:		1.20E-07	1.10E-07	2.10E-07	2.10E-07	-1.10E-09	1.80E-08	3.50E-08	3.50E-08
Average activity:		1.50E-07	1.17E-07	1.15E+07	6.67E+06	5.17E-09	2.22E-08	3.74E-08	3.73E-08
Std. Deviation:		2.65E-08			1.15E+07	7.87E-09			2.52E-09
Coef. of variation (%):		1.76E+01			1.73E+02	1.52E+02			6.74E+00
Ave. @ 95% confid. level:		1.95E-07			2.61E+07	1.84E-08			4.16E-08
(for t 0.05,2)	2.92								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0035-02, May 17, 1996.

See Attach. 12, Vol. 3.

Table A4-23	Excavation Standing Water Gross Alpha and Beta Activity						
			Filtered Water Samples*				
Sample Code	Beta Activity (pCi/L)				Alpha Activity (pCi/L)		
No. SW-0496-	Activity	+/-Error	MDC		Activity	+/-Error	MDC
EF-04-Q16A	4.30	0.72	0.91		0.72	0.72	0.72
EF-02-N16/17	6.60	0.94	1.20		1.10	0.65	0.86
EF-06-M18B	7.10	0.81	0.97		3.40	0.63	0.65
EF-09-N16/17	18.00	1.80	2.20		9.70	1.50	1.50
EF-08-M18B	70.00	5.40	6.50		59.00	5.60	5.00
EF-07-N14A	27.00	2.90	3.50		18.00	2.40	2.30
EF-05-N14A	9.70	1.90	2.50		6.10	1.30	1.30
No. of data points:	7				7		
Maximum value:	70.00	5.40	6.50		59.00	5.60	5.00
Minimum value:	4.30	0.72	0.91		0.72	0.63	0.65
Average activity:	20.39	2.58	3.14		14.00	2.46	2.26
Std. Deviation:	23.28				20.72		
Coef. of variation (%):	114.18				148.00		
Ave. @ 95% confid. level:	37.5				29.2		

* Samples filtered through 0.45 um filters (Gelman A/E) under vacuum.

& Alpha activity result (0.35+/-0.51 pCi/L) substituted with its MDC.

Data Chem lab report no. 96R-0040-07, May 6, 1996. See Attach. 12, Vol. 3.

			Non-Filtered Water Samples				
Sample Code	Beta Activity (pCi/L)			Alpha Activity (pCi/L)			Solids*
No. SW-0496-	Activity	+/-Error	MDC	Activity	+/-Error	MDC	(mg/L)
EF-04-Q16A	44.00	4.40	5.20	29.00	4.20	4.10	2053
EF-02-N16/17	8.90	1.80	2.40	2.60	1.20	1.50	456
EF-06-M18B	20.00	1.70	2.00	11.00	1.50	1.40	716
EF-09-N16/17	63.00	4.80	5.50	38.00	4.50	3.90	2293
EF-08-M18B	130.00	20.00	25.00	130.00	15.00	15.00	2292
EF-07-N14A	130.00	9.90	12.00	79.00	8.60	7.40	3781
EF-05-N14A	27.00	2.40	2.80	13.00	2.00	1.80	1183
No. of data points:	7			7			7
Maximum value:	130.00	20.00	25.00	130.00	15.00	15.00	3781.00
Minimum value:	8.90	1.70	2.00	2.60	1.20	1.40	456.00
Average activity:	60.41	8.88	10.98	43.23	7.02	6.75	1824.86
Std. Deviation:	50.60			45.90			1142.46
Coef. of variation (%):	83.76			106.18			62.61
Ave. @ 95% confid. level:	97.6			76.9			2664

Data Chem lab report no. 96R-0040-05, May 6, 1996. See Attach. 12, Vol. 3.

Table A4-24 Excavation Standing Water (filtered) Radionuclide Concentrations (1 of 2)

Sample Code	K-40 Conc. (uCi/ml.)			Data	Co-60 Conc. (uCi/ml.)			Data
No. SW-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-Q16A	1.10E-07	9.80E-08	1.70E-08	1.10E-07	-1.20E-09	6.50E-09	1.20E-08	1.20E-08
EF-02-N16/17	2.30E-08	1.00E-07	9.20E-08	9.20E-08	9.20E-08	5.40E-09	1.10E-08	9.20E-08
EF-06-M18B	5.90E-08	9.40E-08	9.20E-08	9.20E-08	-1.20E-09	5.40E-09	9.80E-09	9.80E-09
EF-09-N16/17	3.40E-07	4.20E-07	7.70E-07	7.70E-07	-1.00E-08	3.40E-08	5.10E-08	5.10E-08
EF-08-M18B	3.50E-07	3.20E-07	6.20E-07	6.20E-07	3.00E-09	3.60E-08	5.90E-08	5.90E-08
EF-07-N14A	6.30E-07	3.50E-07	7.00E-07	7.00E-07	9.50E-09	2.60E-08	4.80E-08	4.80E-08
EF-05-N14A	1.10E-07	7.30E-08	1.50E-07	1.50E-07	2.50E-09	6.60E-09	1.20E-08	1.20E-08
No. of data points:	7			7	7			7
Maximum value:	6.30E-07	4.20E-07	7.70E-07	7.70E-07	9.20E-08	3.60E-08	5.90E-08	9.20E-08
Minimum value:	2.30E-08	7.30E-08	1.70E-08	9.20E-08	-1.00E-08	5.40E-09	9.80E-09	9.80E-09
Average activity:	2.32E-07	2.49E-07	4.64E-07	3.62E-07	1.35E-08	2.16E-08	3.56E-08	4.05E-08
Std. Deviation:	2.19E-07			3.17E-07	3.51E-08			3.09E-08
Coef. of variation (%):	9.44E+01			8.75E+01	2.60E+02			7.62E+01
Ave. @ 95% confid. level:	3.92E-07			5.95E-07	3.93E-08			6.32E-08
(for t 0.05,6) 1.943								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0040-06, May 17, 1996.

Sample filtered through 0.45 um filters (Gelman A/E) under vacuum.

See Attach. 12, Vol. 3.

Sample Code	Ba-133 Conc. (uCi/ml.)			Data	Cs-137 Conc. (uCi/ml.)			Data
No. SW-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-Q16A	-4.30E-09	7.40E-09	1.20E-08	1.20E-08	-1.10E-10	5.70E-09	1.00E-08	1.00E-08
EF-02-N16/17	-6.50E-10	6.50E-09	1.20E-08	1.20E-08	-6.60E-10	5.30E-09	9.30E-09	9.30E-09
EF-06-M18B	-2.40E-09	7.00E-09	1.20E-08	1.20E-08	-2.50E-09	5.50E-09	9.30E-09	9.30E-09
EF-09-N16/17	-3.10E-08	3.50E-08	5.50E-08	5.50E-08	1.20E-08	3.30E-08	6.40E-08	6.40E-08
EF-08-M18B	8.70E-09	2.90E-08	5.20E-08	5.20E-08	6.50E-09	3.10E-08	5.80E-08	5.80E-08
EF-07-N14A	1.10E-08	3.20E-08	5.80E-08	5.80E-08	5.80E-08	4.20E-08	6.00E-08	6.00E-08
EF-05-N14A	-5.90E-09	7.00E-09	1.10E-08	1.10E-08	3.40E-11	5.20E-09	9.50E-09	9.50E-09
No. of data points:	7			7	7			7
Maximum value:	1.10E-08	3.50E-08	5.80E-08	5.80E-08	5.80E-08	4.20E-08	6.40E-08	6.40E-08
Minimum value:	-3.10E-08	6.50E-09	1.10E-08	1.10E-08	-2.50E-09	5.20E-09	9.30E-09	9.30E-09
Average activity:	-3.51E-09	2.17E-08	3.71E-08	3.03E-08	1.05E-08	2.37E-08	4.04E-08	3.14E-08
Std. Deviation:	1.37E-08			2.32E-08	2.16E-08			2.74E-08
Coef. of variation (%):	-3.91E+02			7.66E+01	2.06E+02			8.71E+01
Ave. @ 95% confid. level:	6.58E-09			4.73E-08	2.63E-08			5.16E-08
(for t 0.05,6) 1.943								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0040-06, May 17, 1996.

Sample filtered through 0.45 um filters (Gelman A/E) under vacuum.

See Attach. 12, Vol. 3.

Table A4-24 Excavation Standing Water (filtered) Radionuclide Concentrations (2 of 2)

Sample Code	Eu-152 Conc. (uCi/mL)			Data	Th-234 Conc. (uCi/mL)			Data
No. SW-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-Q16A	1.00E-08	2.90E-08	5.90E-08	5.90E-08	5.80E-08	2.00E-07	1.80E-07	1.80E-07
EF-02-N16/17	1.20E-08	2.80E-08	5.50E-08	5.50E-08	4.10E-08	1.60E-07	1.30E-07	1.30E-07
EF-06-M18B	2.50E-08	2.70E-08	5.80E-08	5.80E-08	1.10E-07	2.90E-07	1.60E-07	1.60E-07
EF-09-N16/17	1.90E-07	1.70E-07	3.40E-07	3.40E-07	2.90E-07	9.10E-07	5.20E-07	5.20E-07
EF-08-M18B	5.00E-09	1.40E-07	2.30E-07	2.30E-07	1.70E-07	6.40E-07	5.20E-07	5.20E-07
EF-07-N14A	-1.10E-08	1.60E-07	2.50E-07	2.50E-07	3.70E-06	9.90E-06	1.70E-06	3.70E-06
EF-05-N14A	-1.80E-08	3.30E-08	4.50E-08	4.50E-08	8.90E-09	1.30E-07	1.40E-07	1.40E-07
No. of data points:	7			7	7			7
Maximum value:	1.90E-07	1.70E-07	3.40E-07	3.40E-07	3.70E-06	9.90E-06	1.70E-06	3.70E-06
Minimum value:	-1.80E-08	2.70E-08	4.50E-08	4.50E-08	8.90E-09	1.30E-07	1.30E-07	1.30E-07
Average activity:	3.04E-08	1.05E-07	1.86E-07	1.48E-07	6.25E-07	3.77E-06	7.10E-07	7.64E-07
Std. Deviation:	7.18E-08			1.22E-07	1.36E-06			1.31E-06
Coef. of variation (%):	2.36E+02			8.23E+01	2.17E+02			1.71E+02
Ave. @ 95% confid. level:	8.32E-08			2.38E-07	1.62E-06			1.72E-06
(for t 0.05,6) 1.943								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0040-06, May 17, 1996.

Sample filtered through 0.45 um filters (Gelman A/E) under vacuum.

See Attach. 12, Vol. 3.

Sample Code	Ra-226 Conc. (uCi/mL)			Data	Ac-228 Conc. (uCi/mL)			Data
No. SW-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-Q16A	2.80E-07	1.40E-07	2.50E-07	2.80E-07	5.80E-09	2.10E-08	3.90E-08	3.90E-08
EF-02-N16/17	1.10E-07	1.10E-07	2.00E-07	2.00E-07	1.80E-08	2.00E-08	4.10E-08	4.10E-08
EF-06-M18B	8.90E-08	1.10E-07	1.90E-07	1.90E-07	9.90E-10	1.80E-08	3.30E-08	3.30E-08
EF-09-N16/17	6.70E-08	6.90E-07	5.80E-07	5.80E-07	9.50E-08	1.50E-07	2.60E-07	2.60E-07
EF-08-M18B	4.10E-07	5.60E-07	5.40E-07	5.40E-07	2.60E-08	1.20E-07	2.00E-07	2.00E-07
EF-07-N14A	3.00E-07	7.80E-07	6.10E-07	6.10E-07	1.20E-07	1.30E-07	2.30E-07	2.30E-07
EF-05-N14A	2.50E-07	1.10E-07	2.00E-07	2.50E-07	1.30E-08	2.50E-08	4.20E-08	4.20E-08
No. of data points:	7			7	7			7
Maximum value:	4.10E-07	7.80E-07	6.10E-07	6.10E-07	1.20E-07	1.50E-07	2.60E-07	2.60E-07
Minimum value:	6.70E-08	1.10E-07	1.90E-07	1.90E-07	9.90E-10	1.80E-08	3.30E-08	3.30E-08
Average activity:	2.15E-07	4.56E-07	4.10E-07	3.79E-07	3.98E-08	8.91E-08	1.54E-07	1.21E-07
Std. Deviation:	1.29E-07			1.89E-07	4.75E-08			1.04E-07
Coef. of variation (%):	5.99E+01			4.99E+01	1.19E+02			8.59E+01
Ave. @ 95% confid. level:	3.10E-07			5.17E-07	7.47E-08			1.97E-07
(for t 0.05,6) 1.943								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0040-06, May 17, 1996.

Sample filtered through 0.45 um filters (Gelman A/E) under vacuum.

See Attach. 12, Vol. 3.

