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ROCKY FLATS

**Final
Technical Memorandum 1
Addendum to Field Sampling Plan
Rocky Flats Environmental Technology
Site 100 Area OU13**



November 1994

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FINAL

TECHNICAL MEMORANDUM 1
Addendum to Field Sampling Plan

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
100 Area
(Operable Unit No. 13)

U.S. Department of Energy
Rocky Flats Environmental Technology Site
Golden, Colorado

ENVIRONMENTAL RESTORATION PROGRAM

November 1994

EG&G Rocky Flats Environmental Technology Site
Operable Unit No. 13
Technical Memorandum No. 1
Addendum to Field Sampling Plan

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LIST OF ACRONYMS AND ABBREVIATIONS

Am	Americium
CDH	Colorado Department of Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cpm	counts per minute
Cs	Cesium
DOE	U.S. Department of Energy
EMRG	Environmental Management Radiological Guidelines
EPA	U.S. Environmental Protection Agency
FIDLER	Field Instrument for Detection of Low Energy Radiation
GRASSP	General Radiochemistry and Routine Analytical Services Protocol
HPGe	High Purity Germanium
IAG	Interagency Agreement
IHSSs	Individual Hazardous Substance Sites
K	Potassium
MDA	Minimum Detectable Activity
NaI	Sodium Iodide
OU	Operable Unit
pCi/g	picocuries per gram
Pu	Plutonium
Ra	Radium
RCRA	Resource Conservation and Recovery Act
RFETS	Rocky Flats Environmental Technology Site
RFI	Remedial Facility Investigation
RI	Remedial Investigation
TAL	Target Analyte List
Th	Thorium
U	Uranium

1.0 INTRODUCTION

Preparation of this document meets the Phase I, Stage I Resource Conservation and Recovery Act (RCRA) Facilities Investigation/Remedial Investigation (RFI/RI) Work Plan requirements to provide surficial soil-sampling locations needed to obtain regulatory concurrence before proceeding with the remaining Phase I, Stage I activities for Operable Unit No. 13 (OU13) at the U.S. Department of Energy (DOE) Rocky Flats Environmental Technology Site (RFETS) located in Golden, Colorado (Figure 1). The Phase I, Stage I (screening level) activities include visual inspections, surface radiological surveys, surface soil sampling, soil boreholes, groundwater sampling from existing wells and piezometers, and soil-gas surveys. The HPGe surface radiological surveys were completed in August 1993, the Sodium Iodide surface radiological survey was completed in October 1993, and the visual inspections were completed on September 27, 1993. This technical memorandum describes the surface radiological and visual inspections as discussed below. The OU13 Work Plan provides that surficial soil sampling locations be based on surface radiological surveys and visual inspections. The soil-gas surveys, and soil boreholes had not begun before the final preparation of this technical memorandum.

Phase I, Stage I work is being conducted under the Phase I RFI and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) RI for OU13. Sampling is part of a comprehensive, multistaged program of site characterization, feasibility studies, and remedial/corrective actions currently in progress at RFETS. These activities are pursuant to an Interagency Agreement (IAG) among DOE, the U.S. Environmental Protection Agency (EPA), and the State of Colorado Department of Health (CDH), dated January 22, 1991 (DOE 1991). The IAG program developed by DOE, EPA, and CDH addresses both RCRA and CERCLA requirements. Additional information on the approved investigative activities for OU13 can be

found in the *Phase I RFI/RI Work Plan OU13* (DOE 1993a). All Quality Assurance information, Data Quality Objectives, and methods of investigation requirements for the investigation of OU13 can also be found in the OU13 Work Plan (DOE 1993a).

1.1 PURPOSE

One purpose of the visual inspections was to evaluate the physical condition at each IHSS and to identify or confirm possible hazards such as steam pipes and overhead utilities that could impact the nonintrusive activities to follow. Another purpose was to delineate paved and unpaved areas. Information from the inspections and the results of the radiological surveys were used to locate surface soil, asphalt, sediment, and surface water sample locations in each IHSS. Soil samples will be laboratory analyzed for one or all of the following: Target Analyte List (TAL) metals, lithium, magnesium, and radionuclides (gross alpha, gross beta, americium 241, plutonium 239/240, tritium, uranium 233/234, uranium 235, and uranium 238) as per the General Radiochemistry and Routine Analytical Services Protocol (GRASSP). Asphalt and concrete samples will be analyzed for TAL metals listed in the OU13 Work Plan (Table 5.3) using EPA modified method 200.7. Lithium and Mercury are not applicable to modified EPA method 200.7 and will be analyzed by EPA methods 3120 and 245.5 respectively.

Also, asphalt and concrete samples cannot be analyzed for tritium in the laboratory because, under normal conditions, tritium occurs in a liquid phase. Due to the hydrocarbon (tar) component of asphalt, which is naturally radioactive, measurements of gross alpha and beta on these samples will not be indicative of the presence of radioactivity from the sampled location. Additionally, vertical soil profile samples will be analyzed by the laboratory high purity germanium (HPGe) procedure as described in the Rocky Flats Plant, Analysis of Environmental Water and Soil Samples by Gamma Spectroscopy by L-7101-A, effective December 17, 1993. Sediment and surface water samples will be collected in ditches located within or adjacent to OU13 Individual Hazardous Substance Sites (IHSSs) at the request of CDH. These samples will be laboratory analyzed for metals, PCBs, semivolatile organics (SVOCs), and radionuclides. Sediment and surface water samples were not proposed as part of the OU13 Work Plan (DOE

1993a). Section 4.0 of this Technical Memorandum discusses the sampling plan for sediment and surface water at OU13.

The purpose of this report is to document the surface radiological and visual inspection results and to solicit a confirmation of the proposed surface soil, asphalt, sediment, and surface water sampling locations from DOE, CDH, and EPA for OU13 100 Area (Figure 2). Based on the statistical approach (Gilbert, 1987) outlined in the OU13 Work Plan (DOE 1993a), 11 soil samples are required to observe at least one affected soil sample (if contamination exists) with a probability of 95 percent within each IHSS group. Table 1 (from the OU13 Work Plan) indicates which IHSSs are grouped together for sampling purposes.

TABLE 1
NUMBER OF SURFICIAL SOIL AND ASPHALT
SAMPLING BY IHSS OR IHSS GROUPS

<u>IHSS Group</u>	<u>Number of Soil Samples</u>	<u>Number of Asphalt Samples</u>
117.1 and 197	11	2
117.2	11	2
117.3	11	0
158	11	0
148	11	0
157.1	11	0
186	11	0
134S	11	2
134N, 128, and 171	11	0

Surficial soil and asphalt samples are not required for IHSSs 152, 169, 190, and 191.

1.2 BACKGROUND

OU13 is located in the 100 Area (Figure 2). The 100 Area is located in the west-central portion of RFETS. It is bounded on the north, west, and south by the RFETS buffer zone and on the east by the 300 and 400 areas. It is bounded on the west by the Protected Area fence. There are some office buildings, a receiving warehouse, and some trailers housing offices west of that

fence. OU13 was originally configured by IHSSs located immediately south of the west end of the Protected Area (Figure 2). The IHSSs are potentially contaminated areas that have been identified based on previous investigations and historical accounts of site usage. OU13 is comprised of 15 IHSSs as discussed below:

- The North Chemical Storage Site (IHSS 117.1) is located north of the intersection of Sage Avenue and Seventh Street. Past use of the site included storage of building construction debris, other nonradioactive waste, and scrap metal. Automotive batteries may have been included in the stored materials. No chemicals were stored at this site.
- The Middle Chemical Storage Site (IHSS 117.2) is located south of IHSS 117.1, south of Sage Avenue, and west of Seventh Street. It is east of the northern part of Building 551. Historically, the area was used as a multipurpose storage facility including warehouse storage; nonradioactive chemical storage; and storage for pallets, cargo containers, and new drums. It is still used as a storage area; currently, materials stored at this site include acids, soaps, solvents, 55-gallon drums of beryllium chips and turnings, drums of aluminum scrap, and drums of aluminum nitrate.
- The South Chemical Storage Site (IHSS 117.3) is located south of IHSS 117.2, south of Central Avenue, and west of Seventh Street. Various unidentified materials were stored there from at least 1964 or earlier, until 1970. About 4 gallons of radioactively contaminated oil were reported to have leaked from a waste box that was transferred to the site in 1965. The contaminated ground was immediately removed. A large fuel oil storage tank (Tank 224) was constructed in the area in 1973.

- The Oil Burn Pit No. 1 Waste Leak Site (IHSS 128) is located north of building 335 and beneath Sage Avenue, and east of the Fourth Street intersection. It is the site of the reported disposal of approximately 200 gallons of oil contaminated with depleted uranium. These waste oils were burned in a pit in 1956. The pit was backfilled after the oil was burned. The area is now almost entirely covered by Sage Avenue, which was constructed in 1969 and 1970.
- The Lithium Metal Destruction Sites (IHSSs 134N and 134S) is located in an area that extends from the location of IHSS 128 south to the eastern wing of Building 331. Waste lithium was destroyed in this area by burning oil and lithium in 55-gallon drums. The residue containing oxidized lithium was probably sent to the Original Landfill (IHSS 115). The approximate duration of these activities was from 1963 to 1966.
- The Waste Spills Site (IHSS 148) is located at Building 123, west of Fourth Street, between Central and Cottonwood avenues. It is the result of small nitrate-bearing waste spills reported around the outside of Building 123 and possible leakage of the original process waste lines beneath the building that was abandoned about 1975. The wastes may have contained radionuclides.
- The Fuel Oil Tank 221 Spills Site (IHSS 152) is located west of Seventh Street, between Central and Cottonwood avenues, east of Building 452. The spills are associated with an 800,000-gallon fuel-oil storage tank. The tank was constructed in 1973. Fuel-oil leaks from this tank have been reported.
- The North Area Radioactive Site (IHSS 157.1) is located at Building 442, southwest of the intersection of Central Avenue and Fifth Street. Building 442 was used as a laundry facility from 1952 until about 1972, when it was converted to a filter test laboratory. The laundry facility received contaminated clothing and

rag that contained uranium and possibly beryllium. An example of potential contamination is leakage from a barrel of contaminated rags stored outside the building.

- The Building 551 Radioactive Site (IHSS 158) is beneath the north wing of Building 551, and includes Building 554, which was the train loading facility. The area is potentially contaminated by radioactive materials that leaked from containers stored and loaded there.
- Waste Drum Peroxide Burial (IHSS 169) is located east of Building 551 and immediately south and adjacent to IHSS 117.2. This IHSS relates to a reported leaking 55-gallon drum of hydrogen peroxide. One source indicated that a 55-gallon drum of hydrogen peroxide was buried in the chemical storage area east of Building 551; however, no documentation supports this claim. The location of this incident may be confused with IHSS 191. (IHSS 191 is described in the following sections.) It is proposed that these IHSSs be eliminated from the OU13 investigations, because the release of these constituents into the environment do not constitute a threat to human health or the environment.
- The Solvent Burning Ground Site (IHSS 171) is located near Building 335. The yard to the east of the building has been used to practice fire fighting since 1969. Diesel fuel, gasoline, propane, and possibly solvents have been ignited in metal pans. Some of this material may have spilled onto the ground.
- The Valve Vault 12 Site (IHSS 186) is located north of Sage Avenue, northwest of Building 552. It is part of the existing process waste system. Process waste may contain a large range of constituents, including uranium, americium, and plutonium. In 1986, a leak was detected in a process waste line west of Valve Vault 12. The leak was cleaned up by removing contaminated soil.

- The Caustic Leak Site (IHSS 190) involved a leak of raw (not waste) sodium hydroxide from an aboveground, 3,000-gallon tank located east of Building 443. The sodium hydroxide entered the Central Avenue Ditch. Alum was used to neutralize water in the ditch.
- The Hydrogen Peroxide Spill Site (IHSS 191) is the result of a spill that occurred in 1981. A 55-gallon drum of raw (not waste) hydrogen peroxide burst after it fell from a pallet that was being transported by warehouse personnel. The spill occurred near the corner of Fifth Street and Central Avenue. The spill was diluted with water.
- The Scrap Metal Site (IHSS 197) was originally one of the Low Priority Sites classified under OU16 but was transferred to OU13 after the final work plan was submitted for comments. Scrap metal components from early construction were reported buried in this area in the late 1950s or early 1960s. In 1981, during the construction of the new Protected Area perimeter fence, construction debris was discovered and work was begun to remove it. The material unearthed was moist, but not oily, scrap metal consisting of machine turnings, rings, shapes, overlays, and other metal parts. The materials were monitored for radiation with a Field Instrument for Detection of Low Energy Radiation (FIDLER), but none was detected. No transformers or related electrical equipment and materials were found.

1.3 PHASE I, STAGE I ACTIVITIES

The Phase I, Stage I activities for OU13 are designed to detect contamination at each IHSS primarily using noninvasive or limited invasive screening-level surveys. These surveys will provide an assessment of the presence or absence of contamination, and they will also begin to define the nature of contamination present. The following are the activities for the Phase I, Stage I investigations:

- visual inspections;

- surface radiological surveys;

- soil-gas surveys;

- soil boreholes (limited to IHSSs 148 and 186 where underground releases of contaminants are thought to have occurred);

- surficial soil sampling; and

- groundwater sampling from existing wells and piezometers.

Of these, the visual inspections and surface radiological surveys have been completed, and groundwater sampling of the existing monitoring wells and piezometers in the Industrial Area are now being sampled on a quarterly basis. The first quarter sampled was fall 1993; the analytical results will be discussed in Technical Memorandum No. 2 for OU13. This document presents the results of these inspections and surveys on an individual IHSS or group of IHSSs basis. IHSSs have been grouped according to location or type of contaminant. All results of the surface radiological survey are included as appendices or tables. After all of the investigations for the Phase I Stage I activities are completed, a comprehensive document will be prepared to summarize all of the information and fulfill the initial objectives of the RI/RFI as defined in the OU13 Work Plan.

2.0 METHODS OF INVESTIGATION

This section describes the investigative methodologies used during the data collection activities for the initial phase of the Phase I, Stage I activities for OU13 and provides the proposed sampling locations. The activities and methodologies used to collect the data were originally presented in the 1993 OU13 Work Plan (DOE 1993a) and subsequently approved by the Colorado Department of Health (CDH 1993).

2.1 HIGH PURITY GERMANIUM SURVEY

High Purity Germanium surveys (HPGe) were conducted at all of the 15 OU13 IHSSs. The HPGe surveys were conducted in accordance to Standard Operating Procedure (SOP) GT.30. An HPGe instrument is a semiconductor radiation detector that measures in situ low-energy X-ray and gamma-ray emitting radionuclides in soil. The HPGe has a broad energy range, exhibits high resolution, excellent gain stability, moderate area averaging, and the ability to identify and quantify all gamma-emitting radionuclides. The HPGe detector allows detection and calculation of radionuclide concentrations in soil in picoCuries per gram (pCi/g) of gamma-emitting radionuclides including, but not limited to, potassium-40; radium-226; thorium-232; cesium-137; americium-241; plutonium-239, -240, and -241; and uranium-233, -234, and -235. For further information on HPGe and other in-situ radiological detection techniques the reader is referred to *The Compendium of In-Situ Radiological Methods and Applications at Rocky Flats Plant* (DOE 1993b). The detection radius for the instrument, 147.5 feet, is shown by the red-dotted boundary in Figure 2. The draft HPGe results obtained to date, which include the percent error, minimal detectable activity, and Field of View information for all Operable Units at RFETS, are included in Appendix A to this document.

2.2 SODIUM IODIDE SURVEYS

In areas where the HPGe survey indicated elevated radiation concentrations, a sodium iodide (NaI) survey was also conducted to supplement the results. The NaI scintillation detector, also referred to as FIDLER, is used for detecting gamma photons. The detector consists of a single crystal of sodium iodide to which a small amount of thallium has been added. The detector has a narrow field of view of approximately 1 foot in diameter when held 2 inches above the ground. This instrument is designed to measure low-energy gamma-rays and x-rays, which are characteristic of americium and plutonium. The procedure for use of the FIDLER at RFETS as outlined in SOP FO.16 requires a background reading. Because guidelines for residual radioactive materials are presented in terms of radiation levels or activity levels above a normal background for the area or facility, a measurement of background and samples for each media are collected to provide baseline data for comparison with measurements and data collected at a particular site (DOE 1993b).

Areas in IHSS 197 were selected for NaI surveys, based on the HPGe results and at the request of CDH. A grid of 140 feet by 24 feet was used to further define the area of radioactive contamination. The background reading was obtained in accordance with SOP FO.16 by holding the instrument 15 feet upwind from the area surveyed and performing a one-minute scaler count. The field logs for these surveys are included in Appendix B to this document. This IHSS encompasses an area inside a RCRA storage area to the west and space between the Protected Area fence to the east (Figure 2).

2.3 VISUAL INSPECTIONS

A site reconnaissance of the 15 IHSSs in OU13 was conducted by EG&G, CDH, and Jacobs personnel to characterize local physical conditions. In addition to confirming the possible hazards such as steam pipes and overhead utilities, areas of potentially affected media were also noted. In particular, areas of stressed vegetation, soil staining, cracked pavement, and drainage

from buildings were noted through visual inspections, and surface soil or asphalt sample locations were placed accordingly.

2.4 SITE RECONNAISSANCE SEDIMENT AND SURFACE WATER LOCATIONS

On June 27, 1994, representatives of DOE and EG&G performed a site reconnaissance of ditches within or adjacent to the OU13 IHSSs to identify sediment and surface water sampling locations. For purposes of this technical memorandum, a ditch is defined as an elongated depression in the land surface that intermittently carries surface water or runoff, especially during storm events, to a surface water body or storm/sanitary water drain. The ditches within OU13 include the Central Avenue ditch and the tributaries to Walnut Creek as they flow through the Industrial Area.

