

# **NOTICE**

**All drawings located at the end of the document**

**INFORMATION  
ONLY**

**OPERABLE UNIT 1 (IHSSs 119 1 AND 119 2)-  
TREATABILITY STUDY WORK PLAN  
SOIL FLUSHING, BIOTREATMENT, AND  
RADIO FREQUENCY HEATING**

**ROCKY FLATS PLANT  
OPERABLE UNIT 1**

**U S DEPARTMENT OF ENERGY  
ROCKY FLATS PLANT  
GOLDEN COLORADO**

**ENVIRONMENTAL RESTORATION PROGRAM**

**JULY 1992  
FINAL**

**ATTACHMENT 1  
FIELD SAMPLING PLAN**

ADM RD

A-DU01-0007J4

REVIEWED FOR CLASSIFICATION/UCM

By George H. Setlock

Date 8/21/92 UNU

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## ACRONYMS

AHT	Ambient Head Space Temperature
CMS/FS	Corrective Measures Study/Feasibility Study
EMD	Environmental Management Document
FID	Flame Ionization Detector
FSP	Field Sampling Plan
IHSS	Individual Hazardous Substances Site
OU1	Operable Unit 1
PID	Photoionization Detector
RF	Radio Frequency
RFP	Rocky Flats Plant
SOP	Standard Operating Procedure
VOA	Volatile Organics Analysis
VOC	Volatile Organic Compound

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**Operable Unit 1 (IHSSs 119 1 and  
119 2) Field Sampling Plan**

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**1 0 SITE BACKGROUND**

Operable Unit No 1 (OU 1) at the Rocky Flats Plant (RFP) is located to the south of Building 881 on a sloping hillside. Several Individual Hazardous Substance Sites (IHSSs) have been identified on the hillside where past operational practices have resulted in contamination of soils, surface water, and groundwater. Of the IHSSs, two have been identified as having potentially more significant areas of contamination and are the focus of this Field Sampling Plan (FSP). These two areas are identified as IHSSs 119 1 and 119 2 and are referred to as Multiple Solvent Spill Sites. These two areas are located east of Building 881 and along the southern perimeter road (Figure 1 1). Beginning in 1967, these two areas were used as barrel storage areas. The barrels contained unknown types and quantities of solvents and solvent wastes. Operations in these areas were suspended in 1972. A review of analytical data from the Phase I and Phase II RI activities indicates that soil and groundwater contain volatile organic compounds (VOCs). Specifically, these VOCs include tetrachloroethene, 1,1,2,2-tetrachloroethane, trichloroethene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1-dichloroethene, and 1,2-dichloroethane, methyl ethyl ketone, and toluene. Concentrations of these contaminants in soils range up to 150 ug/kg, while concentrations in ground water range up to 33,500 ug/l. This differential in maximum detected concentrations may indicate that additional soil contamination source areas may exist but have not yet been detected by localized drilling programs.

Treatability testing of contaminated soils from IHSSs 119 1 and 119 2 has been proposed in support of the preparation of a draft Corrective Measures Study/Feasibility Study (CMS/FS) report for 881 Hillside. Several ex situ and in situ treatment technologies have been conceptualized as potentially applicable to the soils and contamination present at 119 1 and 119 2.

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These include bioremediation (ex situ and in situ) in-situ soil flushing soil gas extraction and in situ radio frequency (RF) heating Soil gas extraction (or vapor extraction) is being considered elsewhere at RFP (specifically through a site demonstration at Operable Unit 2) and therefore is not included in the OU 1 treatability program The treatability program for OU 1 is focused toward the evaluation of in situ treatment technologies therefore it is critical that the soil sampling program in support of treatability testing obtain soil samples as representative of in situ conditions as possible As a result the collection of undisturbed soil core samples which contain VOCs is integral to this FSP Due to the volatile nature of the contaminants of interest in the 119 1 and 119 2 soils extra care will be required during sampling to preserve the chemical integrity of the collected core samples

Throughout this FSP current approved RFP Environmental Management Document (EMD) operating procedures are incorporated by reference if appropriate In some instances modifications to these existing standard operating procedures (SOPs) are required due to treatability testing program requirements

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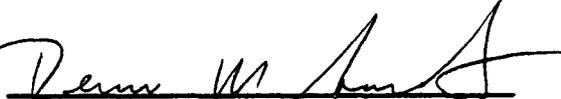
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119 2) Treatability Study Work Plan

  
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## 2 0 SAMPLE PROGRAM

### 2 1 Sampling Objectives

Samples collected during the execution of this FSP will be utilized in the laboratory evaluation of various soil treatment technologies. Therefore it is necessary to collect samples which best represent actual field conditions in order to meet the overall objectives of the treatability testing program. For this FSP it has been determined that undisturbed core samples and bulk samples will be required to meet treatability program needs. In order to best simulate actual field conditions during the execution of the treatability program (specifically the soil flushing component of the treatability program) undisturbed samples which closely represent actual in situ conditions will be required. Standard RFP sampling procedures for the collection of undisturbed cores have been modified in order to collect samples which have undergone only minimal volatilization of organic constituents.