Table A4-25 Excavation Standing Water (non-filtered) Radionuclide Concentrations (1 of 2)

Sample Code	K-40 Conc. (uCi/ml.)			Data	Co-60 Conc. (uCi/ml.)			Data
No. SW-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-Q16A	9.10E-08	1.10E-07	8.90E-08	9.10E-08	1.50E-09	5.10E-09	1.10E-08	1.10E-08
EF-02-N16/17	6.80E-08	7.50E-08	1.40E-07	1.40E-07	-2.50E-09	8.50E-09	1.20E-08	1.20E-08
EF-06-M18B	9.30E-08	8.20E-08	1.60E-07	1.60E-07	-1.50E-09	8.30E-09	1.30E-08	1.30E-08
EF-09-N16/17	2.40E-07	4.20E-07	5.60E-07	5.60E-07	3.20E-08	2.80E-08	6.10E-08	6.10E-08
EF-08-M18B	3.80E-07	4.40E-07	7.70E-07	7.70E-07	1.70E-08	3.30E-08	5.90E-08	5.90E-08
EF-07-N14A	4.80E-07	3.60E-07	6.80E-07	6.80E-07	1.20E-08	3.00E-08	5.30E-08	5.30E-08
EF-05-N14A	3.70E-08	5.00E-08	9.80E-08	9.80E-08	-2.40E-09	6.20E-09	9.10E-09	9.10E-09
No. of data points:	7			7	7			7
Maximum value:	4.80E-07	4.40E-07	7.70E-07	7.70E-07	3.20E-08	3.30E-08	6.10E-08	6.10E-08
Minimum value:	3.70E-08	5.00E-08	8.90E-08	9.10E-08	-2.50E-09	5.10E-09	9.10E-09	9.10E-09
Average activity:	1.98E-07	2.74E-07	4.52E-07	3.57E-07	8.01E-09	2.06E-08	3.88E-08	3.12E-08
Std. Deviation:	1.73E-07			3.00E-07	1.31E-08			2.49E-08
Coef. of variation (%):	8.72E+01			8.40E+01	1.63E+02			8.01E+01
Ave. @ 95% confid. level:	3.26E-07			5.77E-07	1.76E-08			4.95E-08
(for t 0.05,6) 1.943								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0040-04, May 17, 1996.

See Attach. 12, Vol. 3.

Sample Code	Ba-133 Conc. (uCi/ml.)			Data	Cs-137 Conc. (uCi/ml.)			Data
No. SW-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-Q16A	3.30E-09	7.00E-09	1.20E-08	1.20E-08	3.60E-09	5.90E-09	1.10E-08	1.10E-08
EF-02-N16/17	1.50E-10	6.50E-09	1.20E-08	1.20E-08	4.90E-09	7.40E-09	1.30E-08	1.30E-08
EF-06-M18B	-4.70E-09	7.90E-09	1.10E-08	1.10E-08	6.70E-09	7.10E-09	1.30E-08	1.30E-08
EF-09-N16/17	-4.60E-08	3.90E-08	5.80E-08	5.80E-08	2.70E-08	3.70E-08	7.10E-08	7.10E-08
EF-08-M18B	-2.20E-08	2.80E-08	4.60E-08	4.60E-08	1.30E-07	5.80E-08	5.60E-08	1.30E-07
EF-07-N14A	2.10E-09	3.10E-08	5.60E-08	5.60E-08	1.60E-07	6.40E-08	6.10E-08	1.60E-07
EF-05-N14A	-5.10E-10	5.80E-09	1.00E-08	1.00E-08	-1.60E-09	4.90E-09	8.30E-09	8.30E-09
No. of data points:	7			7	7			7
Maximum value:	3.30E-09	3.90E-08	5.80E-08	5.80E-08	1.60E-07	6.40E-08	7.10E-08	1.60E-07
Minimum value:	-4.60E-08	5.80E-09	1.00E-08	1.00E-08	-1.60E-09	4.90E-09	8.30E-09	8.30E-09
Average activity:	-9.67E-09	2.22E-08	3.61E-08	2.93E-08	4.72E-08	3.58E-08	4.21E-08	5.80E-08
Std. Deviation:	1.82E-08			2.28E-08	6.79E-08			6.39E-08
Coef. of variation (%):	-1.88E+02			7.79E+01	1.44E+02			1.10E+02
Ave. @ 95% confid. level:	3.69E-09			4.60E-08	9.71E-08			1.05E-07
(for t 0.05,6) 1.943								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0040-04, May 17, 1996.

See Attach. 12, Vol. 3.

Table A4-25 Excavation Standing Water (non-filtered) Radionuclide Concentrations (2 of 2)

Sample Code	Eu-152 Conc. (uCi/mL)			Data	Th-234 Conc. (uCi/mL)			Data
No. SW-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-Q16A	4.10E-08	3.40E-08	7.10E-08	7.10E-08	6.00E-08	1.80E-07	1.60E-07	1.60E-07
EF-02-N16/17	-1.90E-08	3.40E-08	4.50E-08	4.50E-08	3.10E-07	8.20E-07	1.90E-07	3.10E-07
EF-06-M18B	-2.00E-10	3.80E-08	6.00E-08	6.00E-08	-1.90E-07	5.40E-07	3.40E-07	3.40E-07
EF-09-N16/17	-4.20E-08	7.40E-08	1.30E-07	1.30E-07	5.10E-07	1.40E-06	7.30E-07	7.30E-07
EF-08-M18B	-1.20E-08	1.80E-07	2.80E-07	2.80E-07	1.00E-07	5.20E-07	7.90E-07	7.90E-07
EF-07-N14A	8.60E-08	1.50E-02	2.80E-07	2.80E-07	5.70E-07	1.80E-06	1.20E-06	1.20E-06
EF-05-N14A	-2.90E-10	3.20E-08	5.00E-08	5.00E-08	4.40E-08	1.70E-07	1.60E-07	1.60E-07
No. of data points:	7			7	7			7
Maximum value:	8.60E-08	1.50E-02	2.80E-07	2.80E-07	5.70E-07	1.80E-06	1.20E-06	1.20E-06
Minimum value:	-4.20E-08	3.20E-08	4.50E-08	4.50E-08	-1.90E-07	1.70E-07	1.60E-07	1.60E-07
Average activity:	7.64E-09	5.67E-03	1.63E-07	1.31E-07	2.01E-07	9.63E-07	6.32E-07	5.27E-07
Std. Deviation:	4.27E-08			1.06E-07	2.74E-07			3.90E-07
Coef. of variation (%):	5.59E+02			8.08E+01	1.37E+02			7.41E+01
Ave. @ 95% confid. level:	3.90E-08			2.08E-07	4.02E-07			8.14E-07
(for t 0.05,6) 1.943								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0040-04, May 17, 1996.

See Attach. 12, Vol. 3.

Sample Code	Ra-226 Conc. (uCi/mL)			Data	Ac-228 Conc. (uCi/mL)			Data
No. SW-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-Q16A	1.30E-07	1.70E-07	1.70E-07	1.70E-07	1.30E-08	2.10E-08	4.00E-08	4.00E-08
EF-02-N16/17	2.00E-07	1.10E-07	2.10E-07	2.10E-07	1.20E-08	2.40E-08	4.10E-08	4.10E-08
EF-06-M18B	7.50E-08	1.20E-07	2.00E-07	2.00E-07	1.80E-08	2.70E-08	4.70E-08	4.70E-08
EF-09-N16/17	2.10E-07	4.60E-07	8.10E-07	8.10E-07	1.20E-07	1.00E-07	2.20E-07	2.20E-07
EF-08-M18B	4.30E-07	6.30E-07	4.90E-07	4.90E-07	1.00E-07	9.90E-08	2.10E-07	2.10E-07
EF-07-N14A	1.80E-06	6.80E-07	9.70E-07	1.80E-06	1.20E-07	1.30E-07	2.40E-07	2.40E-07
EF-05-N14A	3.90E-07	1.40E-07	2.30E-07	3.90E-07	2.10E-09	2.10E-08	3.40E-08	3.40E-08
No. of data points:	7			7	7			7
Maximum value:	1.80E-06	6.80E-07	9.70E-07	1.80E-06	1.20E-07	1.30E-07	2.40E-07	2.40E-07
Minimum value:	7.50E-08	1.10E-07	1.70E-07	1.70E-07	2.10E-09	2.10E-08	3.40E-08	3.40E-08
Average activity:	4.62E-07	4.05E-07	5.35E-07	5.81E-07	5.50E-08	7.45E-08	1.50E-07	1.19E-07
Std. Deviation:	6.04E-07			5.82E-07	5.52E-08			9.82E-08
Coef. of variation (%):	1.31E+02			1.00E+02	1.00E+02			8.26E+01
Ave. @ 95% confid. level:	9.06E-07			1.01E-06	9.55E-08			1.91E-07
(for t 0.05,6) 1.943								

Sample analyzed via gamma spectroscopy by Data Chem, report no. 96R-0040-04, May 17, 1996.

See Attach. 12, Vol. 3.

Table A4-26	Excavation Sediment Gross Alpha and Beta Activity						
Sample Code	Beta Activity (pCi/g)				Alpha Activity (pCi/g)		
No. SE-0496-	Activity	+/-Error	MDC		Activity	+/-Error	MDC
EF-01-N16/17	28.00	3.60	4.90		13.00	3.50	4.00
EF-02-N16/17-QA/QC*	20.90	2.47	1.71		18.90	3.32	2.33
EF-04-M18B#	24.00	2.50	2.90		14.00	2.50	2.30
EF-04-N14A	31.00	3.60	4.60		17.00	3.90	4.30
No. of data points:	4				4		
Maximum value:	31.00	3.60	4.90		18.90	3.90	4.30
Minimum value:	20.90	2.47	1.71		13.00	2.50	2.30
Average activity:	25.98	3.09	3.76		15.73	3.34	3.36
Std. Deviation:	4.43				2.71		
Coef. of variation (%):	17.07				17.26		
Ave. @ 95% confid. level:	31.2				18.9		

* Sample analyzed by Quantera, all others analyzed by Data Chem.

Data Chem lab report no. 96R-0039-02, May 8, 1996. Quantera lab report no. APG01, May 2, 1996.

See Attach. 10, Vol. 2 and Attach. 14, Vol. 3.

Sample identified as EF-03-M18B in field logs.

Table A4-27	Excavation Sediment Radionuclide Concentrations (1 of 2)							
Sample Code	K-40 Conc. (pCi/g)			Data	Co-60 Conc. (pCi/g)			Data
No. SE-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-01-N16/17	5.60E+00	1.60E+00	6.90E-01	5.60E+00	1.40E-01	8.80E-02	7.40E-02	1.40E-01
EF-02-N16/17-QA/QC*	7.88E+00	1.05E+00	4.23E-01	7.88E+00	2.09E-01	4.59E-02	5.01E-02	2.09E-01
EF-04-M18B#	7.10E+00	2.00E+00	5.80E-01	7.10E+00	1.30E-01	7.20E-02	6.70E-02	1.30E-01
EF-04-N14A	5.10E+00	1.40E+00	7.40E-01	5.10E+00	1.90E-01	1.30E-01	9.60E-02	1.90E-01
No. of data points:	4			4	4			4
Maximum value:	7.88	2.00	0.74	7.88	0.21	0.13	0.10	0.21
Minimum value:	5.10	1.05	0.42	5.10	0.13	0.05	0.05	0.13
Average activity:	6.42	1.55	0.62	6.42	0.17	0.09	0.07	0.17
Std. Deviation:	1.29			1.29	0.04			0.04
Coef. of variation (%):	20.13			20.13	22.87			22.87
Ave. @ 95% confid. level:	7.94E+00			7.94E+00	2.12E-01			2.12E-01
(for t 0.05,3) 2.353								

Sample analyzed via gamma spectroscopy by Quantera, all others analyzed by Data Chem.

Data Chem lab report no. 96R-0039-01, May 17, 1996. Quantera lab report no. APG01, May 2, 1996.

Sample identified as EF-03-M18B in field logs.

See Attach. 12, Vol. 3 and Attach. 14, Vol. 3.

Sample Code	Ba-133 Conc. (pCi/g)			Data	Cs-137 Conc. (pCi/g)			Data
No. SE-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-01-N16/17	-1.70E-01	5.90E-02	7.20E-02	7.20E-02	1.80E+00	4.00E-01	8.00E-02	1.80E+00
EF-02-N16/17-QA/QC*	2.76E-02	3.55E-02	5.26E-02	5.26E-02	2.85E+00	3.35E-01	4.67E-02	2.85E+00
EF-04-M18B#	1.10E-02	4.40E-02	6.80E-02	6.80E-02	1.80E+00	4.20E-01	6.80E-02	1.80E+00
EF-04-N14A	3.40E-03	7.70E-02	1.20E-01	1.20E-01	8.40E+00	1.40E+00	1.10E-01	8.40E+00
No. of data points:	4			4	4			4
Maximum value:	0.03	0.08	0.12	0.12	8.40	1.40	0.11	8.40
Minimum value:	-0.17	0.04	0.05	0.05	1.80	0.34	0.05	1.80
Average activity:	-0.03	0.06	0.08	0.08	3.71	0.78	0.08	3.71
Std. Deviation:	0.09			0.03	3.16			3.16
Coef. of variation (%):	-289.23			37.27	85.22			85.22
Ave. @ 95% confid. level:	7.69E-02			1.12E-01	7.43E+00			7.43E+00
(for t 0.05,3) 2.353								

Sample analyzed via gamma spectroscopy by Quantera, all others analyzed by Data Chem.

Data Chem lab report no. 96R-0039-01, May 17, 1996. Quantera lab report no. APG01, May 2, 1996.

Sample identified as EF-03-M18B in field logs.

See Attach. 12, Vol. 3 and Attach. 14, Vol. 3.