Sampling locations were placed (1) at wide spots where flow velocities would be decreased, (2) at areas where historical silt accumulation has occurred for collection of sediments, (3) upstream of culverts, and (4) downgradient of abrupt grade transitions where settling is likely to occur. Locations were also placed up and downstream of confluences where water and sediments can be transported from other IHSSs within the Industrial Area.

3.0 DATA SUMMARY

This section summarizes the data collected during the initial screening activities and provides recommendations for placement of surface soil or asphalt sample locations by IHSS or IHSS group. The results of the HPGe surveys are given in Table 2. As discussed in the OU13 Work Plan (DOE 1993a), 11 surface soil samples for each IHSS or IHSS group were determined to be sufficient for detecting contamination above background levels with a 95 percent probability (Table 1, Section 1). For purposes of this technical memorandum, IHSSs are grouped for discussing the HPGe results.

In order to supplement and validate the field HPGe results, vertical soil profile samples will be collected at a rate of two per IHSS or IHSS group and laboratory analyzed with a HPGe detector. Asphalt samples will be obtained to confirm whether levels of radioactivity detected are a result of contamination on the surface or the readings are the result of "breakthrough" from a radiological source below the surface.

A full analysis of the HPGe data will be conducted once the analytical data is obtained from the surface soil and vertical soil profile samples. These data will be used to evaluate completely the HPGe data and will be incorporated into the Remedial Investigation/Remedial Facilities Investigation Report.

TABLE 2: HPGe RESULTS FOR OPERABLE UNIT NO. 13

All units are in picoCuries per gram (pCi/g).

Station	IHSS	K-40	Ra-226	Th-232	U-238	U-235	Cs-137	Am-241	Pu-239
A-13	117.1	16.3	0.808	1.39	2.2	0.0845	0.0199	1.15	<1200
B-13	117.1	13.6	0.908	1.08	2.01	0.12	0.0257	1.51	<1200
C-13	117.1	16.2	0.815	1.5	2.8	0.0936	0.025	0.546	<1200
D-13	117.1	11.7	0.674	0.94	2.07	0.0693	0.0218	2.03	<1200
E-13	117.1	13.5	0.936	1.05	2.14	0.0764	0.0185	3.91	<1200
F-13	197	21.3	1.21	1.5	3.41	0.102	0.014	22.3	1100
F-13	197	20.6	1.04	1.43	2.65	0.0799	0.0135	20.5	636
G-13	197	18.3	0.985	1.18	2.74	0.0842	0.0211	47.7	<1200
H-13	117.1	17	1.04	1.6	2.54	0.0819	0.016	3.59	<1200
I-13	186	16.6	0.831	1.04	1.98	0.0909	<0.02	0.15	<1200
J-13	186	19.1	0.945	1.05	2.19	0.0407	<0.02	<0.2	<1200
K-13	152	13.8	0.816	1.18	2.73	0.0872	0.0748	0.298	<1200
L-13	117.3	15.7	0.817	1.11	2.23	0.0802	0.0288	0.56	<1200
M-13	117.3	18.8	0.739	1.12	2.43	0.0555	0.0385	0.755	<1200
N-13	152	13.7	0.695	0.994	2.19	0.0444	0.0561	0.24	<1200
O-13	169	21.8	0.933	1.44	2.84	0.0561	0.0226	1.67	<1200
P-13	169	19.8	0.884	1.4	2.43	0.056	0.015	3.64	<1200
Q-13	117.2	18.5	0.995	1.74	2.44	0.0972	0.024	6.28	<1200
R-13	169	21.7	0.909	1.27	1.91	0.047	0.0204	0.849	<1200
S-13	158	20.9	0.988	1.23	1.89	0.0726	<0.02	0.325	<1200

TABLE 2: HPGe RESULTS FOR OPERABLE UNIT NO. 13

All units are in picoCuries per gram (pCi/g).

Station	IHSS	K-40	Ra-226	Th-232	U-238	U-235	Cs-137	Am-241	Pu-239
T-13	158	20.1	1.12	1.31	2.33	0.0349	<0.02	0.511	<1200
U-13	158	15.4	1.02	1.11	1.97	0.0407	0.0298	<0.2	<1200
V-13	158	16.2	0.705	1.01	1.82	0.0703	0.0384	<0.2	<1200
W-13	117.2	20.6	1.1	1.51	2.34	0.0841	0.012	0.911	<1200
X-13	134	20.2	1.16	1.23	2.25	0.0877	0.0302	<0.2	<1200
Y-13	134	20.4	1	0.97	2.08	0.053	0.012	<0.2	<1200
Z-13	171	21.8	1.02	1.36	2.63	0.0803	<0.02	<0.2	<1200
AA-13	171	17.2	0.853	0.948	1.76	0.0788	0.0199	<0.2	<1200
BB-13	171	19.5	0.923	1.2	1.76	0.0825	0.011	<0.2	<1200
CC-13	157.1	20.1	0.915	1.46	2.31	0.0727	0.013	<0.2	<1200
DD-13	157.1	17.7	0.752	1.23	2.69	0.0666	0.015	<0.2	<1200
EE-13	157.1	16.7	0.741	1.39	2.51	0.0775	0.0130	<0.2	<1200
FF-13	157.1	22.2	0.978	1.47	2.1	0.0983	0.0187	<0.2	<1200
GG-13	157.1	22.2	0.858	1.54	2.47	0.1	<0.02	<0.2	<1200
HH-13	157.1	20.2	0.83	1.22	1.95	0.0907	0.0237	<0.2	<1200
II-13	190	18.8	0.904	1.15	2.1	0.0621	0.0193	0.52	<1200
JJ-13	190	18.4	1.01	1.23	2.47	0.0797	0.0409	1.94	<1200
KK-13	190	20.6	1	1.08	3.79	0.0909	<0.02	1.56	<1200
LL-13	190	19	1.09	1.11	6.52	0.0889	0.015	<0.2	<1200
MM-13	190	20.7	1.21	1.67	13.1	0.117	<0.02	<0.2	<1200
NN-13	190	21.6	1.09	1.31	5.39	0.0583	0.012	<0.2	<1200

TABLE 2: HPGe RESULTS FOR OPERABLE UNIT NO. 13

All units are in picoCuries per gram (pCi/g).

Station	IHSS	K-40	Ra-226	Th-232	U-238	U-235	Cs-137	Am-241	Pu-239
OO-13	190	20.4	1.26	1.49	2.47	0.0652	<0.02	<0.2	<1200
PP-13	190	16.7	1.02	1.15	1.97	0.0857	<0.02	<0.2	<1200
QQ-13	190	19.8	1.01	1.42	2.74	0.0585	<0.02	<0.2	<1200
RR-13	190	20.7	1	1.4	3.66	0.0741	<0.02	<0.2	<1200
SS-13	190	19	1.1	1.14	8.76	0.102	0.0537	0.271	<1200
TT-13	190	15	0.849	1.09	49.9	0.601	0.103	1.84	<1200
UU-13	190	22	0.956	1.22	4.35	0.074	0.0275	0.316	<1200
VV-13	190	17.8	0.927	1.26	1.78	0.0572	0.0623	1.35	<1200
WW-13	190	15.4	0.837	1.08	2.01	0.057	0.0426	1.42	<1200
WW-13	190	15.9	0.807	1.09	2.17	0.0514	0.0506	1.39	<1200
XX-13	190	16.9	0.803	1.27	<1.1	0.0882	0.0599	3.4	<1200
YY-13	158	23.4	0.97	1.63	2.41	0.0729	<0.02	<0.2	<1200
ZZ-13	148	18.8	0.936	1.52	2.24	0.0884	0.0445	<0.2	<1200
3A-13	148	17.6	1.03	1.11	1.94	0.0786	0.0252	<0.2	<1200
3B-13	148	17.5	0.813	1.01	1.67	0.0796	0.013	<0.2	<1200
3C-13	148	17.6	0.946	1.1	1.93	0.0895	0.0261	<0.2	<1200
5A-13	152	14.0	0.71	0.98	1.8	0.07	0.06	0.3	<400
5B-13	152	19.7	0.77	1.12	1.8	0.05	0.04	0.2	<1200
5C-13	197	23.4	1.05	1.52	2.62	0.0588	0.0983	1.98	838
5D-13	197	23.1	1.11	1.52	5.57	0.127	0.0189	82.6	3410
5E-13	197	20.7	0.993	1.38	1.88	0.0545	0.0946	0.34	40

TABLE 2: HPGe RESULTS FOR OPERABLE UNIT NO. 13

All units are in picoCuries per gram (pCi/g).

Station	IHSS	K-40	Ra-226	Th-232	U-238	U-235	Cs-137	Am-241	Pu-239
6V-13	117.1	22.2	1.07	1.46	2.3	0.09	0.01	<0.1	<400
6W-13	117.1	20.5	0.80	1.25	2.2	0.08	0.09	<0.2	<400
8I-9	148	17.2	0.81	1.31	1.8	0.08	0.02	?	?
9X-13	197	15.5	0.93	1.12	3.3	0.11	0.05	127	2200
9Y-13	197	18.2	1.09	1.33	3.4	0.09	0.03	79.6	1800
9Z-13	117.2	21.2	1.21	1.76	2.3	0.07	0.02	14.6	700
10E-13	197	11.5	0.70	0.94	1.7	0.06	0.02	2.2	<400
10F-13	197	34.1	1.52	2.42	10.4	1.18	0.64	468.0	27200
10I-13	186	18.9	0.76	1.24	1.5	0.08	<0.01	<0.01	<400

? = No detection of this isotope, minimum detectable activity not provided.

K = Potassium Th = Thorium Cs = Cesium Pu = Plutonium
 Ra = Radium U = Uranium Am = Americium

3.1 IHSSs 117.1 AND 197

Seven HPGe locations, A-13 through H-13, were monitored in this IHSS group. Americium-241 values ranged from less than minimum detectable activity (<MDA) to 47.7 pCi/g. Based on the HPGe survey, the only detectable concentrations of plutonium were at location F-13 in IHSS 197 (Figure 3 and Table 2). Based on two readings obtained at location F-13 (Figure 3), plutonium was detected from 636 to 1,100 pCi/g. Supplemental NaI (FIDLER) surveys were also conducted in an area where plutonium was detected by the HPGe survey. The NaI surveys

were performed in a grid of 140 feet by 24 feet based on the location of the HPGe points B-13, F-13 and G-13 (Figures 4, 5, and 6 and Table 3) at the request of CDH. An evaluation of the NaI survey results indicates a range of net count readings in this area from below background to 1,973 (as corrected for background in accordance with SOP FO.16) counts per minute (cpm). The background reading for the survey conducted on October 5, 1993 and depicted on Figure 4 (obtained 15 feet upwind of the area) was 1,999 cpm. The background readings for locations B-13 and G-13 were 1,424 cpm and 2,741 cpm, respectively. In addition, an NaI survey was performed on August 3, 1994 in the southeastern portion of this IHSS between the Protected Area fences. The background reading for this survey was 2,478 cpm. The results of this survey are illustrated on Figure 4. Intermittent FIDLER readings were also obtained between the PA fences at IHSS 117.1 on August 3, 1994 (Figure 3). Less than the background reading indicates that concentrations of the radionuclide of interest are less than the measured background level. All NaI results are reported to EG&G Radiological Engineering. Radiological Engineering has reviewed the NaI surveys for OU13 and prepared a letter response, which is included as Appendix C to this document. After reviewing the NaI surveys, Radiological Engineering concluded that no radiological risk to personnel is associated with these areas in their current conditions. Because the HPGe results detected plutonium in IHSS 197, two additional vertical soil profile samples and three additional surface soil samples will be collected from what was originally proposed in the OU13 Work Plan (DOE 1993b).

The following are proposed locations and sample types for this IHSS group (Figure 3):

<u>Location</u>	<u>Sample Type</u>
SS-1	surface soil
SS-2	surface soil
SS-3	surface soil
SS-4	surface soil
SS-5	surface soil
SS-6	surface soil
SS-7	below pavement grab

SS-8	surface soil
SS-9	surface soil
SS-10	below pavement grab, vertical soil profile, asphalt
SS-11	below pavement grab, vertical soil profile, asphalt
SS-12	surface soil, vertical soil profile
SS-13	surface soil
SS-14	surface soil, vertical soil profile

The surface soil samples from this IHSS group will be laboratory analyzed for TAL metals, volatile organic compounds (VOCs), and radionuclides, and by laboratory HPGe (vertical soil profile samples). The VOCs analyses are added to the parameters specified in the OU13 Work Plan (DOE 1993b) at the request of CDH. These analyses are specified on Table 4. A visual inspection of these IHSSs was conducted in September 1993. No observed soil staining or stressed vegetation was noted. Overhead utilities or steam pipes will not adversely affect sampling activities at these locations. Several metal storage sheds and Connexes (storage containers) are stored on IHSS 197. These will be removed during the site characterization process, and additional HPGe readings will be obtained from underneath the area where the displaced sheds were. RCRA storage area No. 1 is also partially located in IHSS 197.

3.2 IHSSs 117.2 AND 158

Ten HPGe locations, O-13 through W-13 and YY-13 (Figure 5 and Table 2), were monitored in this IHSS group. Plutonium was not detected, and the americium-241 values ranged from less than minimum detectable activity (<MDA) to 6.28 pCi/g. Uranium-238 values ranged from 1.82 to 2.84 pCi/g, and uranium-235 values were less than one pCi/g. Areas of stressed vegetation (discolored or dead vegetation) (Figure 7) at IHSS Group 117.2, 169, and 158 were noted on the east side of IHSS 117.2 in a drainage swale during a site reconnaissance with CDH personnel on September 27, 1993. However, during a site inspection performed on June 10, 1994, no stressed vegetation in this IHSS was observed. Locations for surface soil sampling

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LEGEND

- - - Fence
- ==== IHSS Boundary
- - - - Extent of Asphalt Surface
- HPGE Location
- X348 Net Count per Minute
Boron Fidler Reading
10/5/93
- * Net count rate is
less than background
- △ 2478 Background Boron
Fidler Reading
(counts per minute)
- ▲ Net Count per Minute
Boron Fidler Reading
8/3/94

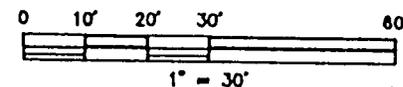
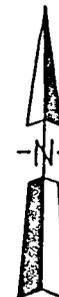
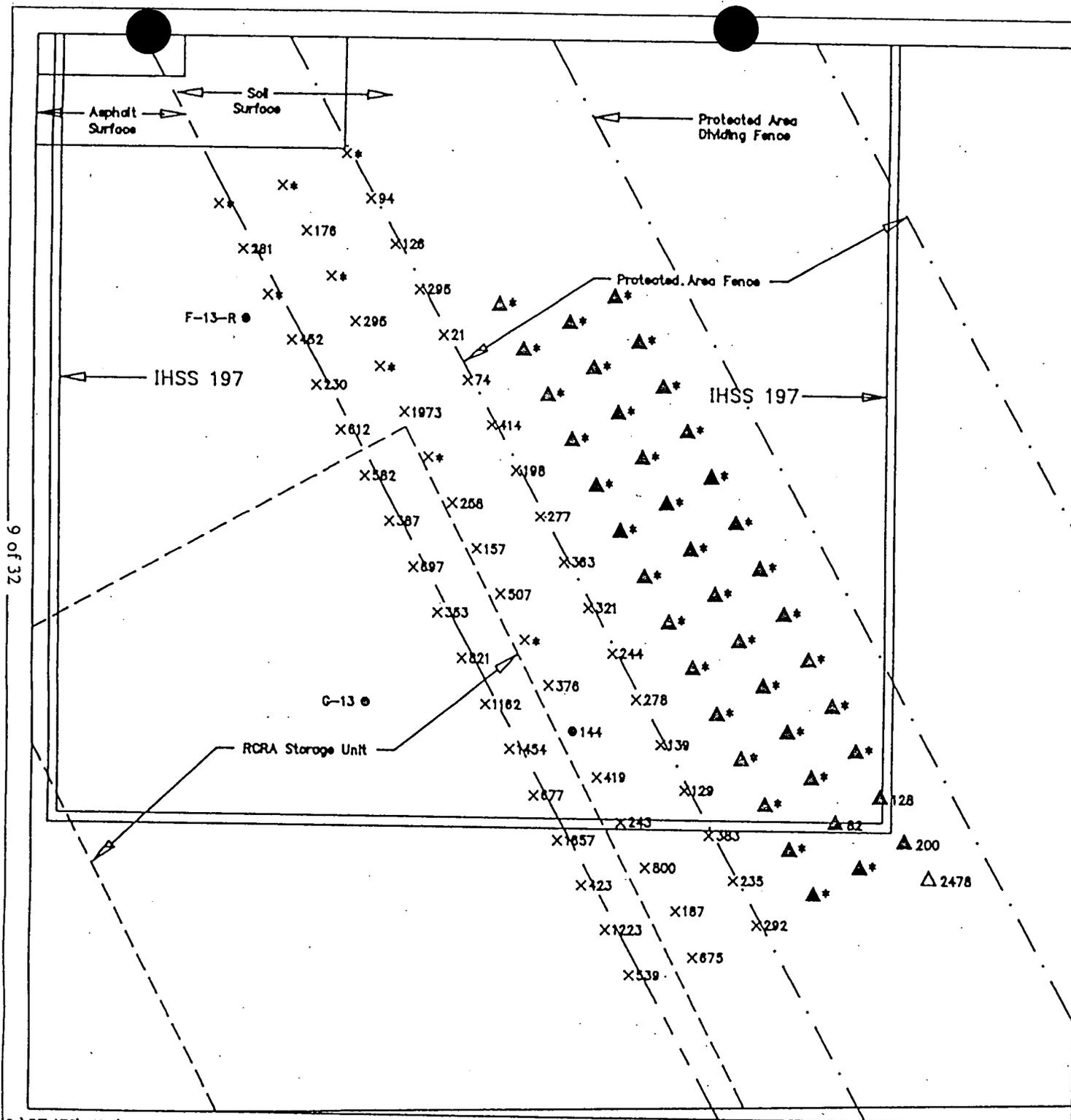