### 2 2 Sampling Locations and Frequency

In order to satisfy soil testing requirements for the treatability testing program up to a maximum of ten borings will be completed in IHSSs 119 1 and 119 2. Of these ten borings seven will be completed in IHSS 119 1 and three will be completed in IHSS 119 2. The locations of these ten borings have been determined based on a review of existing Phase I Phase II and recently received Phase III Remedial Field Investigation/Remedial Investigation (RFI/RI) analytical data. The ten boring locations are highlighted on Figures 2 1 and 2 2. For this sampling effort only one round of sample collection will be required. Dependent on in situ soil contamination





levels ten borings may or may not be required to satisfy the testing requirements of this program Drilling should commence with boring No TS 1 identified on the attached figure and continue in numeric order until all ten borings have been completed or adequate sample volume has been collected The EG&G RFP treatability study oversight contractor will instruct the field drilling contractor as to when sufficient soil sample has been collected

### 2.3 Sample Designation

Soil samples collected during this sampling effort will be named or numbered according to standard RFP nomenclature convention as described in RFP EMD FO 14 Field Data Management Specifically Appendix FO 14A describes the accepted RFP conventions for sample nomenclature

### 2.4 Sampling Procedures

Sampling for OU 1 treatability testing will primarily consist of completing borings in IHSSs 119 1 and 119 2 in order to collect undisturbed cores and bulk samples for further laboratory testing SOPs developed for RFP are referenced here and apply to the collection of soil samples for the treatability testing program However due to the requirements of the treatability program minor modifications to the prescribed SOPs are required General RFP SOPs which relate to field operations and are relevant to this work include

- FO 01 Air Monitoring & Dust Control
- FO 02 Transmittal of Field QA Records
- FO 03 General Equipment Decontamination
- FO 04 Heavy Equipment Decontamination
- FO 06 Handling of Personal Protective Equipment
- FO 07 Handling of Decontamination Water and Wash Water
- FO 08 Handling of Drilling Fluids and Cuttings

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- FO 09 Handling of Residual Samples
- FO 10 Receiving Labeling and Handling Environmental Materials Containers
- FO 11 Field Communications
- FO 12 Decontamination Facility Operations
- FO 13 Containerization Preserving Handling and Shipping of Soil and Water Samples
- FO 14 Field Data Management
- FO 15 Photoionization Detectors (PIDs) and Flame Ionization Detectors (FIDs)
- FO 16 Field Radiological Measurements
- FO 18 Environmental Sample Radioactivity Content Screening

The above referenced SOPs shall be reviewed by the drilling contractor prior to initiation of field work to ensure that the provisions of the SOPs are adhered to when executing this FSP. Note that the sampling procedures described below require that portions of the cuttings generated during drilling operations will be saved as bulk sample for use in the treatability program. Handling of cuttings in this fashion is not in accordance with procedures outlined in FO 8 Section 6 4 1

Handling of Drilling Fluids and Cuttings When this FSP does not call for collection of cuttings for use in the treatability program the provisions of FO 08 Section 6 4 1 will be followed regarding generated drill cuttings. FO 10 describes procedures for handling environmental materials containers. It is critical that these SOPs be followed in the field to ensure that microbial contamination of the sample containers does not occur. The above referenced SOPs are contained in RFP Manual No 5 21000-OPS FO titled EMD Operating Procedures Volume I Field Operations

In addition to the general SOPs referenced above the following SOPs specific to geotechnical sampling are relevant to this FSP

- GT 01 Logging Alluvial and Bedrock Material
- GT 02 Drilling and Sampling Using Hollow Stem Auger Techniques
- GT 03 Isolating Bedrock from Alluvium with Grouted Surface Casing

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- GT 04 Plugging and Abandonment of Boreholes
- GT 17 Land Surveying

SPO GT 01 details procedures for logging of alluvial and bedrock materials from soil borings. For this FSP only provisions of this SOP which directly relate to the visual logging of the collected sample shall be followed. It is intended that once an undisturbed core is retrieved from the borehole the collected sample be visually inspected and logged. Also samples collected with a split spoon sampler not fitted with a clear plastic sleeve will be screened with an HNu meter. No other logging procedures such as physical testing (sieve analysis etc) will be required.

The above referenced geotechnical SOPs shall be reviewed by the drilling contractor prior to initiation of field work to ensure that the provisions of the SOPs are adhered to when executing this FSP. The above referenced SOPs are contained in RFP Manual No 5 21000-OPS-GT titled EMD Operating Procedures Volume I Geotechnical.