Table A4-27	Excavation Sediment Radionuclide Concentrations (2 of 2)							
Sample Code	Eu-152 Conc. (pCi/g)			Data	Th-234 Conc. (pCi/g)			Data
No. SE-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-01-N16/17	1.70E-01	1.60E-01	3.50E-01	3.50E-01	5.70E-01	1.70E+00	8.30E-01	8.30E-01
EF-02-N16/17-QA/QC*	5.28E-02	1.47E-01	2.61E-01	2.61E-01	8.88E-01	4.48E-01	3.10E-01	8.88E-01
EF-04-M18B#	3.00E-02	1.50E-01	2.90E-01	2.90E-01	8.90E-01	2.40E+00	7.30E-01	8.90E-01
EF-04-N14A	-3.60E-02	2.20E-01	3.90E-01	3.90E-01	2.20E+00	6.40E+00	2.60E+00	2.60E+00
No. of data points:	4			4	4			4
Maximum value:	0.17	0.22	0.39	0.39	2.20	6.40	2.60	2.60
Minimum value:	-0.04	0.15	0.26	0.26	0.57	0.45	0.31	0.83
Average activity:	0.05	0.17	0.33	0.32	1.14	3.53	1.42	1.30
Std. Deviation:	0.09			0.06	0.72			0.87
Coef. of variation (%):	158.48			18.02	63.72			66.50
Ave. @ 95% confid. level:	1.55E-01			3.91E-01	1.99E+00			2.32E+00
(for t 0.05,3) 2.353								

Sample analyzed via gamma spectroscopy by Quantera, all others analyzed by Data Chem.

Data Chem lab report no. 96R-0039-01, May 17, 1996. Quantera lab report no. APG01, May 2, 1996.

Sample identified as EF-03-M18B in field logs.

See Attach. 12, Vol. 3 and Attach. 14, Vol. 3.

Sample Code	Ra-226 Conc. (pCi/g)			Data	Ac-228 Conc. (pCi/g)			Data
No. SE-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-01-N16/17	1.30E+00	9.50E-01	7.40E-01	1.30E+00	6.10E-01	2.50E-01	4.20E-01	6.10E-01
EF-02-N16/17-QA/QC*	1.32E+00	1.46E-01	7.91E-02	1.32E+00	6.88E-01	1.63E-01	1.71E-01	6.88E-01
EF-04-M18B#	1.70E+00	1.10E+00	7.50E-01	1.70E+00	1.10E+00	3.20E-01	4.70E-01	1.10E+00
EF-04-N14A	2.50E+00	1.40E+00	1.30E+00	2.50E+00	9.70E-01	3.60E-01	5.90E-01	9.70E-01
No. of data points:	4			4	4			4
Maximum value:	2.50	1.40	1.30	2.50	1.10	0.36	0.59	1.10
Minimum value:	1.30	0.15	0.08	1.30	0.61	0.16	0.17	0.61
Average activity:	1.71	1.01	0.84	1.71	0.84	0.28	0.44	0.84
Std. Deviation:	0.56			0.56	0.23			0.23
Coef. of variation (%):	32.91			32.91	27.47			27.47
Ave. @ 95% confid. level:	2.37E+00			2.37E+00	1.11E+00			1.11E+00
(for t 0.05,3) 2.353								

Sample analyzed via gamma spectroscopy by Quantera, all others analyzed by Data Chem.

Data Chem lab report no. 96R-0039-01, May 17, 1996. Quantera lab report no. APG01, May 2, 1996.

Sample identified as EF-03-M18B in field logs.

See Attach. 12, Vol. 3 and Attach. 14, Vol. 3.

Table A4-28		Supplemental Sample Radiological Analyses (1 of 13)							
					Excavation Floor				
Sample Code		U-234 Conc. (pCi/g)			Data	U-235 Conc. (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-47-N13C		2.45E+00	1.65E-01	3.45E-02	2.45E+00	1.21E-01	4.05E-02	9.61E-03	1.21E-01
EF-33-L16B		1.11E+00	1.07E-01	3.46E-02	1.11E+00	6.20E-02	3.07E-02	3.03E-02	6.20E-02
EF-31-O16B		2.68E+00	1.65E-01	4.31E-02	2.68E+00	1.31E-01	4.47E-02	4.19E-02	1.31E-01
EF-38-O14A		2.17E+00	1.50E+00	4.42E-02	2.17E+00	1.28E-01	4.01E-02	8.89E-03	1.28E-01
EF-34-J16C		1.13E+00	1.08E-01	3.92E-02	1.13E+00	4.52E-02	2.69E-02	3.00E-02	4.52E-02
EF-40-M13C		2.93E+00	1.76E-01	3.55E-02	2.93E+00	1.84E-01	5.29E-02	4.39E-02	1.84E-01
No. of data points:		6			6	6			6
Maximum value:		2.93E+00	1.50E+00	4.42E-02	2.93E+00	1.84E-01	5.29E-02	4.39E-02	1.84E-01
Minimum value:		1.11E+00	1.07E-01	3.45E-02	1.11E+00	4.52E-02	2.69E-02	8.89E-03	4.52E-02
Average activity:		2.08E+00	6.27E-01	3.87E-02	2.08E+00	1.12E-01	4.02E-02	3.07E-02	1.12E-01
Std. Deviation:		7.84E-01			7.84E-01	5.07E-02			5.07E-02
Coef. of variation (%):		3.77E+01			3.77E+01	4.53E+01			4.53E+01
Ave. @ 95% confid. level:		2.72E+00			2.72E+00	1.54E-01			1.54E-01
(for t 0.05,5)	2.015								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996.									
See Attach. 10, Vol. 2.									

					Excavation Floor				
Sample Code		U-238 Conc. (pCi/g)			Data	Ra-224 Conc. (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-47-N13C		2.38E+00	1.62E-01	7.79E-03	2.38E+00	6.34E+00	8.88E-01	4.61E-01	6.34E+00
EF-33-L16B		1.38E+00	1.19E-01	2.85E-02	1.38E+00	4.29E+00	1.24E+00	1.12E+00	4.29E+00
EF-31-O16B		1.97E+00	1.40E-01	7.02E-03	1.97E+00	1.98E+00	4.61E-01	4.35E-01	1.98E+00
EF-38-O14A		9.49E-01	9.96E-02	3.19E-02	9.49E-01	3.41E+00	7.82E-01	5.25E-01	3.41E+00
EF-34-J16C		1.71E+00	1.32E-01	3.69E-02	1.71E+00	7.75E+00	3.12E+00	3.12E+00	7.75E+00
EF-40-M13C		2.98E+00	1.77E-01	2.52E-02	2.98E+00	-3.03E-02	1.97E-01	5.25E-01	5.25E-01
No. of data points:		6			6	6			6
Maximum value:		2.98E+00	1.77E-01	3.69E-02	2.98E+00	7.75E+00	3.12E+00	3.12E+00	7.75E+00
Minimum value:		9.49E-01	9.96E-02	7.02E-03	9.49E-01	-3.03E-02	1.97E-01	4.35E-01	5.25E-01
Average activity:		1.89E+00	1.41E-01	2.56E-02	1.89E+00	3.96E+00	1.47E+00	1.41E+00	4.05E+00
Std. Deviation:		7.23E-01			7.23E-01	2.84E+00			2.69E+00
Coef. of variation (%):		3.81E+01			3.81E+01	7.17E+01			6.64E+01
Ave. @ 95% confid. level:		2.49E+00			2.49E+00	6.29E+00			6.26E+00
(for t 0.05,5)	2.015								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996, and 96M-0176-03, June 10, 1996.									
See Attach. 10, Vol. 2.									

Table A4-28		Supplemental Sample Radiological Analyses (2 of 13)							
					Excavation Floor				
Sample Code		Ra-226 Conc. (pCi/g)			Data	Th-228 Conc. (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-47-N13C		2.60E+00	2.64E-01	1.21E-01	2.60E+00	1.94E+00	1.63E-01	3.81E-02	1.94E+00
EF-33-L16B		4.55E+00	5.61E-01	3.07E-01	4.55E+00	9.32E-01	1.08E-01	3.46E-02	9.32E-01
EF-31-O16B		1.99E+00	2.08E-01	1.16E-01	1.99E+00	7.03E-01	9.26E-02	3.30E-02	7.03E-01
EF-38-O14A		2.04E-01	9.52E-02	1.34E-01	2.04E-01	5.22E-01	8.13E-02	3.78E-02	5.22E-01
EF-34-J16C		7.25E+00	1.27E+00	5.36E-01	7.25E+00	8.04E-01	9.70E-02	3.21E-02	8.04E-01
EF-40-M13C		2.66E-02	4.87E-02	1.28E-01	1.28E-01	2.84E+00	2.15E-01	5.46E-02	2.84E+00
No. of data points:		6			6	6			6
Maximum value:		7.25E+00	1.27E+00	5.36E-01	7.25E+00	2.84E+00	2.15E-01	5.46E-02	2.84E+00
Minimum value:		2.66E-02	4.87E-02	1.16E-01	1.28E-01	5.22E-01	8.13E-02	3.21E-02	5.22E-01
Average activity:		2.77E+00	5.85E-01	2.72E-01	2.79E+00	1.29E+00	1.35E-01	3.91E-02	1.29E+00
Std. Deviation:		2.76E+00			2.74E+00	9.08E-01			9.08E-01
Coef. of variation (%):		9.95E+01			9.82E+01	7.04E+01			7.04E+01
Ave. @ 95% confid. level:		5.04E+00			5.04E+00	2.04E+00			2.04E+00
(for t 0.05,5)	2.015								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996, and									
96M-0176-03, June 10, 1996.									
See Attach. 10, Vol. 2.									
					Excavation Floor				
Sample Code		Th-230 Conc. (pCi/g)			Data	Th-232Conc. (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-47-N13C		1.70E+00	1.42E-01	2.26E-02	1.70E+00	1.56E+00	1.36E-01	2.26E-02	1.56E+00
EF-33-L16B		6.08E-01	8.11E-02	2.05E-02	6.08E-01	6.77E-02	8.58E-02	2.59E-02	6.77E-02
EF-31-O16B		6.72E-01	8.52E-02	3.79E-02	6.72E-01	5.82E-01	7.88E-02	3.22E-02	5.82E-01
EF-38-O14A		4.20E-01	6.85E-02	3.58E-02	4.20E-01	3.79E-01	6.29E-02	7.38E-03	3.79E-01
EF-34-J16C		7.03E-01	8.44E-02	2.78E-02	7.03E-01	6.19E-01	7.86E-02	1.90E-02	6.19E-01
EF-40-M13C		2.54E+00	1.89E-01	3.89E-02	2.54E+00	2.29E+00	1.79E-01	3.35E-02	2.29E+00
No. of data points:		6			6	6			6
Maximum value:		2.54E+00	1.89E-01	3.89E-02	2.54E+00	2.29E+00	1.79E-01	3.35E-02	2.29E+00
Minimum value:		4.20E-01	6.85E-02	2.05E-02	4.20E-01	6.77E-02	6.29E-02	7.38E-03	6.77E-02
Average activity:		1.11E+00	1.17E-01	3.15E-02	1.11E+00	9.16E-01	1.11E-01	2.50E-02	9.16E-01
Std. Deviation:		8.34E-01			8.34E-01	8.38E-01			8.38E-01
Coef. of variation (%):		7.53E+01			7.53E+01	9.14E+01			9.14E+01
Ave. @ 95% confid. level:		1.79E+00			1.79E+00	1.61E+00			1.61E+00
(for t 0.05,5)	2.015								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996.									
See Attach. 10, Vol. 2.									

Table A4-28	Supplemental Sample Radiological Analyses (3 of 13)							
				Excavation Side				
Sample Code	U-234 Conc. (pCi/g)			Data	U-235 Conc. (pCi/g)			Data
No. SS-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
ES-12-J14/15F	1.16E+00	6.57E-01	2.62E-01	1.16E+00	2.39E-01	3.32E-01	3.24E-01	3.24E-01
ES-17-N12F	2.40E+00	1.81E-01	5.79E-02	2.40E+00	1.12E-01	4.91E-02	5.16E-02	1.12E-01
No. of data points:	2			2	2			2
Maximum value:	2.40E+00	6.57E-01	2.62E-01	2.40E+00	2.39E-01	3.32E-01	3.24E-01	3.24E-01
Minimum value:	1.16E+00	1.81E-01	5.79E-02	1.16E+00	1.12E-01	4.91E-02	5.16E-02	1.12E-01
Average activity:	1.78E+00	4.82E-01	1.90E-01	1.78E+00	1.76E-01	2.37E-01	2.32E-01	2.18E-01
Std. Deviation:	8.77E-01			8.77E-01	8.98E-02			1.50E-01
Coef. of variation (%):	4.93E+01			4.93E+01	5.12E+01			6.88E+01
Ave. @ 95% confid. level:	5.69E+00			5.69E+00	5.76E-01			8.87E-01
(for t 0.05,1) 6.314								

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996.

See Attach. 10, Vol. 2.

				Excavation Side				
Sample Code	U-238 Conc. (pCi/g)			Data	Ra-224 Conc. (pCi/g)			Data
No. SS-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
ES-12-J14/15F	3.88E-01	5.38E-01	9.01E-01	9.01E-01	3.29E+00	6.57E-01	4.66E-01	3.29E+00
ES-17-N12F	2.19E+00	1.72E-01	3.75E-02	2.19E+00	5.91E+00	1.38E+00	7.01E-01	5.91E+00
No. of data points:	2			2	2			2
Maximum value:	2.19E+00	5.38E-01	9.01E-01	2.19E+00	5.91E+00	1.38E+00	7.01E-01	5.91E+00
Minimum value:	3.88E-01	1.72E-01	3.75E-02	9.01E-01	3.29E+00	6.57E-01	4.66E-01	3.29E+00
Average activity:	1.29E+00	3.99E-01	6.38E-01	1.55E+00	4.60E+00	1.08E+00	5.95E-01	4.60E+00
Std. Deviation:	1.27E+00			9.11E-01	1.85E+00			1.85E+00
Coef. of variation (%):	9.89E+01			5.90E+01	4.03E+01			4.03E+01
Ave. @ 95% confid. level:	6.98E+00			5.61E+00	1.29E+01			1.29E+01
(for t 0.05,1) 6.314								

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996, and 96M-0176-03, June 10, 1996.