FIGURE 4
Sodium Iodide
Survey IHSS 197
10/5/93 & 8/3/94
Operable Unit 13

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LEGEND

- . - - Fence
- ==== IHSS Boundary
- F HPGE Location
- △ 1424 Background Reading Location
- X 348 Net Count per Minute
Bigran Flier Reading
6/13/94
- * Net count rate is
less than background

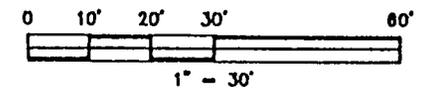
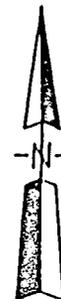
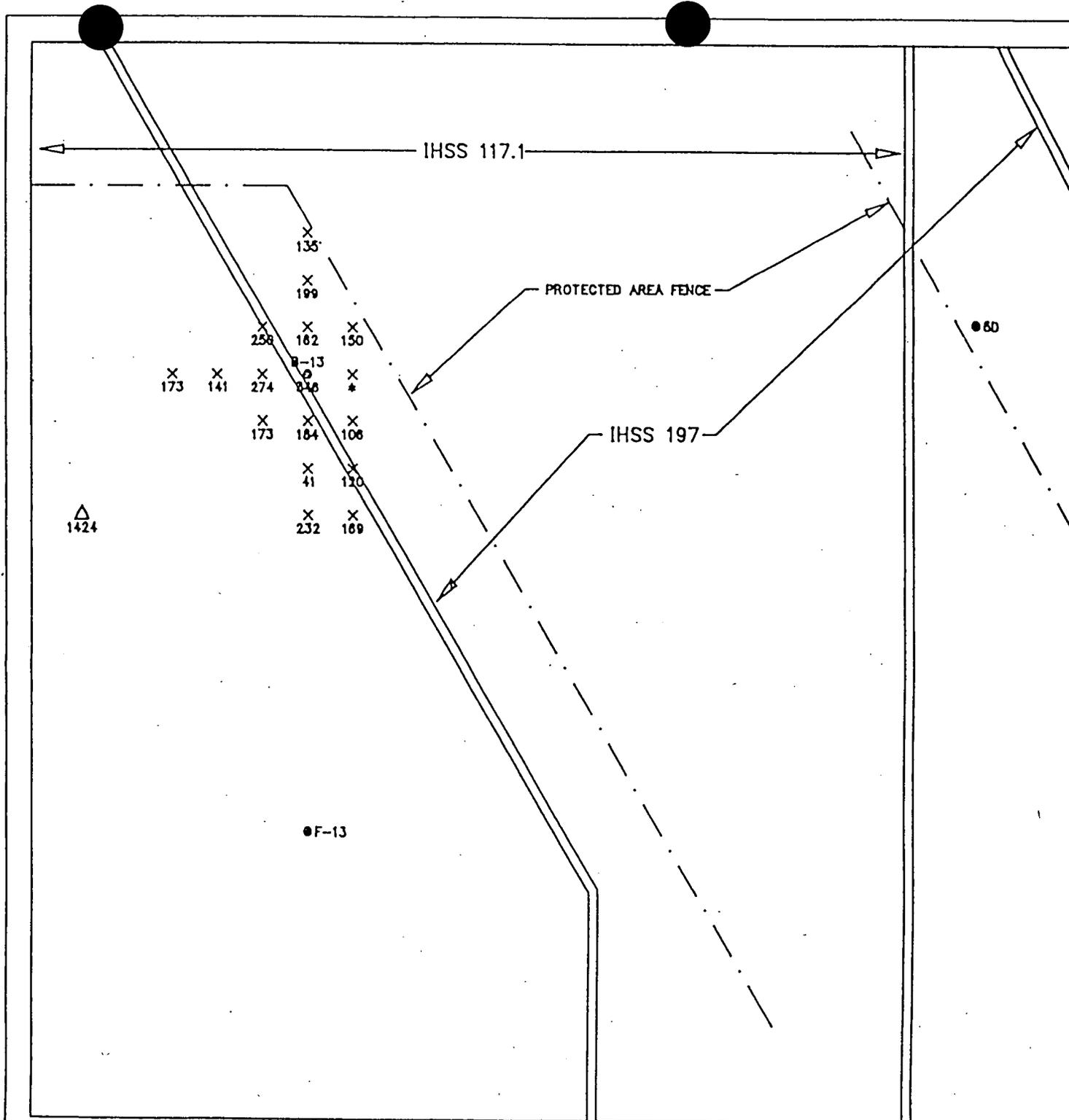


FIGURE 5

Sodium Iodide
Survey IHSS 197 6/13/94
Operable Unit 13

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**TABLE 3: SODIUM IODIDE SURVEY RESULTS IN COUNTS PER MINUTE
 FOR IHSS 197, OPERABLE UNIT NO. 13**

Location Number	Gross Count Rate β/γ (cpm)	Net Count Rate β/γ (cpm)
(Survey performed 10/5/93 between RCRA Storage Unit and Protected Area fence. [See Figure 4]) Background reading = 1999 cpm		
1	1972	*
2	2280	281
3	1961	*
4	2451	452
5	2229	230
6	2611	612
7	2581	582
8	2386	387
9	2696	697
10	2352	353
11	2820	821
12	3161	1162
13	3453	1454
14	2676	677
15	3656	1657
16	2422	423
17	3222	1223
18	2538	539
19	1744	*
20	2175	176
21	1713	*
22	2294	295
23	1802	*
24	2326	327
25	1882	*
26	2257	258
27	2156	157
28	2506	507
29	1964	
(Survey performed 10/5/93 between RCRA Storage Unit and Protected Area fence. [See Figure 4]) Background reading = 1999 cpm		

Notes:

β/γ = Beta/gamma

cpm = counts per minute

Net Count Rate = Gross Count Rate minus Background Reading

* Net Count Rate value is below the background reading

TABLE 3: SODIUM IODIDE SURVEY RESULTS IN COUNTS PER MINUTE
 FOR IHSS 197, OPERABLE UNIT NO. 13 CONTINUED

Location Number	Gross Count Rate β/γ (cpm)	Net Count Rate β/γ (cpm)
30	2375	*
31	2143	376
32	2418	144
33	2242	419
34	2799	243
35	2186	800
36	2674	187
37	1984	675
38	2093	*
39	2125	94
40	2294	126
41	2020	295
42	2073	21
43	2413	74
44	2197	414
45	2276	198
46	2363	277
47	2320	363
48	2239	321
49	2277	244
50	2138	278
51	2128	139
52	2382	129
53	2234	383
54	2291	235
		292

Notes:

β/γ = Beta/gamma

cpm = counts per minute

Net Count Rate = Gross Count Rate minus Background Reading

* Net Count Rate value is below the background reading

TABLE 3: SODIUM IODIDE SURVEY RESULTS IN COUNTS PER MINUTE
 FOR IHSS 197, OPERABLE UNIT NO. 13 *cont'd*

Location Number	Gross Count Rate β/γ (cpm)	Net Count Rate β/γ (cpm)
LOCATION B-13 (Refer to Figure 5; background reading = 1424 cpm; survey conducted 6/13/94)		
1	1674	250
2	1586	162
3	1574	150
4	1597	173
5	1565	141
6	1698	274
7	1770	346
8	1442	*
9	NA	NA
10	NA	NA
11	1597	123
12	1608	184
13	1530	106
14	1465	41
15	1656	232
16	1623	199
17	1559	135
18	1460	40
19	1567	143
20	1643	219
21	1593	169
22	1544	12

Notes:

β/γ = Beta/gamma

cpm = counts per minute

Net Count Rate = Gross Count Rate minus Background Reading

* Net Count Rate value is below the background reading

TABLE 3: SODIUM IODIDE SURVEY RESULTS IN COUNTS PER MINUTE
 FOR IHSS 197, OPERABLE UNIT NO. 13 *cont'd*

Location Number	Gross Count Rate β/γ (cpm)	Net Count Rate β/γ (cpm)
LOCATION G-13 (Refer to Figure 6; background reading = 2741 cpm; survey conducted 3/3/94)		
1	3086	345
2	2593	*
3	3009	268
4	2485	*
5	2516	*
6	2644	*
7	2630	*
8	2640	*
9	2465	*
10	3149	*
11	2426	*
12	2405	*
13	2578	*
14	2595	*
15	2486	*
16	2451	*
17	2500	*
18	2579	*
19	2470	*
20	2559	*
21	2405	*
22	2544	*
23	2535	*
24	2493	*

Notes:

β/γ = Beta/gamma

cpm = counts per minute

Net Count Rate = Gross Count Rate minus Background Reading

* Net Count Rate value is below the background reading

TABLE 3: SODIUM IODIDE SURVEY RESULTS IN COUNTS PER MINUTE
 FOR IHSS 197, OPERABLE UNIT NO. 13 CONT'D

Location Number	Gross Count Rate β/γ (cpm)	Net Count Rate β/γ (cpm)
(Survey performed 8/3/94 between Protected Areas fence. [See Figure 4]) Background reading = 2478 cpm		
1	2478	*
2	2193	*
3	2400	*
4	2678	200
5	2606	128
6	2560	82
7	2085	*
8	2465	*
9	2361	*
10	2330	*
11	2242	*
12	2359	*
13	2156	*
14	2254	*
15	2198	*
16	2191	*
17	2229	*
18	2138	*
19	1993	*
20	1977	*
21	2107	*
22	2078	*
23	2009	*
24	2108	*
25	1918	*
26	2088	*
27	2137	*
28	2182	*

Notes:

β/γ = Beta/gamma

cpm = counts per minute

Net Count Rate = Gross Count Rate minus Background Reading

* Net Count Rate value is below the background reading

TABLE 3: SODIUM IODIDE SURVEY RESULTS IN COUNTS PER MINUTE
 FOR IHSS 197, OPERABLE UNIT NO. 13 *cont's*

Location Number	Gross Count Rate β/γ (cpm)	Net Count Rate β/γ (cpm)
(Survey performed 8/3/94 between Protected Areas fence. [See Figure 4]) Background reading = 2478 cpm		
29	2332	*
30	1995	*
31	1873	*
32	1888	*

were placed near this swale, but not actually in the ditch, because this is considered sediment. (See Section 4.0.) In addition, surface soil samples were located in areas of stressed vegetation as observed in September 1993. Two vertical soil profiles are located in the 117.2 and 169 IHSS group and two are located in IHSS 158 (Figure 7). The surface soil samples from IHSS group 158 will be laboratory analyzed for TAL metals and radionuclides. The asphalt samples from IHSS 117.2 will be laboratory analyzed by HPGe. Below-pavement soil samples will be analyzed for TAL Metals and radionuclides.

Two NaI surveys were also performed at IHSS 117.2 at HPGe location Q-13 on June 21, 1994 (Figure 8 and Table 5). An evaluation of the NaI survey results indicates a net count range from below background to 400 cpm in this area. The background reading obtained for this survey was 1,630 cpm.

3.3 IHSS 186

Two HPGe locations, I-13 and J-13 (Figure 9 and Table 2), were monitored in this IHSS. Plutonium was not detected, and americium-241 was detected at a concentration of less than one pCi/g at location I-13. Uranium-238 was detected at values of 1.98 and 2.19 pCi/g at locations I-13 and J-13, respectively. Uranium-235 was detected at concentrations less than one pCi/g. No stressed vegetation or stained soil was observed or noted for this IHSS. Overhead

**TABLE 4: VOLATILE ORGANIC COMPOUND LIST, SURFACE SOIL SAMPLES
 IHSS GROUP 117.1 AND 197
 EPA METHOD 8240**

Acetone	1,2-Dibromoethane	Methylene chloride
Acetonitrile	Dibromomethane	Methyl iodide
Acrolein	1,4-Dichloro-2-butene	Methyl methacrylate
Acrylonitrile	Dichlorodifluoromethane	4-Methyl-2-pentanone
Allyl alcohol	1,1-Dichloroethane	Pentachloroethane
Allyl chloride	1,2-Dichloroethane	2-Picoline
Benzene	1,2-Dichloroethane-d4	Propargyl alcohol
Benzyl Chloride	1,1-Dichloroethene	β -Propiolactone
Bromoacetone	trans-1,2-Dichlorethene	Propionitrile
Bromochloromethane	1,2-Dichloropropane	n-Propylamine
Bromodichloromethane	1,3-Dichloro-2-propanol	Pyridine
4-Bromofluorobenzene	cis-1,3-Dichloropropene	Styrene
Bromoform	trans-1,3-Dichloropropene	1,1,1,2-Tetrachloroethane
Bromomethane	1,2,3,4-Diepoxybutane	1,1,2,2-Tetrachloroethane
2-Butanone	1,4-Difluorobenzene	Tetrachloroethene
Carbon disulfide	1,4-Dioxane	Toluene
Carbon tetrachloride	Epichlorohydrin	Toluene-d8
Chlorobenzene	Ethanol	1,1,1-Trichloroethane
Chlorobenzene-d5	Ethylbenzene	1,1,2-Trichloroethane
Chlorodibromomethane	Ethlene oxide	Trichloroethene
Chloroethane	Ethyl methacrylate	Trichlorofluoromethane
2-Chloroethanol	2-Hexanone	1,2,3-Trichloropropane
2-Chloroethylvinyl ether	2-Hydroxypropionitrile	Vinyl acetate
Chloroform	Iodomethane	Vinyl chloride
Chloromethane	Isobutyl alcohol	Xylene (Total)
Chloroprene	Malononitrile	
3-Chloropropionitrile	Methacrylonitrile	
1,2-Dibromo-3-chloropropane		

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LEGEND

- - - Fence
- ==== IHSS Boundary
- Q-13
● HPCE Location
- X
83 Net Count per Minute
Boron Fider Reading
6/21/94
- * Net count rate is
less than background
- △
1630 Background Boron
Fider Reading
(counts per minute)

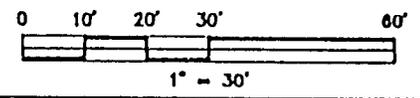
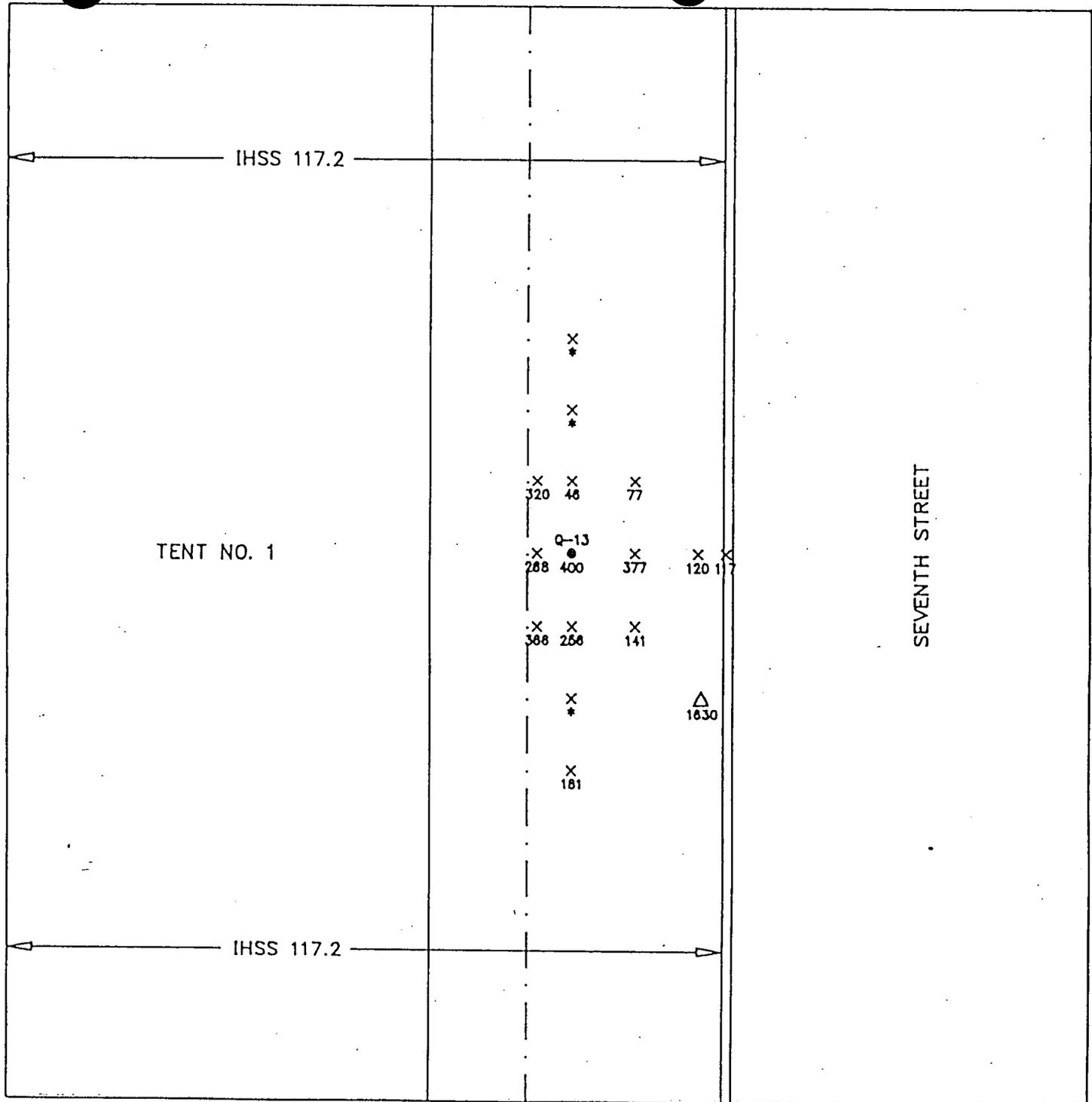