See Attach. 10, Vol. 2.

Table A4-28	Supplemental Sample Radiological Analyses (4 of 13)							
				Excavation Side				
Sample Code	Ra-226 Conc. (pCi/g)			Data	Th-228 Conc. (pCi/g)			Data
No. SS-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
ES-12-J14/15F	2.80E+00	2.79E-01	1.32E-01	2.80E+00	6.98E-01	1.09E-01	5.12E-02	6.98E-01
ES-17-N12F	2.72E+00	4.42E-01	2.19E-01	2.72E+00	2.31E+00	2.05E-01	5.62E-02	2.31E+00
No. of data points:	2			2	2			2
Maximum value:	2.80E+00	4.42E-01	2.19E-01	2.80E+00	2.31E+00	2.05E-01	5.62E-02	2.31E+00
Minimum value:	2.72E+00	2.79E-01	1.32E-01	2.72E+00	6.98E-01	1.09E-01	5.12E-02	6.98E-01
Average activity:	2.76E+00	3.70E-01	1.81E-01	2.76E+00	1.50E+00	1.64E-01	5.38E-02	1.50E+00
Std. Deviation:	5.66E-02			5.66E-02	1.14E+00			1.14E+00
Coef. of variation (%):	2.05E+00			2.05E+00	7.58E+01			7.58E+01
Ave. @ 95% confid. level:	3.01E+00			3.01E+00	6.59E+00			6.59E+00
(for t 0.05,1) 6.314								

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996, and 96M-0176-03, June 10, 1996.

See Attach. 10, Vol. 2.

				Excavation Side				
Sample Code	Th-230 Conc. (pCi/g)			Data	Th-232Conc. (pCi/g)			Data
No. SS-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
ES-12-J14/15F	4.69E-01	8.41E-02	4.44E-02	4.69E-01	4.94E-01	8.49E-02	3.43E-02	4.94E-01
ES-17-N12F	2.25E+00	1.88E-01	3.77E-02	2.25E+00	2.05E+00	1.80E-01	3.76E-02	2.05E+00
No. of data points:	2			2	2			2
Maximum value:	2.25E+00	1.88E-01	4.44E-02	2.25E+00	2.05E+00	1.80E-01	3.76E-02	2.05E+00
Minimum value:	4.69E-01	8.41E-02	3.77E-02	4.69E-01	4.94E-01	8.49E-02	3.43E-02	4.94E-01
Average activity:	1.36E+00	1.46E-01	4.12E-02	1.36E+00	1.27E+00	1.41E-01	3.60E-02	1.27E+00
Std. Deviation:	1.26E+00			1.26E+00	1.10E+00			1.10E+00
Coef. of variation (%):	9.26E+01			9.26E+01	8.65E+01			8.65E+01
Ave. @ 95% confid. level:	6.98E+00			6.98E+00	6.18E+00			6.18E+00
(for t 0.05,1) 6.314								

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996.

See Attach. 10, Vol. 2.

Table A4-28		Supplemental Sample Radiological Analyses (5 of 13)							
					Marsh Area				
Sample Code		U-234 Conc. (pCi/g)			Data	U-235 Conc. (pCi/g)			Data
No. SB-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
MA-34-G/H		8.73E-01	9.57E-02	3.72E-02	8.73E-01	5.54E-02	2.93E-02	3.03E-02	5.54E-02
MA-36-D/C		1.03E+00	1.04E-01	4.01E-02	1.03E+00	3.30E-02	2.24E-02	2.43E-02	3.30E-02
No. of data points:		2			2	2			2
Maximum value:		1.03E+00	1.04E-01	4.01E-02	1.03E+00	5.54E-02	2.93E-02	3.03E-02	5.54E-02
Minimum value:		8.73E-01	9.57E-02	3.72E-02	8.73E-01	3.30E-02	2.24E-02	2.43E-02	3.30E-02
Average activity:		9.52E-01	9.99E-02	3.87E-02	9.52E-01	4.42E-02	2.61E-02	2.75E-02	4.42E-02
Std. Deviation:		1.11E-01			1.11E-01	1.58E-02			1.58E-02
Coef. of variation (%):		1.17E+01			1.17E+01	3.58E+01			3.58E+01
Ave. @ 95% confid. level:		1.45E+00			1.45E+00	1.15E-01			1.15E-01
(for t 0.05,1)	6.314								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996.									
See Attach. 10, Vol. 2.									

					Marsh Area				
Sample Code		U-238 Conc. (pCi/g)			Data	Ra-224 Conc. (pCi/g)			Data
No. SB-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
MA-34-G/H		8.90E-01	9.53E-02	1.95E-02	8.90E-01	2.16E+00	6.48E-01	6.73E-01	2.16E+00
MA-36-D/C		1.15E+00	1.10E-01	2.88E-02	1.15E+00	4.41E-01	3.47E-01	5.54E-01	5.54E-01
No. of data points:		2			2	2			2
Maximum value:		1.15E+00	1.10E-01	2.88E-02	1.15E+00	2.16E+00	6.48E-01	6.73E-01	2.16E+00
Minimum value:		8.90E-01	9.53E-02	1.95E-02	8.90E-01	4.41E-01	3.47E-01	5.54E-01	5.54E-01
Average activity:		1.02E+00	1.03E-01	2.46E-02	1.02E+00	1.30E+00	5.20E-01	6.16E-01	1.36E+00
Std. Deviation:		1.84E-01			1.84E-01	1.22E+00			1.14E+00
Coef. of variation (%):		1.80E+01			1.80E+01	9.35E+01			8.37E+01
Ave. @ 95% confid. level:		1.84E+00			1.84E+00	6.73E+00			6.43E+00
(for t 0.05,1)	6.314								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996, and 96M-0176-03, June 10, 1996.									
See Attach. 10, Vol. 2.									

Table A4-28		Supplemental Sample Radiological Analyses (6 of 13)							
					Marsh Area				
Sample Code		Ra-226 Conc. (pCi/g)			Data	Th-228 Conc. (pCi/g)			Data
No. SB-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
MA-34-G/H		1.18E+00	2.09E-01	1.61E-01	1.18E+00	1.65E+00	1.47E-01	4.74E-02	1.65E+00
MA-36-D/C		1.07E-01	9.88E-02	1.78E-01	1.78E-01	1.60E+00	1.44E-01	5.21E-02	1.60E+00
No. of data points:		2			2	2			2
Maximum value:		1.18E+00	2.09E-01	1.78E-01	1.18E+00	1.65E+00	1.47E-01	5.21E-02	1.65E+00
Minimum value:		1.07E-01	9.88E-02	1.61E-01	1.78E-01	1.60E+00	1.44E-01	4.74E-02	1.60E+00
Average activity:		6.44E-01	1.63E-01	1.70E-01	6.79E-01	1.63E+00	1.46E-01	4.98E-02	1.63E+00
Std. Deviation:		7.59E-01			7.09E-01	3.54E-02			3.54E-02
Coef. of variation (%):		1.18E+02			1.04E+02	2.18E+00			2.18E+00
Ave. @ 95% confid. level:		4.03E+00			3.84E+00	1.78E+00			1.78E+00
(for t 0.05,1)	6.314								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996, and									
96M-0176-03, June 10, 1996.									
See Attach. 10, Vol. 2.									

					Marsh Area				
Sample Code		Th-230 Conc. (pCi/g)			Data	Th-232Conc. (pCi/g)			Data
No. SB-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
MA-34-G/H		2.04E+00	1.52E-01	3.82E-02	2.04E+00	1.48E+00	1.29E-01	3.13E-02	1.48E+00
MA-36-D/C		6.76E+00	2.72E-01	2.65E-02	6.76E+00	1.47E+00	1.27E-01	7.71E-03	1.47E+00
No. of data points:		2			2	2			2
Maximum value:		6.76E+00	2.72E-01	3.82E-02	6.76E+00	1.48E+00	1.29E-01	3.13E-02	1.48E+00
Minimum value:		2.04E+00	1.52E-01	2.65E-02	2.04E+00	1.47E+00	1.27E-01	7.71E-03	1.47E+00
Average activity:		4.40E+00	2.20E-01	3.29E-02	4.40E+00	1.48E+00	1.28E-01	2.28E-02	1.48E+00
Std. Deviation:		3.34E+00			3.34E+00	7.07E-03			7.07E-03
Coef. of variation (%):		7.59E+01			7.59E+01	4.79E-01			4.79E-01
Ave. @ 95% confid. level:		1.93E+01			1.93E+01	1.51E+00			1.51E+00
(for t 0.05,1)	6.314								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996.									
See Attach. 10, Vol. 2.									

Table A4-28		Supplemental Sample Radiological Analyses (7 of 13)							
					Background Soils				
Sample Code		U-234 Conc. (pCi/g)			Data	U-235 Conc. (pCi/g)			Data
No. SS-96-01		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
BG-06		8.16E-01	9.05E-02	3.55E-02	8.16E-01	5.60E-02	2.59E-02	8.44E-03	5.60E-02
BG-08		1.06E+00	1.07E-01	3.57E-02	1.06E+00	4.71E-02	2.64E-02	2.48E-02	4.71E-02
BG-10		8.19E-01	9.04E-02	3.53E-02	8.19E-01	2.47E-02	2.43E-02	3.72E-02	3.72E-02
No. of data points:		3			3	3			3
Maximum value:		1.06E+00	1.07E-01	3.57E-02	1.06E+00	5.60E-02	2.64E-02	3.72E-02	5.60E-02
Minimum value:		8.16E-01	9.04E-02	3.53E-02	8.16E-01	2.47E-02	2.43E-02	8.44E-03	3.72E-02
Average activity:		8.98E-01	9.63E-02	3.55E-02	8.98E-01	4.26E-02	2.55E-02	2.63E-02	4.68E-02
Std. Deviation:		1.40E-01			1.40E-01	1.61E-02			9.40E-03
Coef. of variation (%):		1.56E+01			1.56E+01	3.79E+01			2.01E+01
Ave. @ 95% confid. level:		1.13E+00			1.13E+00	6.98E-02			6.26E-02
(for t 0.05,2)	2.92								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996.									
See Attach. 10, Vol. 2.									

					Background Soils				
Sample Code		U-238 Conc. (pCi/g)			Data	Ra-224 Conc. (pCi/g)			Data
No. SS-96-01		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
BG-06		8.40E-01	9.14E-02	3.03E-02	8.40E-01	1.16E+00	4.38E-01	5.04E-01	1.16E+00
BG-08		1.03E+00	1.05E-01	2.54E-02	1.03E+00	1.61E+00	5.15E-01	5.09E-01	1.61E+00
BG-10		7.80E-01	8.84E-02	3.54E-02	7.80E-01	2.60E+00	5.30E-01	4.93E-01	2.60E+00
No. of data points:		3			3	3			3
Maximum value:		1.03E+00	1.05E-01	3.54E-02	1.03E+00	2.60E+00	5.30E-01	5.09E-01	2.60E+00
Minimum value:		7.80E-01	8.84E-02	2.54E-02	7.80E-01	1.16E+00	4.38E-01	4.93E-01	1.16E+00
Average activity:		8.83E-01	9.52E-02	3.06E-02	8.83E-01	1.79E+00	4.96E-01	5.02E-01	1.79E+00
Std. Deviation:		1.31E-01			1.31E-01	7.37E-01			7.37E-01
Coef. of variation (%):		1.48E+01			1.48E+01	4.12E+01			4.12E+01
Ave. @ 95% confid. level:		1.10E+00			1.10E+00	3.03E+00			3.03E+00
(for t 0.05,2)	2.92								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996, and 96M-0176-03, June 10, 1996.									
See Attach. 10, Vol. 2.									

Table A4-28		Supplemental Sample Radiological Analyses (8 of 13)							
					Background Soils				
Sample Code		Ra-226 Conc. (pCi/g)			Data	Th-228 Conc. (pCi/g)			Data
No. SS-96-01		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
BG-06		1.01E+00	1.82E-01	1.42E-01	1.01E+00	1.15E+00	1.19E-01	2.93E-02	1.15E+00
BG-08		1.14E+00	1.98E-01	1.49E-01	1.14E+00	1.37E+00	1.37E-01	5.64E-02	1.37E+00
BG-10		8.38E-01	1.37E-01	1.24E-01	8.38E-01	1.17E+00	1.31E-01	4.84E-02	1.17E+00
No. of data points:		3			3	3			3
Maximum value:		1.14E+00	1.98E-01	1.49E-01	1.14E+00	1.37E+00	1.37E-01	5.64E-02	1.37E+00
Minimum value:		8.38E-01	1.37E-01	1.24E-01	8.38E-01	1.15E+00	1.19E-01	2.93E-02	1.15E+00
Average activity:		9.96E-01	1.74E-01	1.39E-01	9.96E-01	1.23E+00	1.29E-01	4.61E-02	1.23E+00
Std. Deviation:		1.51E-01			1.51E-01	1.22E-01			1.22E-01
Coef. of variation (%):		1.52E+01			1.52E+01	9.89E+00			9.89E+00
Ave. @ 95% confid. level:		1.25E+00			1.25E+00	1.44E+00			1.44E+00
(for t 0.05,2)	2.92								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996, and									
96M-0176-03, June 10, 1996.									
See Attach. 10, Vol. 2.									

					Background Soils				
Sample Code		Th-230 Conc. (pCi/g)			Data	Th-232 Conc. (pCi/g)			Data
No. SS-96-01		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
BG-06		9.59E-01	1.01E-01	2.94E-02	9.59E-01	1.09E+00	1.07E-01	2.01E-02	1.09E+00
BG-08		1.09E+00	1.12E-01	3.16E-02	1.09E+00	1.23E+00	1.18E-01	2.72E-02	1.23E+00
BG-10		9.86E-01	1.11E-01	3.45E-02	9.86E-01	9.24E-02	1.07E-01	2.97E-02	9.24E-02
No. of data points:		3			3	3			3
Maximum value:		1.09E+00	1.12E-01	3.45E-02	1.09E+00	1.23E+00	1.18E-01	2.97E-02	1.23E+00
Minimum value:		9.59E-01	1.01E-01	2.94E-02	9.59E-01	9.24E-02	1.07E-01	2.01E-02	9.24E-02
Average activity:		1.01E+00	1.08E-01	3.19E-02	1.01E+00	8.04E-01	1.11E-01	2.60E-02	8.04E-01
Std. Deviation:		6.92E-02			6.92E-02	6.20E-01			6.20E-01
Coef. of variation (%):		6.84E+00			6.84E+00	7.71E+01			7.71E+01
Ave. @ 95% confid. level:		1.13E+00			1.13E+00	1.85E+00			1.85E+00
(for t 0.05,2)	2.92								
Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996.									
See Attach. 10, Vol. 2.									

Table A4-28 Supplemental Sample Radiological Analyses (9 of 13)

Sediment and Subsurface

Sample Code	U-234 Conc. (pCi/g)			Data	U-235 Conc. (pCi/g)			Data
No. SE-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-N14A	1.63E+00	1.28E-01	2.78E-02	1.63E+00	1.24E-01	4.10E-02	2.96E-02	1.24E-01
No. SU-0496-								
EF-02-M18B	1.64E+00	1.34E-01	3.05E-02	1.64E+00	8.39E-02	3.63E-02	3.25E-02	8.39E-02

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996.
See Attach. 10, Vol. 2.

Sediment and Subsurface

Sample Code	U-238 Conc. (pCi/g)			Data	Ra-224 Conc. (pCi/g)			Data
No. SE-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-N14A	1.47E+00	1.22E-01	3.65E-02	1.47E+00	2.03E+00	7.03E-01	8.40E-01	2.03E+00
No. SU-0496-								
EF-02-M18B	1.83E+00	1.41E-01	2.09E-02	1.83E+00	5.65E+00	9.76E-01	7.15E-01	5.65E+00

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-01, June 12, 1996, and
96M-0176-03, June 10, 1996.
See Attach. 10, Vol. 2.

Sediment and Subsurface

Sample Code	Ra-226 Conc. (pCi/g)			Data	Th-228 Conc. (pCi/g)			Data
No. SE-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-N14A	2.59E+00	3.13E-01	1.57E-01	2.59E+00	1.20E+00	1.23E-01	3.01E-02	1.20E+00
No. SU-0496-								
EF-02-M18B	2.44E+00	2.89E-01	1.52E-01	2.44E+00	1.20E+00	1.19E-01	3.24E-02	1.20E+00

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996, and
96M-0176-03, June 10, 1996.
See Attach. 10, Vol. 2.

Sediment and Subsurface

Sample Code	Th-230 Conc. (pCi/g)			Data	Th-232 Conc. (pCi/g)			Data
No. SE-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-N14A	1.02E+00	1.05E-01	2.07E-02	1.02E+00	1.01E+00	1.05E-01	3.02E-02	1.01E+00
No. SU-0496-								
EF-02-M18B	9.94E-01	1.01E-01	3.42E-02	9.94E-01	1.01E+00	1.01E-01	1.92E-02	1.01E+00

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-02, June 12, 1996.
See Attach. 10, Vol. 2.

Table A4-28 Supplemental Sample Radiological Analyses (10 of 13)

Surface Water - Filtered Sample

Sample Code	U-234 Conc. (uCi/mL) Activity	+/-Error	MDC	Data Analysis	U-235 Conc. (uCi/mL) Activity	+/-Error	MDC	Data Analysis
H2O-96-02-20-1	1.90E-09	3.41E-10	2.57E-10	1.90E-09	1.35E-10	1.05E-10	1.24E-10	1.35E-10
SW-0496-								
EF-07-N14A	4.07E-09	4.54E-10	2.16E-10	4.07E-09	2.00E-10	1.24E-10	1.43E-10	2.00E-10

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-07, June 11, 1996.
Samples filtered through 0.45 um filters (Gelman A/E See Attach. 10, Vol. 3.

Surface Water - Filtered Sample

Sample Code	U-238 Conc. (uCi/mL) Activity	+/-Error	MDC	Data Analysis	Ra-228 Conc. (uCi/mL) Activity	+/-Error	MDC	Data Analysis
H2O-96-02-20-1	4.65E-10	1.86E-10	2.05E-10	4.65E-10	2.00E-09	1.60E-09	3.30E-09	3.30E-09
SW-0496-								
EF-07-N14A*	2.33E-09	3.37E-10	1.16E-10	2.33E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-07, June 11, 1996, and
96M-0176-10, June 19, 1996. Samples filtered through 0.45 um filters (Gelman A/E).
* Not analyzed for Ra-228, insufficient sample volume.
See Attach. 10, Vol. 3.

Surface Water - Filtered Sample

Sample Code	Ra-226 Conc. (uCi/mL) Activity	+/-Error	MDC	Data Analysis	Th-228 Conc. (uCi/mL) Activity	+/-Error	MDC	Data Analysis
H2O-96-02-20-1	3.90E-10	1.40E-10	3.10E-10	3.90E-10	2.64E-10	1.41E-10	1.58E-10	2.64E-10
SW-0496-								
EF-07-N14A*	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-10	1.51E-10	1.88E-10	2.72E-10

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-09, June 18, 1996, and
96M-0176-08 June 11, 1996. Samples filtered through 0.45 um filters (Gelman A/E).
* Not analyzed for Ra-226, insufficient sample volume.
See Attach. 10, Vol. 3.

Surface Water - Filtered Sample

Sample Code	Th-230 Conc. (uCi/mL) Activity	+/-Error	MDC	Data Analysis	Th-232 Conc. (uCi/mL) Activity	+/-Error	MDC	Data Analysis
H2O-96-02-20-1	3.20E-10	2.42E-10	3.82E-10	3.82E-10	3.83E-10	1.46E-10	1.19E-10	3.83E-10
SW-0496-								
EF-07-N14A	6.85E-10	1.97E-10	1.63E-10	6.85E-10	4.97E-11	1.14E-10	2.07E-10	2.07E-10

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-08, June 11, 1996.
Samples filtered through 0.45 um filters (Gelman A/E).
See Attach. 10, Vol. 3.

Table A4-28	Supplemental Sample Radiological Analyses (11 of 13)							
	Surface Water - Filtered Sample							
	Sr-90 Conc. (uCi/mL)			Data	Tc-99 Conc. (uCi/mL)			Data
Sample Code	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
H2O-96-02-20-1	-1.20E-10	2.50E-09	1.80E-09	1.80E-09	1.20E-08	8.10E-09	7.90E-09	1.20E-08
SW-0496-								
EF-07-N14A#	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.40E-08	8.90E-09	8.00E-09	9.40E-08

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-11, -12, June 12, 1996.
Samples filtered through 0.45 um filters (Gelman A/E See Attach. 10, Vol. 3.
Not analyzed, insufficient sample volume.

Surface Water - Filtered Sample				
	Tritium Conc. (uCi/mL)			Data
Sample Code	Activity	+/-Error	MDC	Analysis
H2O-95-11-29-1	2.15E-07	1.22E-07	2.07E-07	2.15E-07
H2O-95-01-19-1	2.35E-07	1.22E-07	2.07E-07	2.35E-07
H2O-96-02-20-1	2.75E-07	1.23E-07	2.07E-07	2.75E-07
SW-0496-				
EF-09-N16/17	3.15E-07	1.23E-07	2.07E-07	3.15E-07
SW-0496-				
EF-07-N14A	2.25E-07	1.22E-07	2.07E-07	2.25E-07
SW-0496-				
EF-05-N14A	2.25E-07	1.22E-07	2.07E-07	2.25E-07

Sample analyzed via alpha spectroscopy by Data Chem, report no. 96M-0176-06, June 11, 1996.
Samples filtered through 0.45 um filters (Gelman A/E).
See Attach. 10, Vol. 3.

Table A4-28		Supplemental Sample Radiological Analyses (12 of 13)							
					Excavation Floor				
Sample Code		Sr-90 Conc (pCi/g)			Data	Tc-99 Conc (pCi/g)			Data
No. SS-0496-EF-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-20-M20D		2.10E-02	1.30E-01	9.00E-02	9.00E-02	1.80E-02	4.00E-02	4.00E-02	4.00E-02
EF-47-N13C		1.21E-01	1.40E-01	8.80E-02	1.21E-01	2.20E-01	4.70E-02	4.40E-02	2.20E-01
EF-28-M17D		9.20E-01	1.90E-01	8.40E-02	9.20E-01	4.30E-02	4.40E-02	4.30E-02	4.30E-02
No. of data points:		3			3	3			3
Maximum value:		9.20E-01	1.90E-01	9.00E-02	9.20E-01	2.20E-01	4.70E-02	4.40E-02	2.20E-01
Minimum value:		2.10E-02	1.30E-01	8.40E-02	9.00E-02	1.80E-02	4.00E-02	4.00E-02	4.00E-02
Average activity:		3.54E-01	1.56E-01	8.74E-02	3.77E-01	9.37E-02	4.38E-02	4.24E-02	1.01E-01
Std. Deviation:		4.93E-01			4.71E-01	1.10E-01			1.03E-01
Coef. of variation (%):		1.39E+02			1.25E+02	1.18E+02			1.02E+02
Ave. @ 95% confid. level:		1.18E+00			1.17E+00	2.79E-01			2.75E-01
(for t 0.05,2)	2.92								
Sample analyzed by Data Chem, report no. 96M-0176-04, -05, June 12, 1996.									
See Attach. 10, Vol. 3.									
					Excavation Side				
Sample Code		Sr-90 Conc (pCi/g)			Data	Tc-99 Conc (pCi/g)			Data
No. SS-0496-		Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
ES-18-LM11F		2.20E-01	1.40E-01	8.20E-02	2.20E-01	1.30E-01	4.40E-02	4.20E-02	1.30E-01
ES-12-J14/15F		2.60E-01	2.00E-01	1.20E-01	2.60E-01	-8.00E-02	4.20E-02	4.20E-02	4.20E-02
No. of data points:		2			2	2			2
Maximum value:		2.60E-01	2.00E-01	1.20E-01	2.60E-01	1.30E-01	4.40E-02	4.20E-02	1.30E-01
Minimum value:		2.20E-01	1.40E-01	8.20E-02	2.20E-01	-8.00E-02	4.20E-02	4.20E-02	4.20E-02
Average activity:		2.40E-01	1.73E-01	1.03E-01	2.40E-01	2.50E-02	4.30E-02	4.20E-02	8.60E-02
Std. Deviation:		2.83E-02			2.83E-02	1.48E-01			6.22E-02
Coef. of variation (%):		1.18E+01			1.18E+01	5.94E+02			7.24E+01
Ave. @ 95% confid. level:		3.66E-01			3.66E-01	6.88E-01			3.64E-01
(for t 0.05,1)	6.314								
Sample analyzed by Data Chem, report no. 96M-0176-04, -05, June 12, 1996.									
See Attach. 10, Vol. 3.									

Table A4-28 Supplemental Sample Radiological Analyses (13 of 13)

Sediment and Subsurface

Sample Code	Sr-90 Conc. (pCi/g)			Data	Tc-99 Conc. (pCi/g)			Data
No. SE-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
EF-04-N14A	3.00E-01	2.00E-01	1.20E-01	3.00E-01	2.50E-01	4.70E-02	4.40E-02	2.50E-01
No. SU-0496-								
EF-02-M18B	3.70E-01	2.10E-01	1.30E-01	3.70E-01	1.10E-01	4.50E-02	4.40E-02	1.10E-01

Sample analyzed by Data Chem, report no. 96M-0176-04, -05, June 12, 1996.
See Attach. 10, Vol. 3.

Marsh Area

Sample Code	Sr-90 Conc. (pCi/g)			Data	Tc-99 Conc. (pCi/g)			Data
No. SB-0496-	Activity	+/-Error	MDC	Analysis	Activity	+/-Error	MDC	Analysis
MA-36-D/C	1.60E-01	1.30E-01	7.70E-02	1.60E-01	5.70E-01	5.10E-02	4.50E-02	5.70E-01

Sample analyzed by Data Chem, report no. 96M-0176-04, -05, June 12, 1996.
See Attach. 10, Vol. 3.

Background Soils

Sample Code	Sr-90 Conc. (pCi/g)			Data
No. SS-96-01-	Activity	+/-Error	MDC	Analysis
BG-10	-9.30E-03	1.20E-01	8.20E-02	8.20E-02

Sample analyzed by Data Chem, report no. 96M-0176-04, June 12, 1996.
See Attach. 10, Vol. 3.