FIGURE 8

Sodium Iodide
 Survey IHSS 117.2 6/21/94
 Operable Unit 13



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**TABLE 5: SODIUM IODIDE SURVEY RESULTS IN COUNTS PER MINUTE
 FOR IHSS 117.2, HPGe LOCATION Q-13, OPERABLE UNIT NO. 13**

Location Number	Gross Count Rate β/γ (cpm)	Net Count Rate β/γ (cpm)
Location Q-13 (Refer to Figure 8; background reading = 1630 cpm; survey conducted 6/21/94)		
1	1996	366
2	1898	268
3	1950	320
4	1811	181
5	1548	*
6	1886	256
7	2030	400
8	1676	46
9	1615	*
10	1615	*
11	1771	141
12	2007	377
13	1707	77
14	1750	120
15	1747	117
16	N/A	N/A
17	N/A	N/A

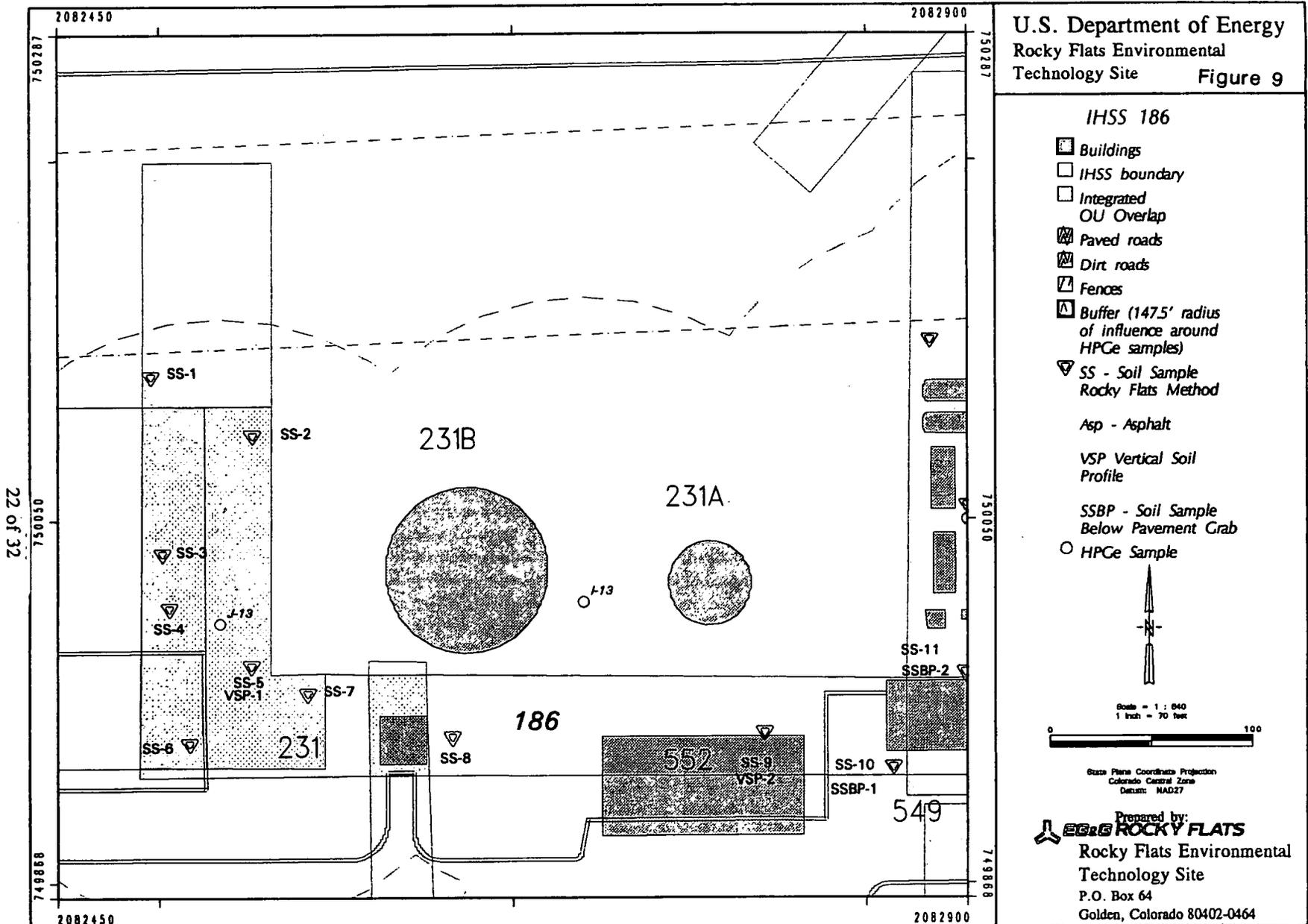
Notes:

β/γ = Beta/gamma

cpm = counts per minute

Net Count Rate = Gross Count Rate minus Background Reading

* Net Count Rate value is below the background reading



- Building footprints are not accurate in some cases
- Sample locations are accurate with respect to State Plane Coordinates

steam lines, however, may be an issue on the western side of the IHSS if heavy equipment (e.g., drill rigs) is required for future sampling. Two vertical soil profile locations are planned in this IHSS and will be laboratory analyzed by HPGe (Figure 9). The surface soil samples will be laboratory analyzed for radionuclides.

3.4 IHSSs 128, 171, AND 134 (NORTH AND SOUTH)

Five HPGe locations, X-13 through BB-13 (Figure 10 and Table 2), were monitored in this IHSS group. Plutonium and americium-241 were not detected at any of these locations. Uranium-235 values for these locations were less than one pCi/g and uranium-238 values ranged from 0.948 pCi/g at location AA-13 to 2.63 pCi/g at location Z-13. Areas of stressed vegetation were noted on the north and east sides and surface soil samples are located accordingly. Two vertical soil profiles are located in this IHSS Group (Figure 10) and will be laboratory analyzed by HPGe. The surface soil samples will be laboratory analyzed for lithium, magnesium, and radionuclides. In addition, surface soil samples obtained from IHSS 134 South will also be laboratory analyzed for TAL metals, and asphalt samples will be obtained and laboratory analyzed by HPGe.

In addition to the proposed surface soil sample locations for this IHSS group, another surface soil sample will be collected at IHSS 134 North and be laboratory analyzed for VOCs (Table 4) and TAL metals. IHSS 134 North is an area where waste lithium was destroyed by burning oil and lithium. As such, soil within this IHSS is stained with oil. Since the potential contamination occurred from a given point source, the sample will be obtained using the grab method as outlined in GT.08.

A site reconnaissance was performed on July 8, 1994 at IHSS 134 North. A surface soil sampling point near the north side of the x-shaped metal box (located on top of the burning activity area) was identified for the sample collection location (Figure 10). The area where the burning activity took place has been covered with a 1- to 2-inch layer of coarse sand. It is proposed that this material be removed before sampling. According to GT.08 grab method

procedure (4.3.4 Procedures), "any undesirable surficial material will be removed to the desired sample depth with a decontaminated steel lawn or garden spade."

3.5 IHSS 148

Four HPGe locations, ZZ-13, 3A-13, 3B-13, and 3C-13 (Figure 11 and Table 2), were monitored in this IHSS. Plutonium-238 and americium-241 were not detected at any of the locations in this IHSS. Uranium-235 values were less than one pCi/g, and uranium-238 values ranged from 1.01 pCi/g at location 3B-13 to 2.24 pCi/g at location ZZ-13. No observed stressed vegetation or stained soil was noted at this IHSS. Overhead steam lines, however, may be an issue on the east and south sides of this IHSS if heavy equipment (e.g., drill rigs) is required for future sampling. Two vertical soil profile locations are planned for this IHSS. The surface soil samples will be laboratory analyzed for TAL metals and radionuclides.

3.6 IHSS GROUP 191 AND 157.1

Six HPGe locations, CC-13 through GG-13 (Figure 12 and Table 2), were monitored in this IHSS group. Plutonium-239 and americium-241 were not detected at any of the locations in this IHSS group. Values for uranium-235 were below one pCi/g, and uranium-238 values ranged from 2.1 pCi/g at location FF-13 to 2.69 pCi/g at location DD-13. No observed stressed vegetation or stained soil was noted in this IHSS. Overhead steam lines, however, may be an issue on the west side of the IHSS if heavy equipment (e.g., drill rigs) is required for future sampling. Two vertical soil profile locations are planned for IHSS 191 (Figure 12). The surface soil samples will be laboratory analyzed for TAL metals and radionuclides.

3.7 IHSS GROUP 152 AND 117.3

Four HPGe locations, K-13 through N-13 (Figure 13 and Table 2), were monitored in this IHSS. Plutonium-239 was not detected at any of these locations. Americium-241 and uranium-235 were detected at levels below one pCi/g. Uranium-238 was detected at values ranging from 2.19

FIGURE 10

IHSS 128, 134N, 134S & 171



Buildings



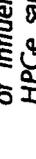
IHSS boundary



Integrated
OU Overlap



Paved roads



Dirt roads



Fences

Buffer (147.5' radius
of influence around
HP/Ce samples)

SS - Soil Sample
Rocky Flats Method

Asp - Asphalt

VSP Vertical Soil
Profile

SSBP - Soil Sample
Below Pavement Grab

HP/Ce Sample

Scale = 1" = 640'
1 inch = 70 feet



State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD87

Prepared by:



**Rocky Flats Environmental
Technology Site**

P.O. Box 64

Golden, Colorado 80402-0464

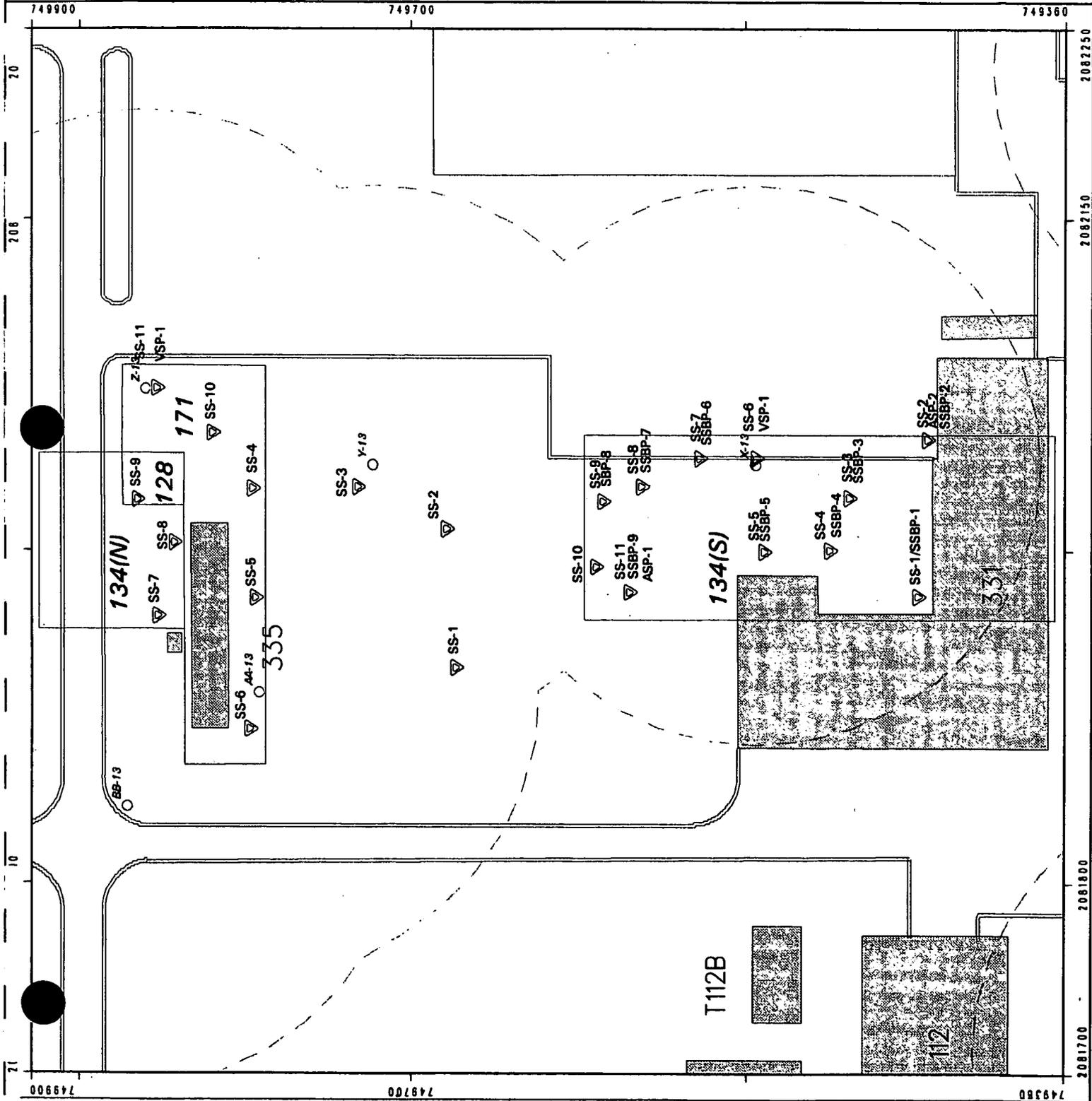
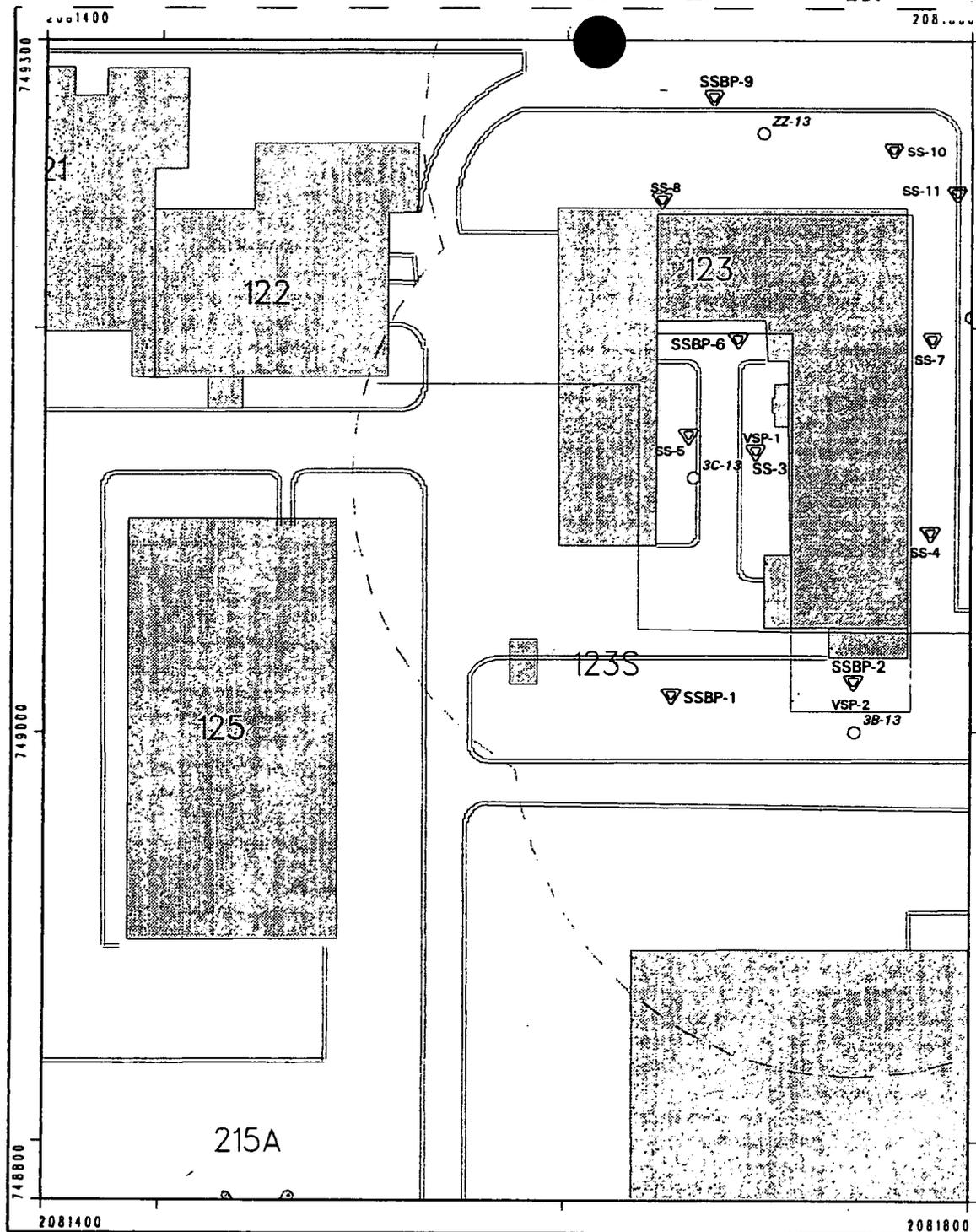
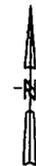


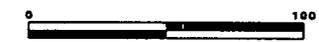
FIGURE 11
IHSS 148



- Buildings
- IHSS boundary
- Integrated OU Overlap
- Paved roads
- Dirt roads
- Fences
- Buffer (147.5' radius of influence around HPGe samples)
- SS - Soil Sample Rocky Flats Method
- Asp - Asphalt
- VSP Vertical Soil Profile
- SSBP - Soil Sample Below Pavement Grab
- HPGe Sample



Scale = 1 : 840
 1 inch = 70 feet



State Plane Coordinate Projection
 Colorado Central Zone
 Datum: NAD27

Prepared by:
EG&G ROCKY FLATS
 Rocky Flats Environmental
 Technology Site
 P.O. Box 64
 Golden, Colorado 80402-0464

pCi/g at location N-13 to 2.73 pCi/g at location K-13. Eleven surface soil samples are planned in IHSS 117.3 in addition to two vertical soil profile sample locations (Figure 13) as identified in the OU13 Work Plan and will be laboratory analyzed by HPGe. The surface soil samples will be laboratory analyzed for TAL metals and radionuclides.