Table A4-29	Field Radiation Measurements - QA/QC Evaluation (1 of 3)								
	Excavation Surface Scan					Excavation Ambient			
Survey Grid No.	Measurements- uR/h Initial	Duplicate	Ratio Init./Dup.	Relative Error(%)	Survey Grid No.	Measurements- uR/h Initial	Duplicate	Ratio Init./Dup.	Relative Error(%)
K-21	13	12	1.08	8.00	K-23	9	8	1.13	11.76
	13	12	1.08	8.00	M-23	9	10	0.90	-10.53
	12	12	1.00	0.00	N-22	9	10	0.90	-10.53
	13	12	1.08	8.00	O-21	10	9	1.11	10.53
M-22	11	12	0.92	-8.70	N-20	10	10	1.00	0.00
	11	11	1.00	0.00	O-19	10	9	1.11	10.53
	11	11	1.00	0.00	O-17	9	8	1.13	11.76
	11	11	1.00	0.00	P-17	8	8	1.00	0.00
O-20	12	11	1.09	8.70	O-16	9	8	1.13	11.76
	12	11	1.09	8.70	P-15	10	9	1.11	10.53
	10	12	0.83	-18.18	N-14	12	11	1.09	8.70
	11	11	1.00	0.00	O-13	12	11	1.09	8.70
L-18	12	13	0.92	-8.00					
	12	13	0.92	-8.00			No. of data	12	12
	14	15	0.93	-6.90			Average	1.06	5.27
	15	14	1.07	6.90			Maximum	1.13	11.76
N-18	15	16	0.94	-6.45			Minimum	0.90	-10.53
	14	14	1.00	0.00					
	13	15	0.87	-14.29			See Attach. 9, Vol. 2.		
	14	14	1.00	0.00					
J-16	11	11	1.00	0.00					
	11	11	1.00	0.00					
	13	12	1.08	8.00					
	13	14	0.93	-7.41					
M-16	17	17	1.00	0.00					
	11	12	0.92	-8.70					
	10	9	1.11	10.53					
	19	16	1.19	17.14					
O-14	16	14	1.14	13.33					
	11	13	0.85	-16.67					
	10	12	0.83	-18.18					
	11	14	0.79	-24.00					
K-14	15	14	1.07	6.90					
	13	13	1.00	0.00					
	13	13	1.00	0.00					
	15	16	0.94	-6.45					
M-12	18	17	1.06	5.71					
	11	15	0.73	-30.77					
	11	13	0.85	-16.67					
	19	19	1.00	0.00					
		No. of data	40	40					
		Average	0.98	-2.24					
		Maximum	1.19	17.14					
		Minimum	0.73	-30.77					

Table A4-29 Field Radiation Measurements - QA/QC Evaluation (2 of 3)

Screening Area Surface Scan

Survey Grid No.	Measurements- uR/h Initial	Duplicate	Ratio Init./Dup.	Relative Error(%)
H-7	8	8	1.00	0.00
	8	7	1.14	13.33
	6	7	0.86	-15.38
	6	6	1.00	0.00
J-8	8	7	1.14	13.33
	6	6	1.00	0.00
	6	6	1.00	0.00
	7	7	1.00	0.00
H-11	8	8	1.00	0.00
	8	8	1.00	0.00
	7	8	0.88	-13.33
	7	7	1.00	0.00
I-15	6	6	1.00	0.00
	6	7	0.86	-15.38
	7	7	1.00	0.00
	7	7	1.00	0.00
G-20	8	8	1.00	0.00
	9	9	1.00	0.00
	7	7	1.00	0.00
	7	7	1.00	0.00
		No. of data	20	20
		Average	0.99	-0.87
		Maximum	1.14	13.33
		Minimum	0.86	-15.38

Excavation Perimeter Ambient

Survey Grid No.	Measurements- uR/h Initial	Duplicate	Ratio Init./Dup.	Relative Error(%)
H-22	7	7	1.00	0.00
F-20	7	7	1.00	0.00
G-15	8	7	1.14	13.33
G-7	5	4	1.25	22.22
Q-16	9	9	1.00	0.00
P-23	8	8	1.00	0.00
K-23/24	8	8	1.00	0.00
J-4	5	5	1.00	0.00
L-9	9	9	1.00	0.00
R-13	8	8	1.00	0.00
		No. of data	10	10
		Average	1.04	3.56
		Maximum	1.25	22.22
		Minimum	1.00	0.00

See Attach. 9, Vol. 2.

Screening Area Ambient

Survey Grid No.	Measurements- uR/h Initial	Duplicate	Ratio Init./Dup.	Relative Error(%)
I-7	5	5	1.00	0.00
H-10	7	6	1.17	15.38
I-14	6	7	0.86	-15.38
G-17	7	8	0.88	-13.33
		No. of data	4	4
		Average	0.97	-3.33
		Maximum	1.17	15.38
		Minimum	0.86	-15.38

Table A4-29	Field Radiation Measurements - QA/QC Evaluation (3 of 3)								
	North CRZ Surface Scan					South CRZ Surface Scan			
Survey Grid No	Measurements- uR/h Initial	Duplicate	Ratio Init./Dup	Relative Error(%)	Survey Grid No	Measurements- uR/h Initial	Duplicate	Ratio Init./Dup	Relative Error(%)
O-11	11	12	0.92	-8.70	K-24	9	9	1.00	0.00
	11	11	1.00	0.00		9	9	1.00	0.00
	12	12	1.00	0.00		9	9	1.00	0.00
	12	12	1.00	0.00		9	9	1.00	0.00
P-12	11	11	1.00	0.00	J-26	9	9	1.00	0.00
	13	13	1.00	0.00		8	8	1.00	0.00
	11	12	0.92	-8.70		9	9	1.00	0.00
	11	11	1.00	0.00		9	8	1.13	11.76
R-13	10	9	1.11	10.53	I-27	10	10	1.00	0.00
	10	10	1.00	0.00		10	9	1.11	10.53
						10	10	1.00	0.00
						10	10	1.00	0.00
		No. of data	10	10			No. of data	12	12
		Average	0.99	-0.69			Average	1.02	1.86
		Maximum	1.11	10.53			Maximum	1.13	11.76
		Minimum	0.92	-8.70			Minimum	1.00	0.00
		See Attach. 9, Vol. 2.							
	North CRZ Ambient					South CRZ Ambient			
Survey Grid No	Measurements- uR/h Initial	Duplicate	Ratio Init./Dup	Relative Error(%)	Survey Grid No	Measurements- uR/h Initial	Duplicate	Ratio Init./Dup	Relative Error(%)
P-10	10	9	1.11	10.53	K-23	8	8	1.00	0.00
Q-11	10	10	1.00	0.00	I-25	11	11	1.00	0.00
R-13	9	9	1.00	0.00	H-26	9	9	1.00	0.00
		No. of data	3	3			No. of data	3	3
		Average	1.04	3.51			Average	1.00	0.00
		Maximum	1.11	10.53			Maximum	1.00	0.00
		Minimum	1.00	0.00			Minimum	1.00	0.00
		See Attach. 9, Vol. 2.							

Table A4-30 Gross Alpha and Beta Sample Activity - QA/QC Evaluation

Sample Code	Alpha Activity* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
SU-0496-EF-01-N16/17	1.70E+01	2.60E+00	1.30E+01	2.50E+00	1.31	26.67
SS-0496-EF-45-L11A	1.70E+01	3.70E+00	1.40E+01	3.80E+00	1.21	19.35
SS-0496-EF-22-J20D	1.30E+01	2.30E+00	1.00E+01	2.20E+00	1.30	26.09
SS-0496-ES-17-N12F	2.70E+01	3.20E+00	2.00E+01	3.00E+00	1.35	29.79
SS-0496-EF-35-J14D	1.60E+01	3.00E+00	1.90E+01	3.10E+00	0.84	-17.14
SS-0496-ES-10-J16/17F	1.10E+01	2.70E+00	1.40E+01	2.70E+00	0.79	-24.00
SB-0496-MA36	1.30E+01	2.70E+00	1.50E+01	2.70E+00	0.87	-14.29
SB-0496-MA46	6.00E+00	2.00E+00	9.20E+00	2.30E+00	0.65	-42.11
SS-0596-EF-53-I7D	1.40E+01	2.10E+00	-9.10E-01	2.10E+00	-15.38	227.81
SW-0496-EF-06-M18B (F)	3.40E+00	6.30E-01	4.00E+00	7.10E-01	0.85	-16.22
SW-0496-EF-06-M18B	1.10E+01	1.50E+00	1.10E+01	1.70E+00	1.00	0.00
10898-009 (QA/QC Lab)	1.89E+01	3.30E+00	1.40E+01	3.00E+00	1.35	29.79
			No. of data		12	12
			Average		-0.32	20.48
			Maximum		1.35	227.81
			Minimum		-15.38	-42.11

* Samples with "SW" prefix are in pCi/L, all others are in pCi/g-dry.

See Attach. 10, Vol. 2, Attach. 12, Vol. 3, and Attach. 14, Vol. 3.

Sample Code	Beta Activity* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
SU-0496-EF-01-N16/17	3.20E+01	2.60E+00	2.90E+01	2.60E+00	1.10	9.84
SS-0496-EF-45-L11A	2.50E+01	3.20E+00	1.80E+01	3.80E+00	1.39	32.56
SS-0496-EF-22-J20D	2.20E+01	2.50E+00	2.40E+01	2.30E+00	0.92	-8.70
SS-0496-ES-17-N12F	2.80E+01	3.00E+00	3.10E+01	2.80E+00	0.90	-10.17
SS-0496-EF-35-J14D	1.90E+01	3.00E+00	1.80E+01	2.60E+00	1.06	5.41
SS-0496-ES-10-J16/17F	1.50E+01	2.90E+00	1.50E+01	2.50E+00	1.00	0.00
SB-0496-MA36	2.30E+01	3.00E+00	2.40E+01	4.00E+00	0.96	-4.26
SB-0496-MA46	1.50E+01	2.20E+00	1.40E+01	2.70E+00	1.07	6.90
SS-0596-EF-53-I7D	-3.10E-01	2.60E+00	2.10E+00	2.50E+00	-0.15	-269.27
SW-0496-EF-06-M18B (F)	7.10E+00	8.10E-01	6.40E+00	8.00E-01	1.11	10.37
SW-0496-EF-06-M18B	2.00E+01	1.70E+00	1.70E+01	1.70E+00	1.18	16.22
10898-009 (QA/QC Lab)	2.09E+01	2.47E+00	1.96E+01	2.35E+00	1.07	6.42
			No. of data		12	12
			Average		0.97	-17.06
			Maximum		1.39	32.56
			Minimum		-0.15	-269.27

* Samples with "SW" prefix are in pCi/L, all others are in pCi/g-dry.

See Attach. 10, Vol. 2, Attach. 12, Vol. 3, and Attach. 14, Vol. 3.

Table A4-31	Specific Sample Radionuclide Activity - QA/QC Evaluation (1 of 2)					
Sample Code	U-234 Activity*				Ratio	Relative
	Initial	Error +/-	Duplicate	Error +/-	Init./Dup.	Error(%)
SB-0496-MA34	8.73E-01	9.57E-02	8.67E-01	9.50E-02	1.01	0.69
H2O-96-02-22-01 (F)	1.90E+00	3.41E-01	7.39E-01	2.09E-01	2.57	87.99
				No. of data	2	2
				Average	1.79	44.34
				Maximum	2.57	87.99
				Minimum	1.01	0.69
Sample Code	U-235 Activity*				Ratio	Relative
	Initial	Error +/-	Duplicate	Error +/-	Init./Dup.	Error(%)
SB-0496-MA34	5.54E-02	2.93E-02	4.74E-02	2.70E-02	1.17	15.56
H2O-96-02-22-01 (F)	1.35E-01	1.05E-01	1.58E-02	8.17E-02	8.54	158.09
				No. of data	2	2
				Average	4.86	86.83
				Maximum	8.54	158.09
				Minimum	1.17	15.56
Sample Code	U-238 Activity*				Ratio	Relative
	Initial	Error +/-	Duplicate	Error +/-	Init./Dup.	Error(%)
SB-0496-MA34	8.90E-01	9.53E-02	8.12E-01	9.03E-02	1.10	9.17
H2O-96-02-22-01 (F)	4.65E-01	1.86E-01	2.94E-01	1.39E-01	1.58	45.06
				No. of data	2	2
				Average	1.34	27.11
				Maximum	1.58	45.06
				Minimum	1.10	9.17
Sample Code	Ra-226 Activity*				Ratio	Relative
	Initial	Error +/-	Duplicate	Error +/-	Init./Dup.	Error(%)
H2O-96-02-22-01 (F)	3.90E-01	1.40E-01	8.70E-01	1.80E-01	0.45	-76.19
Sample Code	Ra-228 Activity*				Ratio	Relative
	Initial	Error +/-	Duplicate	Error +/-	Init./Dup.	Error(%)
H2O-96-02-22-01 (F)	2.00E+00	1.60E+00	1.60E+00	1.20E+00	1.25	22.22
Sample Code	Tritium Activity*				Ratio	Relative
	Initial	Error +/-	Duplicate	Error +/-	Init./Dup.	Error(%)
H2O-96-02-22-01 (F)	2.75E+02	1.23E+02	2.37E+02	1.22E+02	1.16	14.84

* Samples with "H2O" prefix are in pCi/L, all others are in pCi/g-dry.

See Attach. 10, Vol. 2 and 3.

Table A4-31 Specific Sample Radionuclide Activity - QA/QC Evaluation (2 of 2)

Sample Code	Th-228 Activity* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
SB-0496-MA34	1.65E+00	1.47E-01	1.69E+00	1.50E-01	0.98	-2.40
H2O-96-02-22-01 (F)	2.64E-01	1.41E-01	1.39E-01	1.09E-01	1.90	62.03
				No. of data	2	2
				Average	1.44	29.82
				Maximum	1.90	62.03
				Minimum	0.98	-2.40

Sample Code	Th-230 Activity* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
SB-0496-MA34	2.04E+00	1.52E-01	1.99E+00	1.52E-01	1.03	2.48
H2O-96-02-22-01 (F)	3.20E-01	2.42E-01	4.56E-01	2.65E-01	0.70	-35.05
				No. of data	2	2
				Average	0.86	-16.29
				Maximum	1.03	2.48
				Minimum	0.70	-35.05

Sample Code	Th-232 Activity* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
SB-0496-MA34	1.48E+00	1.29E-01	1.43E+00	1.29E-01	1.03	3.44
H2O-96-02-22-01 (F)	3.83E-01	1.46E-01	4.01E-02	6.94E-02	9.55	162.09
				No. of data	2	2
				Average	5.29	82.76
				Maximum	9.55	162.09
				Minimum	1.03	3.44

Sample Code	Ra-228 Activity* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
H2O-96-02-22-01 (F)	2.00E+00	1.60E+00	1.60E+00	1.20E+00	1.25	22.22

Sample Code	Ra-226 Activity* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
H2O-96-02-22-01 (F)	3.90E-01	1.40E-01	8.70E-01	1.80E-01	0.45	-76.19

* Samples with "H2O" prefix are in pCi/L, all others are in pCi/g-dry.

See Attach. 10, Vol. 2 and 3.

Table A4-32 Gamma Spectroscopic Sample Analysis - QA/QC Evaluation (1 of 3)

Sample Code	Nuclide	Sample Concentration* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
SU-0496-EF-01-N16/17	K-40	9.20E+00	2.70E+00	9.70E+00	2.90E+00	0.95	-5.29
	Co-60	7.50E-02	5.40E-02	9.00E-02	5.80E-02	0.83	-18.18
	Ba-133	-7.00E-03	4.60E-02	-3.60E-01	8.30E-02	0.02	-192.37
	Cs-137	8.30E-01	1.80E-01	8.30E-01	1.80E-01	1.00	0.00
	Eu-152	1.10E-01	1.60E-01	1.20E-01	1.80E-01	0.92	-8.70
	Ra-226	2.40E+00	1.20E+00	2.30E+00	1.20E+00	1.04	4.26
	Ac-228	9.80E-01	3.40E-01	1.20E+00	3.30E-01	0.82	-20.18
	Pa-231	3.00E+00	5.80E-01	3.30E+00	6.00E-01	0.91	-9.52
	Th-234	1.10E+00	2.90E+00	3.30E-01	1.10E+00	3.33	107.69
H2O-95-11-29-1	K-40	9.70E+01	1.10E+02	2.80E+01	1.20E+02	3.46	110.40
	Co-60	1.50E+00	5.30E+00	-3.50E+00	6.00E+00	-0.43	-500.00
	Ba-133	-3.00E+00	7.30E+00	-2.00E+00	6.90E+00	1.50	40.00
	Cs-137	-2.30E+00	5.90E+00	3.30E+00	6.60E+00	-0.70	-1120.00
	Eu-152	6.30E+00	2.60E+01	9.00E+00	3.20E+01	0.70	-35.29
	Ra-226	1.60E+02	1.20E+02	1.20E+02	1.20E+02	1.33	28.57
	Ac-228	1.40E+01	1.80E+01	1.00E+01	2.10E+01	1.40	33.33
	Pa-231	3.10E+01	3.50E+01	1.70E+01	2.90E+01	1.82	58.33
	Th-234	-9.30E+00	2.50E+02	2.60E+01	2.50E+02	-0.36	-422.75
SS-1295-ES-04-P13	K-40	7.50E+00	2.40E+00	7.00E+00	2.50E+00	1.07	6.90
No data for duplicate.	Co-60	2.10E-02	2.00E-02	0.00E+00	0.00E+00	n/a	200.00
	Cs-137	2.00E-01	1.30E-01	3.50E-01	1.50E-01	0.57	-54.55
	Pb-214	9.10E-01	2.10E-01	7.60E-01	2.40E-01	1.20	17.96
	Ac-228	9.10E-01	3.20E-01	9.30E-01	3.20E-01	0.98	-2.17
	Th-234	1.50E+01	0.00E+00	4.60E+00	0.00E+00	3.26	106.12
SW-0496-EF-06-M18B	K-40	9.30E+01	8.20E+01	5.40E+01	1.10E+02	1.72	53.06
	Co-60	-1.50E+00	8.30E+00	3.60E+00	5.60E+00	-0.42	-485.71
	Ba-133	-4.70E+00	7.90E+00	-3.50E+00	7.70E+00	1.34	29.27
	Cs-137	6.70E+00	7.10E+00	6.60E+00	6.70E+00	1.02	1.50
	Eu-152	-2.00E+00	3.80E+01	-8.50E+00	2.60E+01	0.24	-123.81
	Ra-226	7.50E+01	1.20E+02	1.20E+01	1.20E+02	6.25	144.83
	Ac-228	1.80E+01	2.70E+01	1.70E+01	2.50E+01	1.06	5.71
	Pa-231	1.50E+01	3.50E+01	7.60E-01	3.60E+01	19.74	180.71
	Th-234	-1.90E+02	5.40E+02	-3.60E+01	2.50E+02	5.28	136.28

* Samples with "H2O" or "SW" prefix are in pCi/L, all others are in pCi/g-dry.

See Attach. 10, Vol. 2, and Attach, 12, Vol. 3.

Table A4-32	Gamma Spectroscopic Sample Analysis - QA/QC Evaluation (2 of 3)						
Sample Code	Nuclide	Sample Concentration* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
SB-0496-M46	K-40	6.50E+00	2.00E+00	6.90E+00	2.10E+00	0.94	-5.97
	Co-60	3.40E-03	2.80E-02	-1.20E-02	2.50E-02	-0.28	-358.14
	Ba-133	6.90E-03	3.40E-02	5.00E-03	3.40E-02	1.38	31.93
	Cs-137	5.60E-02	3.60E-02	7.10E-02	4.00E-02	0.79	-23.62
	Eu-152	1.80E-01	1.30E-01	6.20E-02	1.40E-01	2.90	97.52
	Ra-226	8.10E-01	7.00E-01	7.50E-01	6.70E-01	1.08	7.69
	Ac-228	7.00E-01	3.00E-01	1.00E+00	2.90E-01	0.70	-35.29
	Pa-231	1.60E+00	3.60E-01	1.40E+00	3.60E-01	1.14	13.33
	Th-234	5.70E-01	1.70E+00	9.10E-01	2.50E+00	0.63	-45.95
SB-0496-MA34	K-40	8.60E+00	1.70E+00	7.90E+00	1.70E+00	1.09	8.48
	Co-60	1.50E-02	4.10E-02	2.30E-02	4.10E-02	0.65	-42.11
	Ba-133	3.20E-03	5.50E-02	5.90E-02	4.70E-02	0.05	-179.42
	Cs-137	4.90E-01	1.40E-01	5.60E-01	1.40E-01	0.88	-13.33
	Eu-152	8.60E-02	1.80E-01	2.40E-01	2.00E-01	0.36	-94.48
	Ra-226	2.10E+00	1.00E+00	2.20E+00	1.10E+00	0.95	-4.65
	Ac-228	1.10E+00	4.20E-01	1.20E+00	3.80E-01	0.92	-8.70
	Pa-231	1.90E+00	5.10E-01	2.20E+00	5.40E-01	0.86	-14.63
	Th-234	1.30E+00	3.80E+00	1.50E+00	4.40E+00	0.87	-14.29
SS-0496-EF-22-J20D	K-40	6.50E+00	1.40E+00	7.20E+00	1.90E+00	0.90	-10.22
	Co-60	1.20E-02	3.70E-02	3.30E-02	3.70E-02	0.36	-93.33
	Ba-133	2.90E-02	3.80E-02	-5.70E-03	4.30E-02	-5.09	297.85
	Cs-137	1.60E+00	2.90E-01	1.40E+00	3.50E-01	1.14	13.33
	Eu-152	7.70E-02	1.60E-01	1.60E-01	1.40E-01	0.48	-70.04
	Ra-226	1.10E+00	7.90E-01	1.30E+00	9.20E-01	0.85	-16.67
	Ac-228	1.00E+00	3.00E-01	9.10E-01	3.00E-01	1.10	9.42
	Pa-231	1.70E+00	3.60E-01	1.60E+00	3.60E-01	1.06	6.06
	Th-234	8.70E-01	2.50E+00	1.30E+00	3.70E+00	0.67	-39.63
SS-0496-EF-45-L11A	K-40	5.20E+00	1.90E+00	7.20E+00	2.20E+00	0.72	-32.26
	Co-60	5.10E-02	5.70E-02	2.50E-02	6.00E-02	2.04	68.42
	Ba-133	3.30E-02	5.80E-02	-2.60E-02	6.80E-02	-1.27	1685.71
	Cs-137	1.50E+00	3.70E-01	1.30E+00	3.40E-01	1.15	14.29
	Eu-152	-3.20E-02	2.50E-01	2.40E-02	2.50E-01	-1.33	1400.00
	Ra-226	1.40E+00	1.20E+00	9.50E-01	1.10E+00	1.47	38.30
	Ac-228	1.20E+00	4.60E-01	8.20E-01	3.60E-01	1.46	37.62
	Pa-231	2.60E+00	6.90E-01	2.40E+00	6.20E-01	1.08	8.00
	Th-234	1.20E+00	3.30E+00	7.00E-01	2.20E+00	1.71	52.63

*Samples with "H2O" or "SW" prefix are in pCi/L, all others are in pCi/g-dry.

See Attach. 10, Vol. 2, and Attach, 12, Vol. 3.

Table A4-32	Gamma Spectroscopic Sample Analysis - QA/QC Evaluation (3 of 3)						
Sample Code	Nuclide	Sample Concentration* Initial	Error +/-	Duplicate	Error +/-	Ratio Init./Dup.	Relative Error(%)
SS-0496-EF-36-L14A	K-40	3.50E+00	1.30E+00	3.20E+00	1.10E+00	1.09	8.96
	Co-60	9.00E-02	4.90E-02	7.10E-02	4.30E-02	1.27	23.60
	Ba-133	-3.80E-02	5.50E-02	1.10E-02	5.00E-02	-3.45	362.96
	Cs-137	2.20E+00	5.10E-01	2.30E+00	5.30E-01	0.96	-4.44
	Eu-152	2.10E-01	1.80E-01	-3.00E-02	2.00E-01	-7.00	266.67
	Ra-226	2.50E+00	1.30E+00	2.60E+00	1.20E+00	0.96	-3.92
	Ac-228	5.20E-01	2.80E-01	5.00E-01	2.40E-01	1.04	3.92
	Pa-231	2.70E+00	5.70E-01	2.70E+00	5.60E-01	1.00	0.00
	Th-234	2.20E+00	5.80E+00	2.00E+00	5.30E+00	1.10	9.52
SS-0496-EF-15-019B	K-40	7.10E+00	1.40E+00	6.20E+00	1.40E+00	1.15	13.53
	Co-60	8.90E-03	2.50E-02	-1.80E-03	3.10E-02	-4.94	301.41
	Ba-133	2.40E-02	4.10E-02	-3.80E-03	4.20E-02	-6.32	275.25
	Cs-137	5.20E-01	1.20E-01	5.60E-01	1.30E-01	0.93	-7.41
	Eu-152	4.30E-03	1.40E-01	-6.70E-02	1.40E-01	-0.06	-227.43
	Ra-226	9.70E-01	7.50E-01	1.30E+00	7.80E-01	0.75	-29.07
	Ac-228	9.50E-01	3.00E-01	8.40E-01	2.80E-01	1.13	12.29
	Pa-231	1.80E+00	3.90E-01	1.70E+00	4.20E-01	1.06	5.71
	Th-234	9.70E-01	2.90E+00	1.60E+00	4.60E+00	0.61	-49.03
SS-0596-EF-54-11C	K-40	2.60E+00	1.00E+00	3.20E+00	1.10E+00	0.81	-20.69
	Co-60	7.70E-02	6.60E-02	7.20E-02	4.70E-02	1.07	6.71
	Ba-133	3.10E-02	4.80E-02	-5.40E-03	4.40E-02	-5.74	284.38
	Cs-137	2.00E+00	4.70E-01	2.10E+00	4.90E-01	0.95	-4.88
	Eu-152	6.60E-02	2.00E-01	1.40E-01	1.60E-01	0.47	-71.84
	Ra-226	1.00E+00	7.90E-01	1.30E+00	9.60E-01	0.77	-26.09
	Ac-228	2.00E-01	1.90E-01	6.10E-01	2.10E-01	0.33	-101.23
	Pa-231	1.80E+00	4.40E-01	1.60E+00	4.50E-01	1.13	11.76
	Th-234	5.50E-01	1.60E+00	4.70E-01	7.80E-01	1.17	15.69
SS-0596-EF-55-I15D	K-40	8.80E-01	6.40E-01	1.50E+00	6.00E-01	0.59	-52.10
	Co-60	7.60E-03	2.40E-02	1.70E-02	2.20E-02	0.45	-76.42
	Ba-133	-1.80E-02	2.50E-02	9.90E-03	2.60E-02	-1.82	688.89
	Cs-137	7.50E-02	2.60E-01	2.40E-01	6.70E-02	0.31	-104.76
	Eu-152	2.50E-02	8.80E-02	7.50E-02	1.00E-01	0.33	-100.00
	Ra-226	3.90E-01	4.30E-01	9.00E-02	4.40E-01	4.33	125.00
	Ac-228	3.50E-01	1.70E-01	2.10E-01	1.40E-01	1.67	50.00
	Pa-231	3.90E-01	2.00E-01	6.00E-01	2.20E-01	0.65	-42.42
	Th-234	4.10E-01	1.10E+00	9.00E-02	4.60E-01	4.56	128.00
					No. of data	104	105
					Average	0.86	25.02
* Samples with "H2O" or "SW" prefix are in pCi/L, all others are in pCi/g-dry.					Maximum	19.74	1685.71
See Attach. 10, Vol. 2.					Minimum	-7.00	-1120.00