3.8 IHSS 190

Twenty HPGe locations, FF-13 through XX-13 (Figure 2 and Table 2), were monitored in this IHSS. Plutonium-239 was not detected at any of these locations. Americium-241 values, however, ranged from <MDA to 3.4 pCi/g at location XX-13. Uranium-235 values were less than one pCi/g, and uranium-238 values ranged from <MDA at location XX-13 to 49.9 pCi/g at location TT-13.

No observed stressed vegetation was noted during the inspection of this IHSS, and no other physical constraints were noted. This IHSS is not slated for surficial soil, asphalt, or vertical soil profile sampling at this time according to the OU13 Work Plan (DOE.1993a). The elevated uranium-238 value at location TT-13 (49.9 pCi/g) will be investigated as part of the sediment sampling in the Industrial Area for the OU12 RFI/RI effort.

An NaI survey was also performed at IHSS 190 at HPGe location 77-13 on June 15, 1994 (Figure 14 and Table 6). An evaluation of the NaI survey results indicates a net count range in readings in this area from below background to 9,419 cpm. Radiological Engineering of EG&G was immediately notified of the 9,419 cpm reading. Radiological Engineering's response can be found in Appendix C. Radiological Engineering concluded that no radiological risk to personnel is associated with this area. The background readings obtained for these surveys were 3298 and 2237 cpm.

TABLE 6: SODIUM IODIDE SURVEY RESULTS IN COUNTS PER MINUTE
 FOR IHSS 190, HPGe LOCATION TT, OPERABLE UNIT NO. 13

Location Number	Gross Count Rate β/γ (cpm)	Net Count Rate β/γ (cpm)
First Survey		
Location TT (Refer to Figure 14; background reading = 3298 cpm; survey conducted 6/15/94)		
1	2657	*
2	2432	*
3	2572	*
4	2536	*
5	2705	*
6	2599	*
7	3428	130
8	3183	*
9	3013	*
10	1986	*
11	4577	1279
12	4493	1195
13	3641	343
14	6207	2909
15	12717	9419
16	2606	*
17	2353	*

Notes:

β/γ = Beta/gamma

cpm = counts per minute

Net Count Rate = Gross Count Rate minus Background Reading

* Net Count Rate value is below the background reading

TABLE 6: (continued) SODIUM IODIDE SURVEY RESULTS IN COUNTS PER MINUTE
 FOR IHSS 190, HPGe LOCATION TT, OPERABLE UNIT NO. 13

Location Number	Gross Count Rate β/γ (cpm)	Net Count Rate β/γ (cpm)
Second Survey (performed west of TT Location; the two surveys match at location 10 and 4)		
1	2738	501
2	2253	16
3	2377	140
4	3937	1300
5	2340	103
6	2663	427
7	2860	623
8	2046	*
9	2148	*
10	1986	*
11	2567	230
12	2371	34
13	2124	*
14	2406	69
15	N/A	N/A
16	2577	240
17	2134	*

Notes:

β/γ = Beta/gamma

cpm = counts per minute

Net Count Rate = Gross Count Rate minus Background Reading

* Net Count Rate value is below the background reading

4.0 SURFACE WATER AND SEDIMENT FIELD SAMPLING ANALYSIS PLAN

The objective of this sampling plan is to (1) provide rationale for selection of the surface water and sediment sample locations in ditches within or adjacent to OU13 IHSSs; (2) define the number of samples to be collected; (3) define the analytical parameters and references for field procedures, and (4) identify equipment needed to perform the sampling. This additional site data are essential for meeting the RI/RFI objectives for OU13. At the request of CDH, surface water and sediment sample locations were identified for OU13 activities beyond the proposed locations listed in the OU12 Technical Memorandum. The surface water and sediment sampling activity for the entire Industrial Area is part of the OU12 scope of work.

4.1 SAMPLE LOCATION IDENTIFICATION

Approximately 26 sediment samples will be obtained from the ditches and other surface water features in or adjacent to IHSSs in OU13 (Figure 15). These features include the Central Avenue ditch and the tributaries to Walnut Creek as they flow through the Industrial Area. In addition, up to 10 opportunistic surface water grab samples will be collected concurrently, if standing water is observed in the ditches.

Samples were located according to the following biasing parameters:

- to provide coverage of the Central Avenue ditch from just west of the intersection of Fourth Street, to just west (upstream) of the Sewage Treatment Plant;
- to provide coverage to the tributaries to upper Walnut Creek;

- samples located in wide spots that produce a decrease of flow velocities within the ditch, in areas where there are obvious silty accumulation of sediments, upstream of culverts, and below abrupt grade transitions where settling is more likely to occur; and
- upstream and downstream of minor confluences that may be bringing in water and sediments from other IHSSs.

Twenty-six sediment sample locations were identified during the site reconnaissance performed on June 27, 1994 (Figure 15). The following presents the rationale for the sediment sampling locations:

- SED-1: IHSS 134(N). Before culvert water flows west to east. The ditch in this area was dry during the site reconnaissance.
- SED-2: IHSS 134(N). Near exit to culvert to east. Some standing water observed.
- SED-3: IHSS 186, at confluence of two streams, and after a culvert. This ditch flows from south to north. No water observed.
- SED-4: IHSS 186, tributary to drainage at SED-3 (see above), at low wide spot. Flow from west to east. No water observed.
- SED-5: IHSS 186 tributary to drainage at SED-3 (see above), near culvert outlet. Flow from south to north. No water observed.
- SED-6: IHSS 190, in Central Avenue ditch, on the west side of the culvert that passes under 5th Street. Flow from west to east. No water was observed.
- SED-7: IHSS 190, at a confluence from a ditch (flow south to north) that joins the Central Avenue ditch on west side of 5th Street. No water was observed.

- SED-8: IHSS 190, at a ditch that flows south to north that intersects Central Avenue ditch on the east side of 5th Street. No water was observed.
- SED-9: IHSS 190, in Central Avenue ditch on the west side of a culvert. No water observed.
- SED-10: IHSS 117.2, in ditch which flows from west to east at low area where sediments collect. No water observed.
- SED-11: IHSS 117.2, confluence of three drainage culverts from parking area and road. No water observed.
- SED-12: IHSS 117.3, Central Avenue ditch on the west side of the culvert that passes under 7th street. No water observed.
- SED-13: IHSS 117.3, on east side of IHSS swale area drainage from north to south. No water observed.
- SED-14: IHSS 117.3, on south side of IHSS drainage ditch flows west to east. No water observed.
- SED-15: IHSS 117.3, southeast side of the IHSS. At culvert where two ditches converge. No water observed.
- SED-16 through
- SED-21: In Central Avenue ditch before culverts that pass under roadways. No water observed.
- SED-22: In Central Avenue ditch just before curving northward under Central Avenue. No water observed. In Central Avenue ditch.

SED-23: At concrete vault on north side of Central Avenue. No water observed.

SED-26: At culvert before entering buffer zone to buffer zone drainage control number BZ-DC-1CA. South Walnut Creek. No water observed.

4.2 SAMPLING PROCEDURES

Sediment samples will be collected in accordance to *Rocky Flats EMD Operating Procedures Manual Volume V: Surface Water SW.06 Sediment Sampling*, and surface water samples will be collected in accordance with *SW.03 Surface Water Sampling*. Sample crews will collect opportunistic grab surface water sample in locations of standing water at the time of sediment sample collection. Sample locations may be adjusted plus or minus 50 feet from this sampling plan to optimize the biasing parameters outlined in Section 4.1.

4.3 ANALYTICAL PARAMETERS

Table 7 lists the proposed analyte list for sediment and surface water samples for OU13. This list was developed with the expectation that the information from these samples will be used for other investigations of the Industrial Area.

TABLE 7
PROPOSED ANALYTE LIST
OPERABLE UNIT 13
SURFACE WATER AND SEDIMENTS

Metals	Semivolatile Organics	Chrysenes
Aluminum	1,2,4-Trichlorobenzene	Dibenzofuran
Antimony	1,2-Dichlorobenzene	Dibenzo(a,h)Anthracene
Arsenic	1,3-Dichlorobenzene	Diethylphthalate
Barium	1,4-dichlorobenzene	Dimethylphthalate
Beryllium	2,4,5-Trichlorophenol	Di-n-Butyl Phthalate
Cadmium	2,4,6-Trichlorophenol	Di-n-Octyl Phthalate
Calcium	2,4-Dichlorophenol	Fluoranthene
Chromium	2,4-Dimethylphenol	Fluorene
Cobalt	2,4-Dinitrophenol	Hexachloroethane
Copper	2,4-Dinitrotoluene	Hexachlorobutadiene
Cyanide	2,6-Dinitrotoluene	Hexachlorocyclopentadiene
Iron	2-Chloronaphthalene	Indeno(1,2,3-cd)Pyrene
Lead	2-Chlorophenol	Isophorone
Lithium	2-Methylnaphthalene	N-Nitroso-Dipropylamine
Magnesium	2-Methylphenol	Naphthalene
Manganese	2-Nitrophenol	Nitrobenzene
Mercury	3-Nitrophenol	Phenanthrene
Nickel	3,3-Dichlorobenzidine	Phenol
Potassium	4,6-Dinitro-2-Methylphenol	Pyrene
Selenium	4-Bromophenyl Phenyl Ether	
Silver	4-Chloroaniline	Radionuclides
Sodium	4-Chlorophenyl Phenyl Ether	Gross Alpha
Thallium	4-Chloro-3-Methylphenol	Gross Beta
Vanadium	4-Methylphenol	Uranium-233,-234,-235, and -238
Zinc	2-Nitroaniline	Americium-241
	4-Nitroaniline	Plutonium-239,-240
PCB Analysis	4-Nitrophenol	Tritium
	Acenaphthene	
Aroclor-1016	Acenaphthylene	
Aroclor-1221	Anthracene	
Aroclor-1232	Benzoic Acid	
Aroclor-1242	Benzo(a)Anthracene	
Aroclor-1248	Benzo(a)Pyrene	
Aroclor-1254	Benzo(b)Fluoranthene	
Aroclor-1260	Benzo(g,h,i)perylene	
	Benzo(k)Fluoranthene	
	Benzyl Alcohol	
	Bis(2-Chloroethoxy)Methane	
	Bis(2-Chloroethyl)Ether	
	Bis(2-Chloroisopropyl)Ether	
	Bis(2-Ethylhexyl)Phthalate	
	Butyl Benzyl Phthalate	

5.0 RECOMMENDATIONS

Based on surface radiological surveys, visual inspections, and historical information about the IHSSs in OU13, 11 surface soil sample locations were identified in each IHSS or IHSS Group for laboratory analysis of either TAL metals, radionuclides, or both in IHSSs 117.1, 197, 117.2, 128, 134 (north and south), 148, 157.1, 158, 171, and 186. Samples from two vertical soil profile sample locations were identified in each of these IHSS or IHSS groups to be analyzed for laboratory HPGe to confirm field HPGe results. Based on HPGe results, three additional surface soil samples and two additional vertical soil profile samples were added to IHSS Group 117 and 197. In addition, VOCs were added to the parameter list for surface soil samples collected in IHSS Group 117.1 and 197. One grab surface soil sample from IHSS 134 North was also identified for VOCs and TAL metal analysis. Visual inspections of the IHSSs in OU13 noted areas of stressed vegetation and cultural features such as overhead steam lines which may have an effect on future intrusive sample collection activities.

An analysis of the HPGe results for IHSS 197 indicated concentrations of plutonium from 636 to 1,100 pCi/g. An NaI (FIDLER) survey was conducted in this IHSS near the area of these readings. The survey identified a range in net cpm from below background to 1,973 cpm, which confirms the elevated HPGe readings for this IHSS. Other HPGe results for IHSSs 117.1 and 197 indicated concentrations of americium -241 values from 0.546 to 3.91 pCi/g. Surface soil samples were placed randomly since areas of stressed vegetation or soil staining were not observed. Asphalt and vertical soil profile samples were placed at or near HPGe reading locations.

An analysis of the HPGe results for IHSS 117.2, 158, and 169 indicated concentrations of americium -241 from <MDA to 6.28 pCi/g; uranium -238 values from 1.82 to 2.84 pCi/g; uranium -235 values less than one pCi/g; and plutonium not detected. Locations of surface soil

samples were placed near stressed vegetation.

An analysis of HPGe results for IHSS 186 indicated concentrations of americium -241 of less than one pCi/g; uranium -238 at values of 1.98 and 2.19 pCi/g; uranium -235 at less than one pCi/g; and plutonium not detected. No areas of stressed vegetation or soil staining were noted, and surface soil samples were located randomly. Vertical soil profile samples were placed at or near HPGe reading locations.

An analysis of HPGe results for IHSS groups 128, 171, and 134 (North and South) indicated concentrations of uranium -235 values less than one; uranium -238 values from 0.948 to 2.63 pCi/g; and americium -241 and plutonium not detected. Surface soil samples were located near areas of stressed vegetation. Vertical soil profile samples were placed at or near HPGe reading locations.

An analysis of HPGe results for IHSS 148 indicated concentrations of uranium -235 values of less than one pCi/g; uranium -238 values from 1.01 to 2.24 pCi/g; and americium and plutonium not detected. No surface soil or asphalt sample locations are proposed for this IHSS. Two vertical soil profile samples were placed at or near HPGe reading locations.

An analysis of HPGe results for IHSS groups 191 and 157.1 indicated concentrations of uranium -235 values of less than one; uranium -238 values from 2.1 to 2.69 pCi/g; and americium and plutonium were not detected. Stressed vegetation or stained soils were not observed in this IHSS group. Overhead steam lines were noted on the west side of this IHSS group. Surface soil samples were placed randomly, and vertical soil profile samples were placed at or near HPGe reading locations.

An analysis of HPGe results from IHSS groups 152 and 117.3 indicated concentrations of uranium -238 values from 2.19 pCi/g to 2.73 pCi/g; americium -241 and uranium -235 values were detected at levels less than one pCi/g; and plutonium not detected. Eleven surface soil samples were placed randomly in IHSS 117.3 because areas of stressed vegetation or soil

staining were not noted. Vertical soil profile samples were placed at or near HPGe reading locations.

An analysis of HPGe results from IHSS 190 indicated concentrations of americium -241 values from <MDA to 3.4 pCi/g; uranium -235 values less than one pCi/g; uranium -238 values from <MDA to 49.9 pCi/g; and plutonium not detected. Areas of stressed vegetation or soil staining were not noted. Surficial soil, asphalt, or vertical soil profile samples are not required for this IHSS.

Surface water and sediment sampling locations were biased to provide coverage of Central Avenue ditch, tributaries to upper Walnut Creek, and minor confluences that may be bringing in water and sediments from other IHSSs. Samples were located in wide spots that allow for a decrease of flow velocities within the ditch, in areas where there is obvious silty accumulation of sediments, upstream of culverts, and below abrupt grade transitions, where settling is more likely to occur. Analytical parameters were proposed that will be of use to the entire Industrial Area investigations.

6.0 REFERENCES

Colorado Department of Health. 1993 (August 9). Letter from Gary Bauman regarding approval of OU13 Work Plan.

Gilbert, R.O., 1987. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold Company, New York.

U.S. Department of Energy. 1991 (January 22). Interagency Agreement Among the U.S. Department of Energy, the U.S. Environmental Protection Agency, and the Colorado Department of Health.

U.S. Department of Energy. 1993a. Environmental Restoration Program, Golden Colorado. *Phase I RFI/RI Work Plan, Rocky Flats Plant 100 Area, Operable Unit 13.*

U.S. Department of Energy. 1993b. *Compendium of In-Situ Radiological Methods and Applications at RFP*. Golden, Colorado.

U.S. Department of Energy. 1994. *Rocky Flats EMD Operating Procedures Manual Volume V: Surface Water*. Golden, Colorado.

APPENDIX A

DRAFT HPGe RESULTS, TO DATE FOR ALL OPERABLE UNITS AT RFETS

APPENDIX B

**PRE-EVALUATION FIELD FORMS FOR THE SODIUM IODIDE
SURVEY IN IHSS 197**

Pre-Action
CONTAMINATION SURVEY

Number OU 13 1176E LOCATION "Q"
 Technician Ron C. Holmes
 Meter Model No. - SIN Bicron Fiddler, A051M
 Detector Model No. - SIN Bicron E-5, A0690
 Due Date 11/94

Date/Time 6-21-94 12:30
 Scaler Background (cpm) 1630
 Meter Background (cpm) 1650
 Survey Type Alpha Beta-Gamma βγ
 X-Ray

Page 1 of 1
 Technician RCH
 Scaler Model No. N/A
 Scaler SIN N/A
 Cal. Due Date N/A

Near Number	Item Surveyed	Location Surveyed	Direct Survey				Smear Survey				Role: Yes/No						
			Gross Count Rate (cpm)		Net Count Rate (cpm)		Total Activity (dpm/100 cm ²)		Gross Count Rate (cpm)			Net Count Rate (cpm)		Total Activity (dpm/100 cm ²)			
			α	βγ X RAY	α	βγ X RAY	α	βγ	α	βγ		α	βγ	α	βγ		
A	Soil Surface	1	NA	1996	NA	366											
		2		1898		268											
		3		1950		320											
		4		1811		181											
		5		1548		-82											
		6		1886		258											
		7		2030		400											
		8		1676		46											
		9		1615		-15											
		10		1615		-15											
		11		1771		141											
		12		2007		377											
		13		1707		77											
		14		1750		120											
	↓	15		1747		117											
	N/A	16		N/A		N/A											
	N/A	17		N/A		N/A											

*Net Count Rate = Gross Count Rate Minus Background Count Rate

Area or Equipment Drawing Showing Survey Points on Reverse Side.