Table A4-33	Inter-Laboratory Comparison Analysis - QA/QC Evaluation (1 of 3)						
Sample Code	Nuclide	Sample Concentration* DataChem	Error +/-	Quanterra	Error +/-	Ratio Init./Dup.	Relative Error(%)
SB-0496-MA35	K-40	1.21E+01	3.60E+00	1.31E+01	1.60E+00	0.92	-7.94
10898-003	Co-60	9.20E-02	0.00E+00	5.41E-02	0.00E+00	1.70	51.88
	Cs-137	5.70E-01	1.70E-01	1.86E-01	5.08E-02	3.06	101.59
	Ra-226	1.30E+00	1.20E+00	8.25E-01	8.85E-02	1.58	44.71
	Ra/Ac-228	1.20E+00	4.30E-01	1.14E+00	1.76E-01	1.05	5.13
	Pa-231	2.20E+00	6.30E-01	2.77E-01	9.62E-01	7.94	155.27
	Th-234	9.00E-01	2.50E+00	9.03E-01	4.29E-01	1.00	-0.33
SB-0496-MA45	K-40	6.10E+00	1.30E+00	9.45E+00	2.79E+00	0.65	-43.09
10898-004	Co-60	6.20E-02	0.00E+00	2.23E-01	0.00E+00	0.28	-112.98
	Cs-137	3.20E-01	1.00E-01	2.13E-01	2.48E-01	1.50	40.15
	Ra-226	2.00E+00	1.00E+00	6.77E-01	2.32E-01	2.95	98.84
	Ra/Ac-228	1.10E+00	3.20E-01	1.16E+00	0.00E+00	0.95	-5.31
	Pa-231	1.80E+00	4.70E-01	4.96E+00	0.00E+00	0.36	-93.49
	Th-234	1.60E-01	1.60E+00	7.65E-01	1.27E+00	0.21	-130.81
SS-0496-EF-04-M18B	K-40	7.10E+00	2.00E+00	6.56E+00	9.80E-01	1.08	7.91
10898-002	Co-60	1.31E-01	7.20E-02	4.63E-03	0.00E+00	28.29	186.35
	Cs-137	1.80E+00	4.20E-01	8.67E-02	5.18E-02	20.76	181.62
	Ra-226	1.70E+00	1.10E+00	5.80E-01	6.90E-02	2.93	98.25
	Ra/Ac-228	1.10E+00	3.20E-01	9.26E-01	1.34E-01	1.19	17.18
	Pa-231	1.70E+00	3.90E-01	8.18E-01	0.00E+00	2.08	70.06
	Th-234	8.90E-01	2.40E+00	8.59E-01	4.04E-01	1.04	3.54
SS-0496-EF-38-O14A	K-40	2.40E+00	9.70E-01	4.46E+00	3.52E+00	0.54	-60.06
10898-007	Co-60	3.30E-01	9.60E-02	3.30E-01	2.82E-01	1.00	0.00
	Cs-137	6.80E+00	1.20E+00	7.98E+00	1.36E+00	0.85	-15.97
	Ra-226	7.50E+00	2.70E+00	1.65E+00	4.58E-01	4.55	127.87
	Ra/Ac-228	3.90E-01	2.80E-01	1.25E+00	0.00E+00	0.31	-104.88
	Pa-231	1.80E+00	4.90E-01	9.21E+00	0.00E+00	0.20	-134.60
	Th-234	8.40E-01	2.30E+00	5.45E+00	0.00E+00	0.15	-146.58
SS-0496-EF-45-L11A	K-40	5.20E+00	1.90E+00	6.02E+00	2.35E+00	0.86	-14.62
10898-006	Co-60	5.10E-02	5.70E-02	2.49E-01	0.00E+00	0.20	-132.00
	Cs-137	1.50E+00	3.70E-01	6.10E-01	1.95E-01	2.46	84.36
	Ra-226	1.40E+00	1.20E+00	1.10E+00	2.26E-01	1.27	24.00
	Ra/Ac-228	1.20E+00	4.60E-01	9.30E-01	0.00E+00	1.29	25.35
	Pa-231	2.60E+00	6.90E-01	4.43E+00	0.00E+00	0.59	-52.06
	Th-234	1.20E+00	3.30E+00	2.65E+00	1.31E+00	0.45	-75.32

* Samples with "10898-" are Quanterra results, all others are Data Chem's. Data are in pCi/g - dry.

Results with no values for the error, signify that the data are reported at the MDC.

See Attach. 10, Vol. 2 , Attach 12, Vol. 3, and Attach. 14, Vol. 3

Table A4-33	Inter-Laboratory Comparison Analysis - QA/QC Evaluation (2 of 3)							
Sample Code		Nuclide	Sample Concentration* DataChem	Error +/-	Quanterra	Error +/-	Ratio Init./Dup.	Relative Error(%)
SS-0496-EF-24-M22C		K-40	6.60E+00	1.90E+00	9.11E+00	3.33E+00	0.72	-31.95
10898-008		Co-60	-1.20E-02	3.60E-02	1.87E-01	0.00E+00	-0.06	-227.43
		Cs-137	4.50E-01	1.60E-01	3.12E-01	1.89E-01	1.44	36.22
		Ra-226	1.20E+00	7.80E-01	8.32E-01	3.00E-01	1.44	36.22
		Ra/Ac-228	1.00E+00	2.80E-01	1.11E+00	0.00E+00	0.90	-10.43
		Pa-231	2.50E+00	4.80E-01	5.32E+00	0.00E+00	0.47	-72.12
		Th-234	9.30E-01	2.60E+00	2.70E+00	1.87E+00	0.34	-97.52
SS-0496-ES-10-J16/17F		K-40	3.10E+00	1.00E+00	5.25E+00	1.85E+00	0.59	-51.50
10898-005		Co-60	5.60E-03	2.50E-02	2.19E-01	0.00E+00	0.03	-190.03
		Cs-137	3.10E-01	7.80E-02	3.01E-01	0.00E+00	1.03	2.95
		Ra-226	5.30E-01	5.50E-01	3.41E-01	1.89E-01	1.55	43.40
		Ra/Ac-228	4.90E-01	2.10E-01	1.03E+00	0.00E+00	0.48	-71.05
		Pa-231	6.80E-01	2.60E-01	4.91E+00	0.00E+00	0.14	-151.34
		Th-234	2.50E-01	7.80E-01	1.70E+00	0.00E+00	0.15	-148.72
SS-0496-EF-02-N16/17#		K-40	9.20E+00	2.70E+00	1.02E+01	2.67E+00	0.90	-10.31
10898-009		Co-60	7.50E-02	5.40E-02	3.11E-01	0.00E+00	0.24	-122.28
		Cs-137	8.31E-01	1.80E-01	2.68E+00	4.97E-01	0.31	-105.33
		Ra-226	2.40E+00	1.20E+00	1.10E+00	2.20E-01	2.18	74.29
		Ra/Ac-228	9.80E-01	3.40E-01	1.02E+00	0.00E+00	0.96	-4.00
		Pa-231	3.00E+00	5.80E-01	5.06E+00	0.00E+00	0.59	-51.12
		Th-234	1.10E+00	2.90E+00	1.76E+00	8.84E-01	0.63	-46.15
						No. of data	56	56
						Average	1.99	-17.93
						Maximum	28.29	186.35
						Minimum	-0.06	-227.43

* Samples with "10898-" are Quanterra results, all others are Data Chem's. Data are in pCi/g - dry.

Results with no values for the error, signify that the data are reported at the MDC.

Sample identified as SS-0496-01-N16/17 in Data Chem Lab report.

See Attach. 10, Vol. 2 and Attach. 14, Vol. 3

Table A4-33	Inter-Laboratory Comparison Analysis - QA/QC Evaluation (3 of 3)					
		Gross Alpha Activity*			Ratio	Relative
	Data Chem	Error +/-	Quanterra	Error +/-	Init./Dup.	Error(%)
SW-0496-EF-02-N16/17	2.60E+00	1.20E+00	4.58E+00	1.07E+00	0.57	-55.15
10898-01						
		Gross Beta Activity*			Ratio	Relative
	Data Chem	Error +/-	Quanterra	Error +/-	Init./Dup.	Error(%)
SW-0496-EF-02-N16/17	8.90E+00	1.80E+00	6.18E+00	1.22E+00	1.44	36.07
10898-01						
		Gross Alpha Activity*			Ratio	Relative
	Data Chem	Error +/-	Quanterra	Error +/-	Init./Dup.	Error(%)
SW-0496-EF-02-N16/17-F	1.10E+00	6.50E-01	2.42E+00	8.96E-01	0.45	-75.00
10898-01						
		Gross Beta Activity*			Ratio	Relative
	Data Chem	Error +/-	Quanterra	Error +/-	Init./Dup.	Error(%)
SW-0496-EF-02-N16/17- F	6.60E+00	9.40E-01	5.39E+00	1.17E+00	1.22	20.18
10898-01						
Sample Code		Pb-210 Activity*			Ratio	Relative
	Data Chem	Error +/-	Quanterra	Error +/-	Init./Dup.	Error(%)
SW-0496-EF-02-N16/17- F	7.80E+01	1.20E+02	2.54E+01	1.09E+02	3.07	101.74
10898-01						
Sample Code		Th-234 Activity*			Ratio	Relative
	Data Chem	Error +/-	Quanterra	Error +/-	Init./Dup.	Error(%)
SW-0496-EF-02-N16/17- F	4.10E+01	1.60E+02	5.52E+01	5.85E+01	0.74	-29.52

* Sample ID No. with "F" sufffix are filtered water samples. Al l results are in pCi/L.

See Attach. 12, Vol. 3 and 14, Vol. 3.

US Army Corps
of Engineers
Baltimore District

ENVIRONMENTAL REMEDIATION RESIDENT OFFICE

ATTACHMENTS - VOLUME 2

FINAL STATUS SURVEY REPORT for the DECOMMISSIONING of the BUSH RIVER - 26th STREET DISPOSAL SITE

ABERDEEN PROVING GROUND, MD
EDGEWOOD AREA

Prepared by
Foster Wheeler Environmental Corporation
for the
U.S. Army Corps of Engineers and Directorate of Safety, Health, and Environment-Radiation Protection Office
NRC License No. 19-10306-01, Docket No. 030-04552

May 12, 1997

FOSTER WHEELER ENVIRONMENTAL CORPORATION
A Division of FOSTER WHEELER USA CORPORATION
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ACRONYM LIST

Abbreviation	
Ac-228	Actinium-228
ACE	U.S. Army Corps of Engineers
ACOE	Army Corps of Engineers
AEC	Atomic Energy Commission
AEHA	Army Environmental Hygiene Agency
APG	Aberdeen Proving Ground
APG RPO	Aberdeen Proving Ground Radiation Protection Officer
ATG	2Allied Technology Group
B-12	Baron-12
Ba-133	Barium-133
Bi-214	Bismuth-214
C-14	Carbon-14
CASY	Chemical Area Storage Yard
CERCLA	Comprehensive Environmental Restoration and Conservation Liability Act
CFR	Code of Federal Regulations
Co-60	Cobalt-60
cpm	Counts Per Minute
CRZ	Contaminated Reduction Zone
Cs-137	Cesium-137
CWA	Chemical Warfare Agent
dpm	Decentigration Per Minute
DQO	Data Quality Objectives
DSHE	Directorate of Safety, Health and Environment
EPA	Environmental Protection Agency
Eu-152	Europium-152
FWENC	Foster Wheeler Environmental Corporation
H-3	Hydrogen-3
HCN	Hydrogen Cyanide
HDPE	High Density Polyethylene
HP	Health Physicist
K-40	Potassium-40
MCA	Multi Channel Analysis
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentration
MDE	Maryland Department of Environment
NaI	Sodium Iodide
NIST	National Institute of Standards and Technology
NPL	National Priority List
NRC	Nuclear Regulatory Commission
NUREG	Nuclear Regulation
Pb-214	Lead-214
Po-210	Polonium-210

PPE	Personal Protective Equipment
Pu-239	Plutonium-239
QA/QC	Quality Assurance Quality Control
R&D	Research and Development
Ra-224	Radium-224
RI/FS	Remedial Investigations Feasibility Studies
SA	Screening Area
Sr-90	Strontium-90
Tc-99	Technetium-99
TCLP	Toxicity Characteristic Leaching Procedure
Th-234	Thorium-234
U-238	Uranium-238
UXO	Unexploded Ordnance
WESTON	Roy F. Weston, Inc.