0013

CONTAMINATION SURVEY

Site Number IHS 197 RCRA unit #1
 Technician David Spruce
 Meter Model No. - S/N A512P Bicon Fidler
 Detector Model No. - S/N 6-5 B289K
 Cal. Due Date Daily 3/3/94

Date/Time 3/3/94 1400
 Scaler Background (cpm) 2241
 Meter Background (cpm) 2500
 Survey Type Alpha α Beta-Gamma β/γ
 X-Ray

Page 1 of 2
 Technician _____
 Scaler Model No. N/A
 Scaler S/N N/A
 Cal. Due Date _____

Smear Number	Item Surveyed	Location Surveyed	Direct Survey						Smear Survey						Release Yes/N
			Gross Count Rate (cpm)		Net Count Rate (cpm)		Total Activity (dpm 100 cm ²)		Gross Count Rate (cpm)		Net Count Rate (cpm)		Total Activity (dpm 100 cm ²)		
			α	β/γ X-RAY	α	β/γ X-RAY	α	β/γ	α	β/γ	α	β/γ	α	β/γ	
<u>N/A</u>	<u>Black Top (surface)</u>	<u>1</u>	<u>N/A</u>	<u>3086</u>	<u>N/A</u>	<u>3457</u>									
		<u>2</u>		<u>2593</u>		<u>-148</u>									
		<u>3</u>		<u>3009</u>		<u>268</u>									
		<u>4</u>		<u>2485</u>		<u>-256</u>									
		<u>5</u>		<u>2516</u>		<u>-225</u>									
		<u>6</u>		<u>2644</u>		<u>-97</u>									
		<u>7</u>		<u>2630</u>		<u>-111</u>									
		<u>8</u>		<u>2640</u>		<u>-101</u>									
		<u>9</u>		<u>2465</u>		<u>-276</u>									
		<u>10</u>		<u>3149</u>		<u>-408</u>									
		<u>11</u>		<u>2426</u>		<u>-315</u>									
		<u>12</u>		<u>2465</u>		<u>-336</u>									
		<u>13</u>		<u>2578</u>		<u>-163</u>									
		<u>14</u>		<u>2595</u>		<u>-146</u>									
		<u>15</u>		<u>2486</u>		<u>-255</u>									
		<u>16</u>		<u>2451</u>		<u>-290</u>									
<u>✓</u>	<u>✓</u>	<u>17</u>	<u>✓</u>	<u>2500</u>	<u>✓</u>	<u>-241</u>									

*Net Count Rate = Gross Count Rate Minus Background Count Rate

or Equipment Drawing Showing Survey Points on Reverse Side.

**PRE-ACTIVITY
CONTAMINATION SURVEY**

FORM 1.1B

Site Number ITSS 197
 Technician DM. Spruce
 Meter Model No.- SIN Bioron Fdler A051M
 Detector Model No.- SIN A069Q
 Cal. Due Date Daily 6-14-94

Date/Time 6-13-94 1130
 Scaler Background (cpm) 1424
 Meter Background (cpm) 1406
 Survey Type Alpha α Beta-Gamma β/γ
 X-Ray

Page 2 of 2
 Technician _____
 Scaler Model No. _____
 Scaler S/N N/A
 Cal. Due Date _____

Smear Number	Item Surveyed	Location Surveyed	Direct Survey						Smear Survey						Release Yes/No
			Gross Count Rate (cpm)		Net Count Rate (cpm)		Total Activity (dpm 100 cm ²)		Gross Count Rate (cpm)		Net Count Rate (cpm)		Total Activity (dpm 100 cm ²)		
			α	β/γ X-RAY	α	β/γ X-RAY	α	β/γ	α	β/γ	α	β/γ	α	β/γ	
N/A	SOIL SURFACE	1	N/A	1460	N/A	40									
		2		1567		143									
		3		1643		219									
		4		1593		169									
		5		1544		12									
		6													
		7													
		8													
		9													
		10													
		11													
		12													
		13													
		14													
		15													
		16													
N/A	SOIL SURFACE	17	N/A		N/A										

[Handwritten signature and scribbles]
 6-16-94

N/A

CONTAMINATION SURVEY

Site Number JHSS 197 site F
 Technician David Spruce
 Meter Model No. - S/N Beckman Fidler #051M
 Detector Model No. - S/N A0690
 Cal. Due Date 11-94

Date/Time 6-13-94 1130
 Scaler Background (cpm) 1424
 Meter Background (cpm) 1400
 Survey Type Alpha α Beta-Gamma β/γ
 X-Ray

Page 2 of 2
 Technician _____
 Scaler Model No. _____
 Scaler S/N NA
 Cal. Due Date _____

Sample Number	Item Surveyed	Location Surveyed	Direct Survey						Smear Survey						Release Yes/No	
			Gross Count Rate (cpm)		Net Count Rate (cpm)		Total Activity (dpm 100 cm ²)		Gross Count Rate (cpm)		Net Count Rate (cpm)		Total Activity (dpm 100 cm ²)			
			α	β/γ X-RAY	α	β/γ X-RAY	α	β/γ	α	β/γ	α	β/γ	α	β/γ		
JA	Soil Surface	1	NA	1460	NA	40										
		2		1567		143										
		3		1643		219										
		4		1593		169										
		5		1544		12										

*Net Count Rate = Gross Count Rate Minus Background Count Rate

Area or Equipment Drawing Showing Survey Points on Reverse Side

Pre-Activity

CONTAMINATION SURVEY

Site Number DU13 IHSS 190 SIFATT
 Technician David Spruce / Tom Waddle
 Detector Model No. - S/N Echler A051M
 Cal. Due Date 11-94

Date/Time 6-15-94 0845
 Page 1 of 2
 Scaler Background (cpm) 2337
 Meter Background (cpm) 2200
 Technician [Signature]
 Scaler Model No. [Signature]
 Scaler S/N [Signature]
 Survey Type Alpha Beta-Gamma BIY
 X-Ray
 Cal. Due Date [Signature]

Smear Number	Item Surveyed	Location Surveyed	Gross Count Rate (cpm)		Direct Survey		Total Activity (dpm/100 cm ²)		Gross Count Rate (cpm)		Smear Survey		Total Activity (dpm/100 cm ²)		Remarks	
			α	β	Net Count Rate (cpm)	Net Count Rate (cpm)	α	β	Net Count Rate (cpm)	Net Count Rate (cpm)	α	β	Net Count Rate (cpm)	Net Count Rate (cpm)		
1	SOIL SURFACE	1	NA	2378	NA	501	BIY	α	BIY	α	BIY	α	BIY			
2		2		2253		16										
3		3		2377		140										
4		4		3537		1300										
5		5		2340		103										
6		6		2663		427										
7		7		2860		623										
8		8		2046		-191										
9		9		2148		-89										
10		10		1984		-257										
11		11		2567		230										
12		12		2371		34										
13		13		2124		-213										
14		14		2406		69										
15		15		NA		NA										
16		16		2577		240										
17		17		2134		-203										

*Net Count Rate = Gross Count Rate Minus Background Count Rate

Pre-Activity

CONTAMINATION SURVEY

Site Number D03 IHS's 190 site TT
 Technician David Spence/Tea Lakshila
 Meter Model No. SIN Edler A051M
 Detector Model No. SIN 6-5A0670
 Cal. Due Date 11-94

Date/Time 6-15-94 0900
 Scaler Background (cpm) 3298
 Meter Background (cpm) 3300
 Survey Type Alpha Beta-Gamma β Y
 X-Ray

Page 2 of 2
 Technician _____
 Scaler Model No. _____
 Scaler S/N _____
 Cal. Due Date _____

Smear Number	Item Surveyed	Location Surveyed	Direct Survey		Smear Survey		Total Activity (dpm 100 cm ²)	Total Activity (dpm 100 cm ²)	Rel: Yes/
			Gross Count Rate (cpm)	Net Count Rate (cpm)	Gross Count Rate (cpm)	Net Count Rate (cpm)			
NA	Soil Surface	1	NA	NA	NA	NA	NA	NA	
		2	2432	-866					
		3	2522	-724					
		4	2534	-702					
		5	2705	-593					
		6	2599	-699					
		7	3428	130					
		8	3183	-115					
		9	3013	-15					
		10	See Note 1 of 2						
		11	4577	1279					
		12	9493	1195					
		13	3641	343					
		14	6207	2909					
		15	12717	9419					
		16	2606	-692					
		17	2353	-945					

*Net Count Rate = Gross Count Rate Minus Background Count Rate

1050m EAST RCN

Page 1 of 2

Technician

Scaler Model No.

Scaler S/N

Cal. Due Date

Pre-Activity CONTAMINATION SURVEY

Date/Time 6-15-97 0900

3412 Report Scaler Background (cpm) 3298

3300 Meter Background (cpm) 3300

Survey Type Alpha Beta-Gamma X-Ray

Site Number 0013 1901H55 IT

Technician D.S. PRICE / T.W. MOORE

Scaler Model No. - S/N FDLR HOS1M

Director Model No. - S/N 6-5 H069 G

Cal. Due Date 11-97

Smear number	Item Surveyed	Location Surveyed	Direct Survey			Smear Survey		
			Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Activity (dpm 100 cm ²)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Activity (dpm 100 cm ²)
NA	Soil Surface	NA	NA	NA	NA	a	a	a
1			2652	2432	-641	a	a	a
2			2572	2536	-762	a	a	a
3			2705	2599	-699	a	a	a
4			3183	3428	130	a	a	a
5			3013	3183	-115	a	a	a
6			4577	4493	1195	a	a	a
7			4577	4493	1195	a	a	a
8			3641	3413	229	a	a	a
9			2909	2909	0	a	a	a
10			2353	2353	0	a	a	a
11			2606	2606	0	a	a	a
12			2353	2353	0	a	a	a
13						a	a	a
14						a	a	a
15						a	a	a
16						a	a	a
17						a	a	a

Smear number	Item Surveyed	Location Surveyed	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Activity (dpm 100 cm ²)	Gross Count Rate (cpm)	Net Count Rate (cpm)	Total Activity (dpm 100 cm ²)	Role	Yes
1	Soil Surface	NA	2652	2432	-641	a	a	a	a	
2			2572	2536	-762	a	a	a	a	
3			2705	2599	-699	a	a	a	a	
4			3183	3428	130	a	a	a	a	
5			3013	3183	-115	a	a	a	a	
6			4577	4493	1195	a	a	a	a	
7			4577	4493	1195	a	a	a	a	
8			3641	3413	229	a	a	a	a	
9			2909	2909	0	a	a	a	a	
10			2353	2353	0	a	a	a	a	
11			2606	2606	0	a	a	a	a	
12			2353	2353	0	a	a	a	a	
13						a	a	a	a	
14						a	a	a	a	
15						a	a	a	a	
16						a	a	a	a	
17						a	a	a	a	

1050m EAST RCN

FORM 1

Page 1 of 2

Technician

Scaler Model No.

Scaler S/N

Cal. Due Date

Pre-Activity CONTAMINATION SURVEY

Date/Time 6-15-97 0900

3412 Report Scaler Background (cpm) 3298

3300 Meter Background (cpm) 3300

Survey Type Alpha Beta-Gamma X-Ray

Site Number 0013 1901H55 IT

Technician D.S. PRICE / T.W. MOORE

Scaler Model No. - S/N FDLR HOS1M

Director Model No. - S/N 6-5 H069 G

Cal. Due Date 11-97

Smear number

Item Surveyed

Location Surveyed

Gross Count Rate (cpm)

Net Count Rate (cpm)

Total Activity (dpm 100 cm²)

Gross Count Rate (cpm)

Net Count Rate (cpm)

Total Activity (dpm 100 cm²)

Role

Yes

NA

Soil Surface

2652

2432

-641

a

a

a

a

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GAMMA SURVEY

CONTROL NO. SPECIAL

BKG	C/M METER	SCALER	AREA POSTED (Y/N)	BKG	C/M METER	SCALER	AREA POSTED (Y/N)
23.	2100	2009		50.			
24.	2100	2108		51.			
25.	2000	1918		52.			
26.	2100	2088		53.			
27.	2200	2137		54.			
28.	2200	2182		55.			
29.	2400	2332		56.			
30.	2000	1995		57.			
31.	1900	1873		58.			
32.	1900	1888		59.			
33.				60.			
34.				61.			
35.				62.			
36.				63.			
37.				64.			
38.				65.			
39.				66.			
40.				67.			
41.				68.			
42.				69.			
43.				70.			
44.				71.			
45.				72.			
46.				73.			
47.				74.			
48.				75.			
49.				76.			

GAMMA SURVEY

CONTROL NO. SPECIAL

Taken by: D.M Spruce Emp. [REDACTED] Reviewed by: [REDACTED]
 Taken by: Ron Holme Emp. [REDACTED] SSO D.M Spruce Emp. # 1
 Taken by: _____ Emp. # _____ Name/Organization _____ Emp. # _____

Date: 08-03-94 ^{IHS 197} Building: 197 Survey Description: Area EAST of 197
 Time: _____ Room #: _____ in the Fenced Area of PA
 Shift: _____ (No Mens Land) Buffer Zone
Protected Area EAST of RCRA Storage

BICRON FIDLER Unit #1

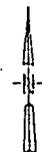
Mfg:	<u>FIDLER</u>	<u>FIDLER</u>	<u>FIDLER</u>	<u>FIDLER</u>	<u>FIDLER</u>
Model:	<u>Bicron</u>	_____	_____	_____	_____
Serial #:	<u>ADSIM</u>	_____	_____	_____	_____
Date Perf. Ck:	<u>08-03-94</u>	_____	_____	_____	_____
Date Calib'd:	<u>11-9-93</u>	_____	_____	_____	_____
Cal. Due Date:	<u>11-9-94</u>	_____	_____	_____	_____

	BKG	c/m METER	SCALER	AREA POSTED (Y/H)		BKG	c/m METER	SCALER	AREA POSTED (Y/H)
1.	✓	2500	2478	—	12.	—	2400	2359	—
2.	—	2200	2193	—	13.	—	2200	2156	—
3.	—	2400	2400	—	14.	—	2300	2254	—
4.	—	2700	2678	200	15.	—	2200	2198	—
5.	—	2600	2606	128	16.	—	2200	2151	—
6.	—	2000	2000	82	17.	—	2300	2229	—
7.	—	2100	2085	—	18.	—	2200	2138	—
8.	—	2500	2465	—	19.	—	2000	1993	—
9.	—	2400	2361	—	20.	—	2000	1977	—
10.	—	2400	2330	—	21.	—	2200	2107	—
11.	—	2800	2289	—	22.	—	2100	2078	—
			2242						

FIGURE 3

IHSS 117.1 & 197

-  Buildings
-  IHSS boundary
-  Integrated OU Overlap
-  Paved roads
-  Dirt roads
-  Fences
-  Plant Security Zone Fences
-  Area of influence of HPCe samples
-  Proposed Soil Sample Locations Rocky Flats Method
-  Proposed Asphalt Sample Locations
-  Proposed Vertical Soil Profile Locations
-  HPCe Sample location
-  Proposed Soil Sample Location - Below Pavement Grab



Map scale = 1:1,000
1 inch = 70 feet



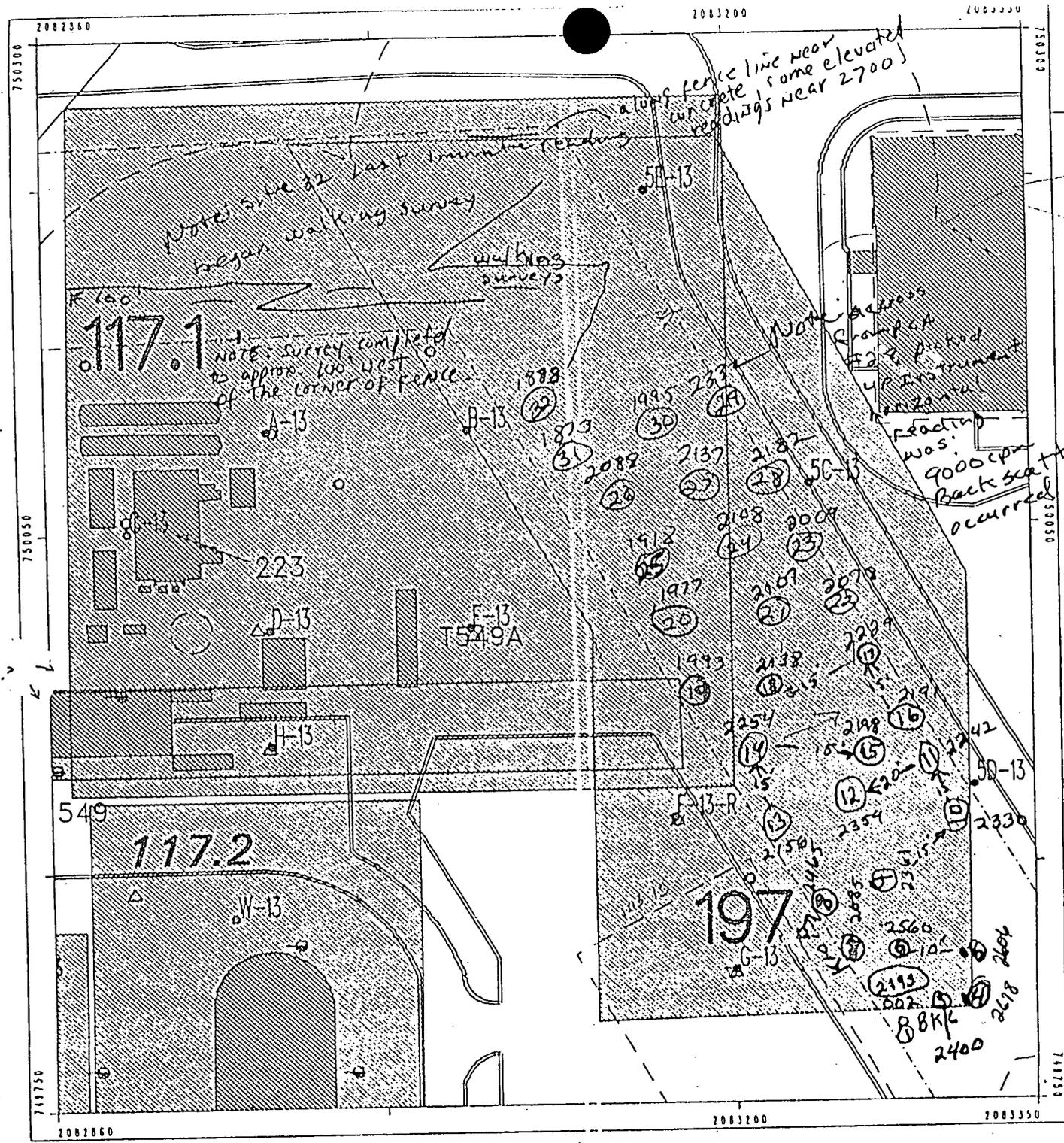
State Plane Coordinate Projection
Colorado General Zone
Datum: NAD83

Prepared by:

 EG&G ROCKY FLATS

Rocky Flats Plant
P.O. Box 464
Golden, Colorado 80402-0464

Scale: Figure 3, 1988



add
dash line
to map
align

3-7
Part of 186
or 119?

APPENDIX C

**LETTER FROM DAVID HYDER EG&G RADIOLOGICAL ENGINEERING
TO MIKE MCHUGH, EG&G ENVIRONMENTAL RESTORATION MANAGEMENT,
"USE OF THE BICRON FIDLER IN OPERABLE UNIT 13 DSH-025-94"**



INTEROFFICE CORRESPONDENCE

DATE: June 28, 1994

TO: M. F. McHugh, Environmental Restoration Management, Bldg. 080, X8624

FROM: *D.S. Hyder*
D. S. Hyder, Radiological Engineering, Bldg. T690B, X6282

SUBJECT: USE OF THE BICRON FIDLER IN OPERABLE UNIT 13 - DSH-025-94

REFS: (a) Model G-5 "FIDLER" Description, Bicron Corporation, February, 1992

(b) Draft Technical Memorandum 1, Addendum to Field Sampling Plan, Rocky Flats Plant 100 Area (Operable Unit 13), January 1994

(c) Environmental Management Radiological Guideline, 3-21000-OPS-EMRG-6.6, R.O., Use of the Bicron FIDLER, January 21, 1994

(d) Health and Safety Plan, Rocky Flats Plant, Integrated Operable Units, Phase I, August, 1993

(e) G. W. Baughman, CDH ltr to R. J. Schassburger, DOE, Comments - Draft Technical Memorandum 1, Addendum to Field Sampling Plan, Rocky Flats Plant 100 Area (Operable Unit 13), May 16, 1994

The purpose of this correspondence is to provide clarification on the capabilities and use of the Field Instrument for the Detection of Low Energy Radiation (FIDLER). This instrument is one of several tools currently used at Rocky Flats to assist in defining areas that contain radioactive materials that emit low energy gamma and/or x-rays.

Reference (a) describes the FIDLER G-5 probe as a 5" diameter sodium iodide crystal that is only 0.063" thick. This crystal configuration provides less efficiency for photons greater than 100 KeV. At Rocky Flats this probe is connected to the Bicron Analyst which is a single channel analyzer. This single channel analyzer acts as a discriminator because the FIDLER is calibrated to read only photons in the energy window of approximately 10 to 35 KeV. The bremsstrahlung x-rays emitted by americium - 241 fall into this energy range. However it should also be noted that the FIDLER will detect without discrimination any other photons in this same energy range regardless of the source. Section 2.2 of reference (b) is incorrect in implying that the FIDLER can distinguish between gamma and x-rays with energies that are greater than 10 KeV apart without being modified to use a multi channel analyzer.

M. F. McHugh
June 23, 1994
DSH-025-94
Page 2

The truck mounted gamma spectroscopy system has six high purity germanium (HPGe) detectors routed through a multiplexor that integrates the signals received from all six detectors into a single spectrum. It's true that the sodium iodide (NaI) detector has a higher efficiency for photon (gamma and x-ray) radiation than the high purity germanium (HPGe) detector. However the longer count time of the six HPGe's with a larger active detector area and a multi channel analyzer actually gives it greater sensitivity along with qualitative (isotopic) results. When these results are compared with results from a reference source, quantitative information can be obtained assuming a homogeneous mixture of the surficial soils to a depth of 3.0 centimeters. It is a misconception that the FIDLER can verify the truck mounted HPGe readings; a tripod mounted HPGe would be better suited for this task.

Section 3.1 of reference (b) is incorrect in stating that an area would be a radiologically controlled area (RCA) if FIDLER readings were greater than two times the square root of background plus the background reading. Section 5.7.1 of reference (c) states that this situation should be reported to the Site Safety Officer (SSO). Radiologically controlled areas are established by Radiological Engineering in accordance with the Rocky Flats Health and Safety Practices (HSP) Manual. The use of two times the square root of background, plus background, is the upper limit of a theoretical two standard deviations that represents the reproducibility (acceptable error) of the background reading. This is still considered to be background level and greater than this theoretical limit is considered above background. Section 6.4.7 of reference (d) states that Radiological Engineering will be consulted when readings in excess of background are encountered.

To further address the comment in reference (e) on evaluation of initial FIDLER survey results, Radiological Engineering reviewed the survey results located in the appendix and printed in Table 2 of reference (b). Location 24 has an incorrect net count; it is shown as 1973 cpm and should be 327 cpm after subtracting the background of 1999 cpm from the gross counts of 2326 cpm. The only other locations with greater than 1000 cpm above background are 12, 13, 15, and 17. These locations have been evaluated by Radiological Engineering and due to the fact that these areas are part of an asphalt pad with no loose surface contamination, no radiological risk to personnel is associated with these areas in their current condition. Radiological Engineering should be contacted prior to any intrusive activities in these specific areas.

Please contact me at extension 6282 or digital page 3297 with any concerns or questions concerning this correspondence.

M. F. McHugh
June 23, 1994
DSH-025-94
Page 3

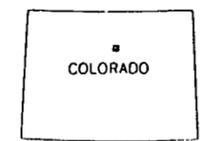
cc:

G. M. Aldrich
J. L. Anderson
K. D. Anderson
E. A. Blush
R. C. Gentry
D. B. Kent
M. L. Littleton
R. W. Norton
R. T. Reiman

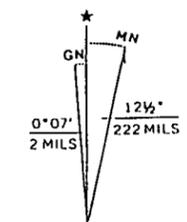
FINAL

EXPLANATION

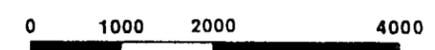
--- Rocky Flats Environmental
Technology Site Boundary



COLORADO



UTM GRID AND 1979 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET



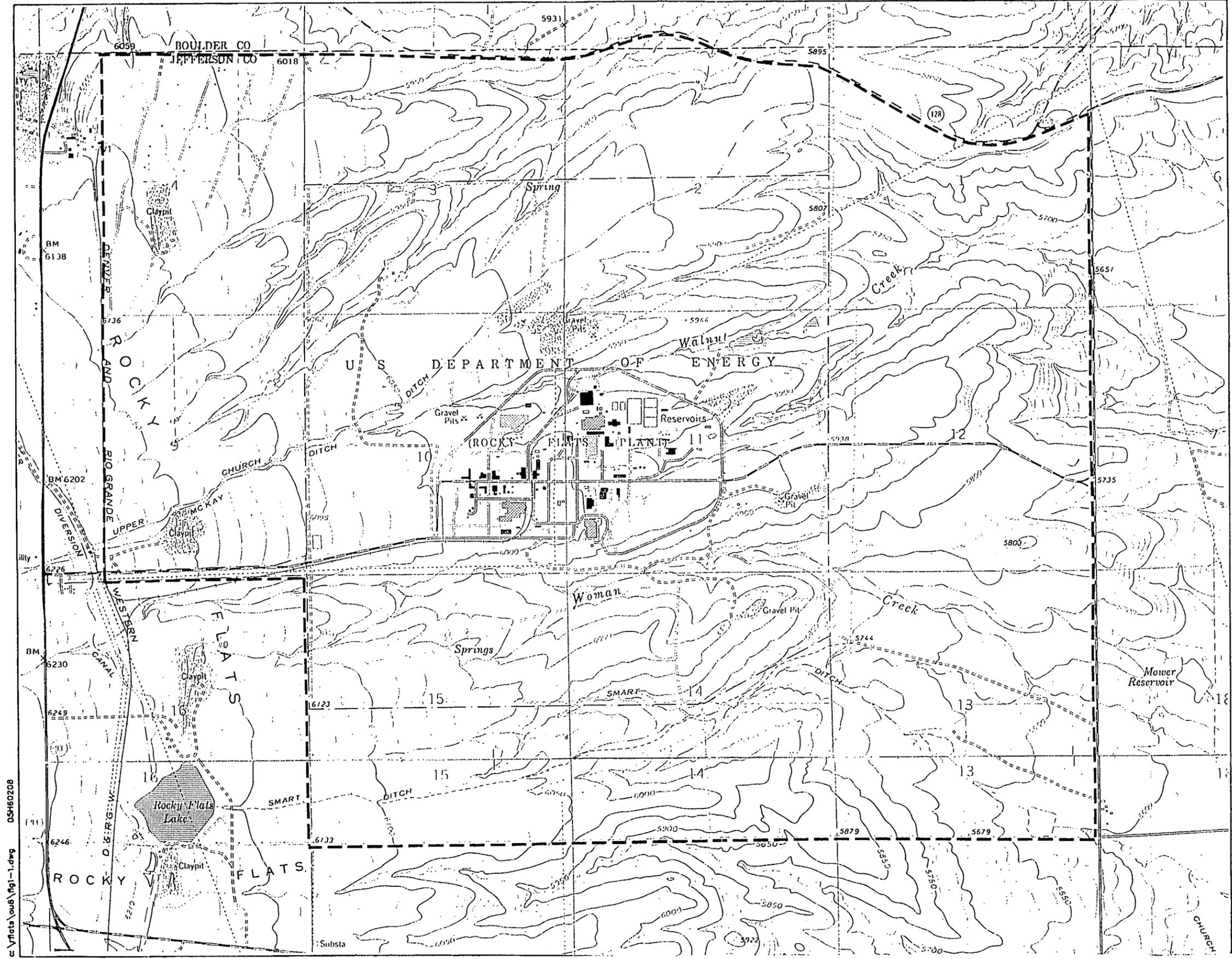
SCALE IN FEET

FIGURE 1-1
OPERABLE UNIT 13
TECHNICAL MEMORANDUM 1

Site Location and
Local Topography

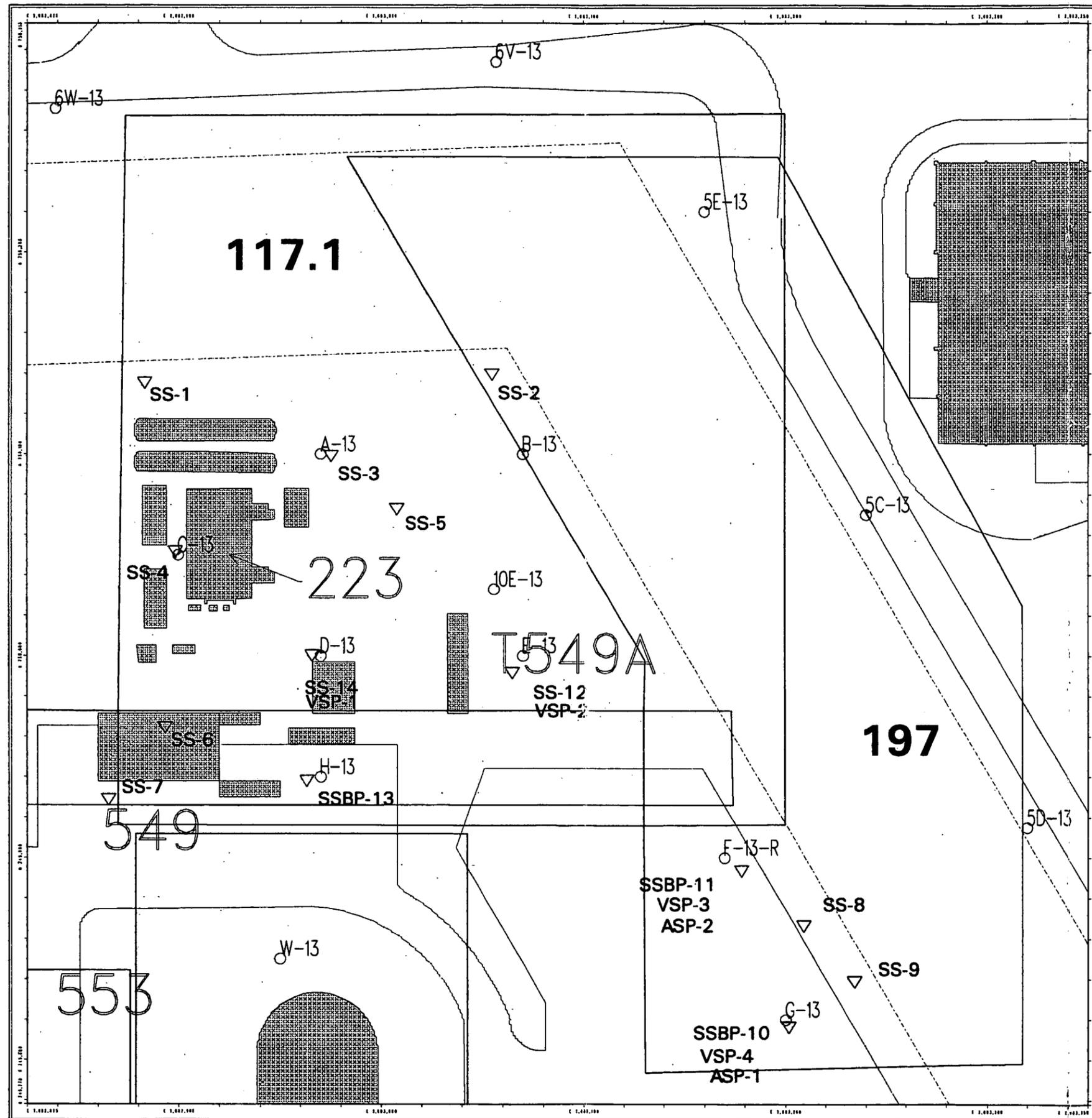
EG&G ROCKY FLATS

Rocky Flats Environmental
Technology Site
P.O. Box 464
Golden, Colorado 80402-0464



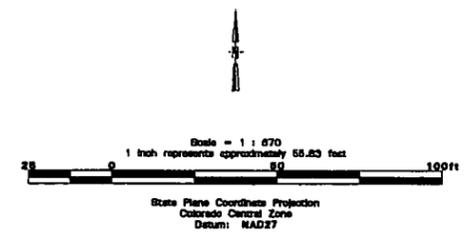
SOURCE: USGS 7.5 Minute Topography Maps, Louisville PR 1979 and Golden 1980

FIGURE 3
IHSS Group 117.1 and 197



EXPLANATION

- OU 13 IHSS
- Buildings or other structures
- Fences
- Paved roads
- Dirt roads
- SS - Soil Sample
RFP Method
- Asp - Asphalt
- VSP - Vertical soil
Profile
- SSBP - Soil Sample
Below Pavement Grab
- HPGE Sample



U.S. Department of Energy
 Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS
 Rocky Flats Environmental Technology Site
 P.O. Box 484
 Golden, Colorado 80402-0484

MAP ID: OU-10

October 10, 1994

/home/512860/projects/ou/ou13/fla197.amd

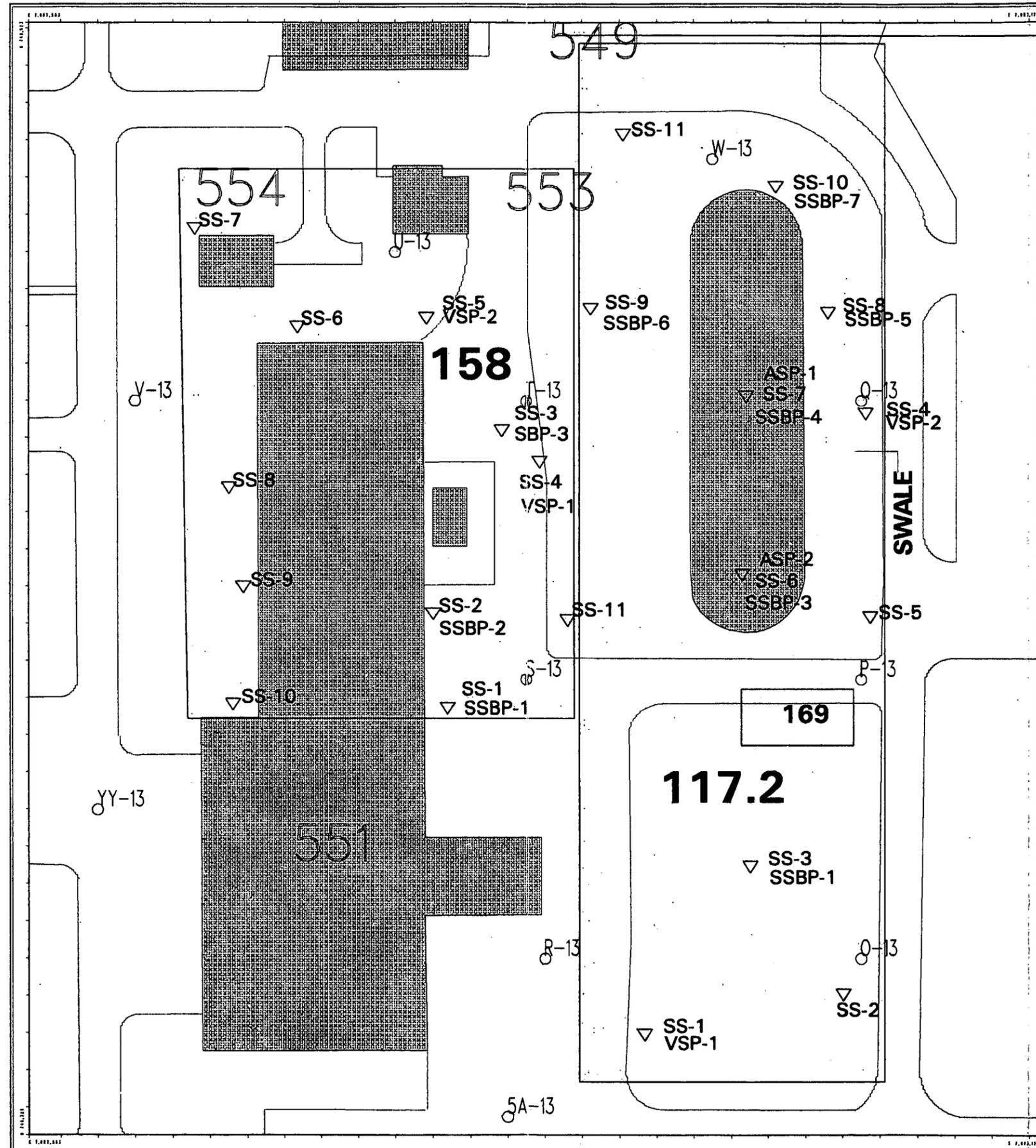
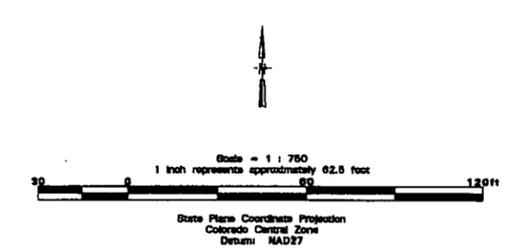


FIGURE 7
IHSS 158 and 117.2

EXPLANATION

- OU 13 IHSS
- ▨ Buildings or other structures
- - - Fences
- == Paved roads
- - - Dirt roads
- ▽ SS - Soil Sample Rocky Flats Method
- Asp - Asphalt
- VSP Vertical Soil Profile
- SSBP - Soil Sample Below Pavement Grab
- HPGe Sample



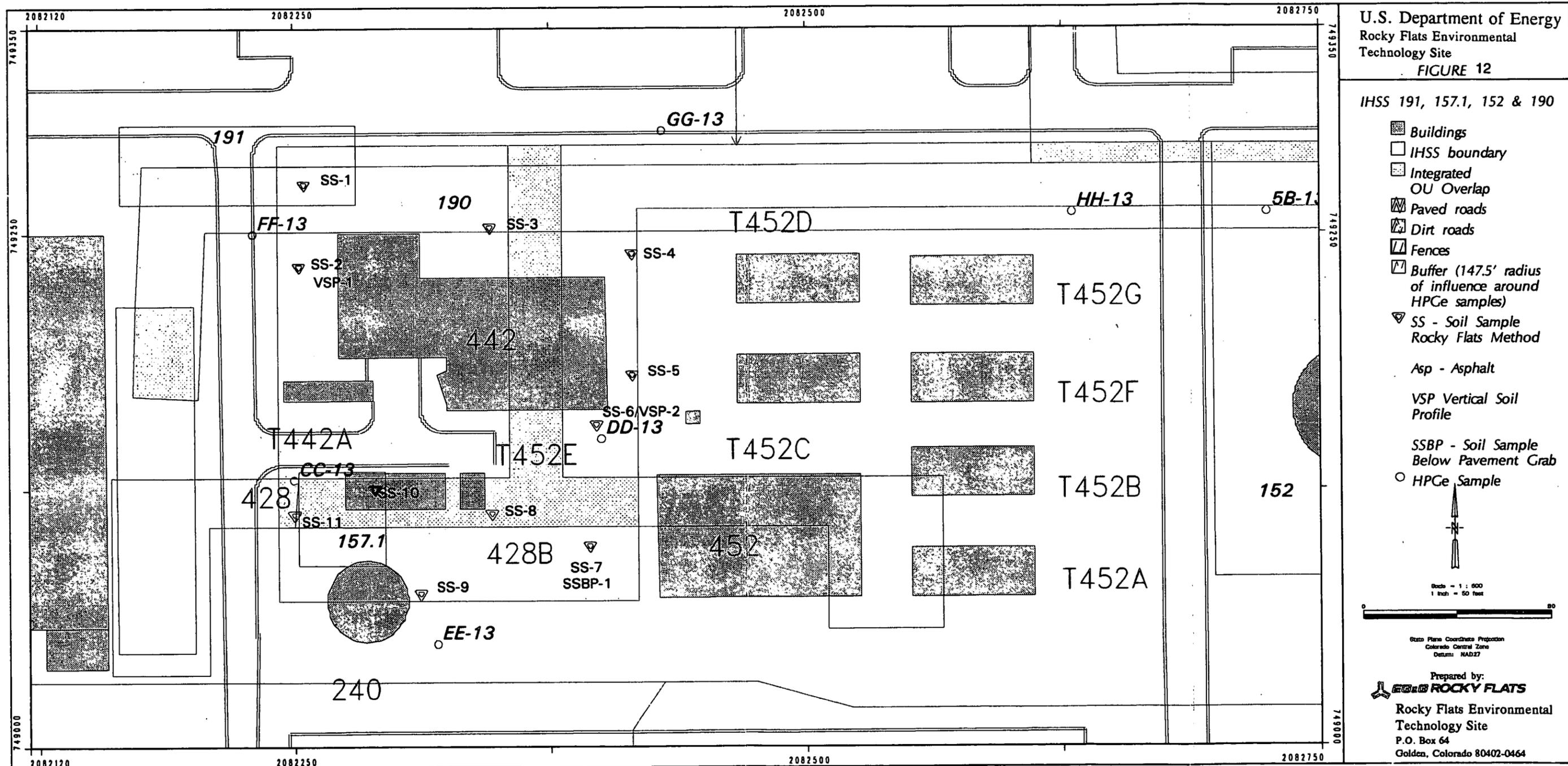
U.S. Department of Energy
 Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS
 Rocky Flats Environmental Technology Site
 P.O. Box 464
 Golden, Colorado 80402-0464

MAP ID: ou-10 October 10, 1994

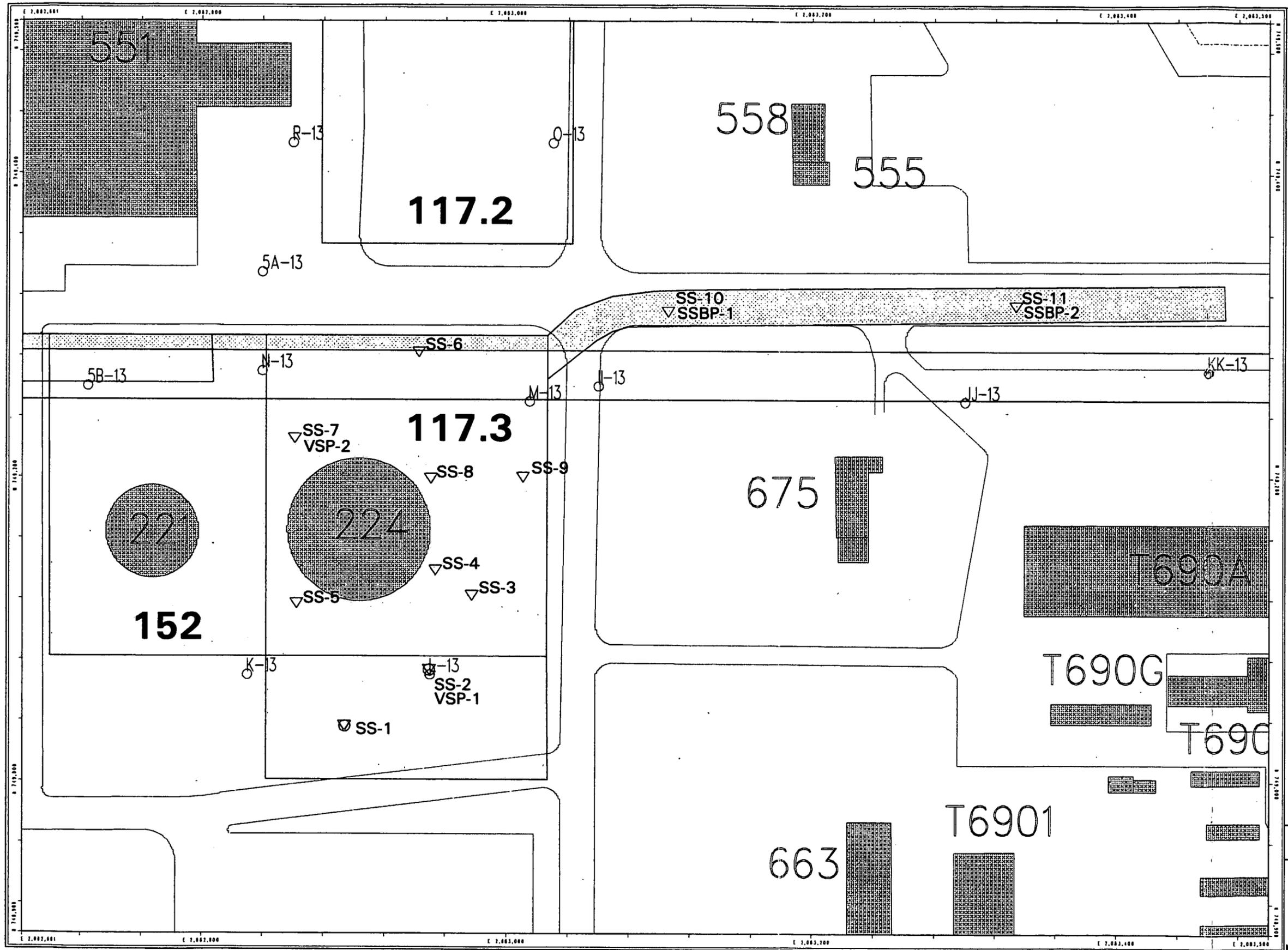
**Building footprints are not accurate in some cases
 Sample locations are accurate with respect to State Plane Coordinates*

/home/6512680/projects/ou13/fig158.dwg



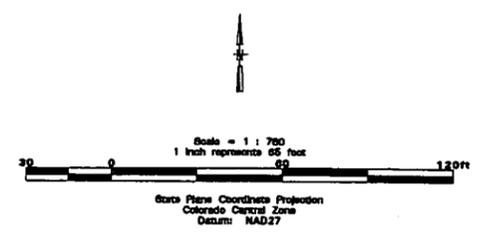
*Building footprints are not accurate in some cases
Sample locations are accurate with respect to State Plane Coordinates

FIGURE 13
IHSS 152 and 117.3



EXPLANATION

- OU 13 IHSS
- Integrated OU Overlap
- Buildings or other structures
- Fences
- Paved roads
- Dirt roads
- SS - Soil Sample Rocky Flats Method
- Asp - Asphalt
- VSP Vertical Soil Profile
- SSBP - Soil Sample Below Pavement Grab
- HPGe Sample
- Add pH analysis



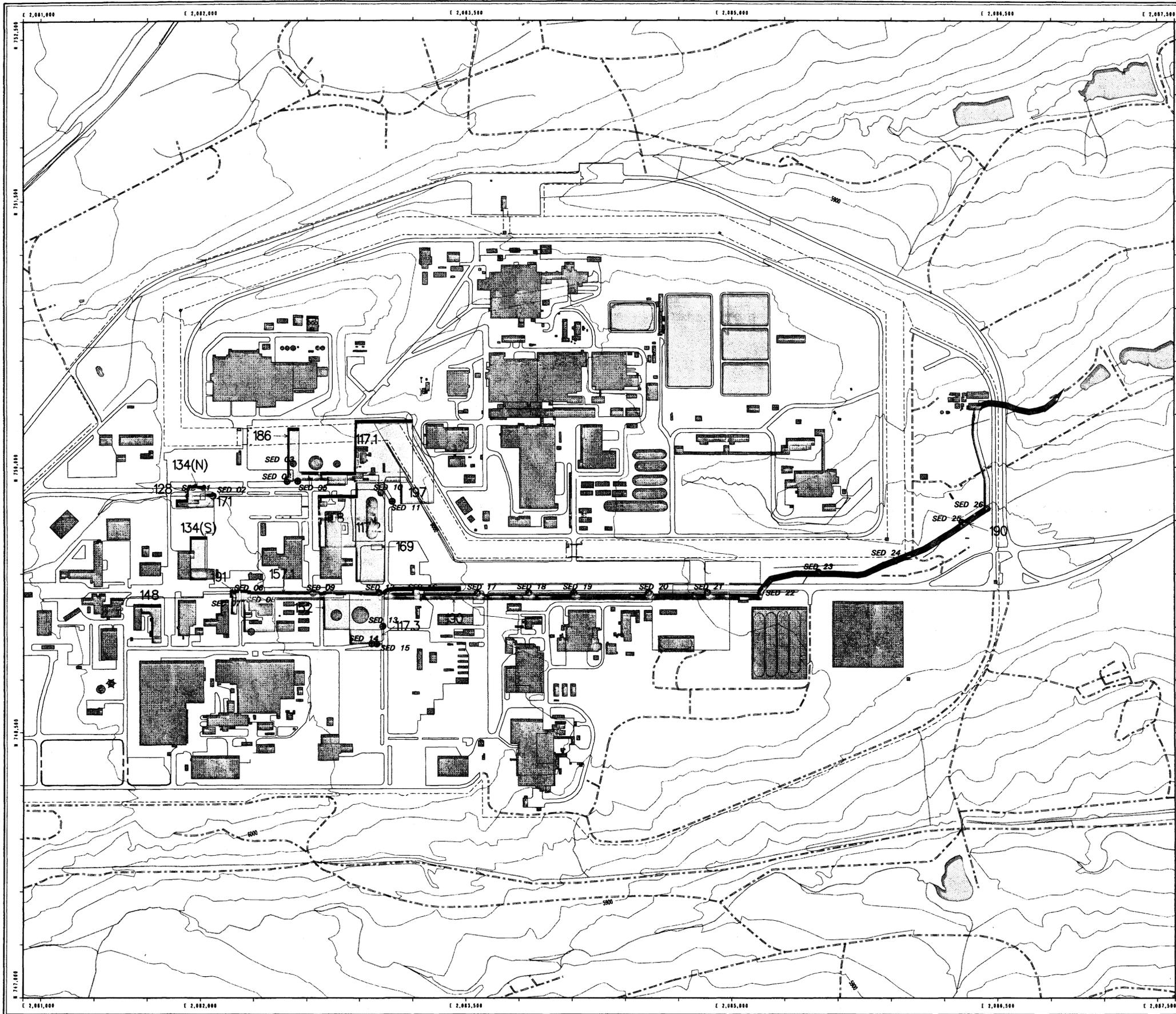
U.S. Department of Energy
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EG&G ROCKY FLATS
 Rocky Flats Environmental Technology Site
 P.O. Box 464
 Golden, Colorado 80402-0464

MAP ID: ou-10

October 10, 1994

/home/512660/projects/ou13/ou13a162.dwg



OUI3 Proposed Sediment Sampling Locations

FIGURE 15

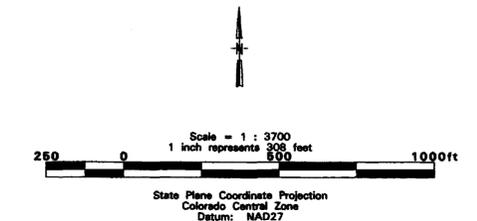
EXPLANATION

-  Operable Unit 13
-  Proposed sediment sampling locations

Standard Map Features

-  Buildings or other structures
-  Lakes and ponds
-  Streams, ditches, or other drainage features
-  Fences
-  Contours (20' Intervals)
-  Paved roads
-  Dirt roads

DATA SOURCE:
Buildings, roads, and fences provided by
Facilities Unit,
EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by
USGS - (date unknown)



**U.S. Department of Energy
Rocky Flats Environmental Technology Site**

Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464

PROJECT NO.	BY / DEPARTMENT	DATE
None Assigned	GIS Analyst Ron Holmes/Jacobs Eng.	08/11/94
MAP ID	Checked	
*** Draft ***	Approved	
DATE CREATED	Mike McHugh/EG&G	
August 11, 1994		

OUI3-A-000142