Note that SOP GT 02 describes in detail specific drilling and sampling methods for the collection of undisturbed core and bulk samples. Due to the specific use requirements for the collected soil samples as required by the treatability testing program the following modifications to this SOP have been made and override procedures presented in GT 02.

Drilling each boring location will consist of the completion of a two-part procedure. For each boring location (up to ten as required) two separate borings will be completed. The first boring or the exploratory boring will be hereinafter referred to as the A boring for each location. The purpose of the A boring for each location is to identify interval(s) of contamination or hot spots. This will allow the second boring (or the B boring as described below) to target in on specific intervals for the collection of undisturbed samples which contain VOCs. For the A borings drilling will be completed with 2½ ID hollow stem augers equipped with a 2 OD split spoon sampler. No insert sleeve is required for the A borings.

For each A boring sampling will be continuous (as possible) using the above described sampling equipment. Sampling will continue until an apparent bedrock (clay stone) surface is

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encountered and then an additional eight feet will be drilled/sampled to confirm that the apparent bedrock surface is in fact a continuous bedrock layer. If colluvial material is encountered after the initial bedrock layer is reached, sampling will continue through the colluvial material until a second bedrock layer is detected. Drilling into the second apparent bedrock layer shall continue for a maximum of two feet. Once again, if colluvial material is encountered prior to completing the additional two feet of drilling, drilling and sampling will continue until two continuous feet of bedrock is obtained.

Core sampling shall be continuous with the split spoon. When recovered, the core sample shall be logged by the field geologist. As each core is retrieved, representative shavings shall be collected from the core every two to three inches and placed in a glass jar for ambient head space temperature (AHT) screening. A HNu meter equipped with a 11.7 eV bulb shall be used for the screening. The HNu reading for each collected core interval shall be recorded in the field notebook. Any interval which registers an HNu reading which is greater than or equal to 2 ppm above background shall be noted as target intervals for the B boring. After each collected interval is logged and screened, it shall be placed in a bulk plastic sample container of suitable size to accommodate one interval of core sample. The sample may be disturbed through the process of containerization. Two exceptions to this procedure for bulk sample collection shall be followed: bedrock (clay stone) or humic top soil (top 6-10' of boring) intervals shall not be collected. These intervals can be disposed of according to SOP FO 8. Bulk samples will be collected according to the above procedures for the first four completed A borings. The sampling oversight engineer may direct the collection of drill cuttings to supplement the bulk samples collected from the A cores. For all successive borings, the collected and screened samples shall be disposed according to SOP FO 8. Samples shall be refrigerated to 4°C to prevent volatilization. The procedures for completion of the B borings are described below.

For the B borings, drilling will be completed with 4 1/4" ID hollow stem augers equipped with a 4" outside diameter (OD) split spoon sampler. Inside the split spoon will be a 3.5" OD x 24" length clear plastic liner capable of collecting an undisturbed sample approximately 3.0" in diameter and 24" in length. For each boring, sampling will be continuous only for the targeted intervals from

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the A borings The B boring shall be located no further than 2 feet from the location of the A boring If possible the B boring shall be located closer than 2 feet to the A boring

Core sampling shall occur in the targeted intervals with the split spoon and inserted plastic sleeve being advanced in two foot intervals When recovered the core sample will be logged by the field geologist through the clear plastic sleeve For each collected sample interval from the B borings the clear plastic liner shall be removed from the split spoon and the ends sealed with a small sheet of Teflon® and two plastic end caps These end caps will then be secured to the liner with electrical tape These measures plus refrigeration are designed to minimize loss of volatile constituents in the field The sleeve will then be placed in a cooler and refrigerated to 4° C If the retrieved sample exhibits void spaces on either end of the sample sleeve these voids shall be filled/packed with pieces of Teflon® sheeting prior to sealing

The collection of three inch cores for Volatile Organic Analysis (VOA) is not required as specified by SOP GT 02 since the entire two foot sections for the targeted intervals will be collected and preserved in a manner consistent with VOA analysis Any required analytical testing will be completed by the treatability testing laboratory therefore collection of samples for submittal to third party analytical laboratories is not required for this FSP

In addition to the QA samples specified in GT 02 Section 6 0 two additional QA samples are required These QA samples represent sampling equipment material blanks collected as described below For both the clear plastic sleeve and the bulk plastic sample container distilled water shall be introduced into clean unused samples of each material and allowed to contact the material for 24 hours Then an aliquot of each water sample which has contacted the material will be collected in sample bottles and submitted to the treatability laboratory for VOA and semi VOA analysis

Modifications to the above described procedures may be made by the EG&G RFP oversight engineer in the field if required to fulfill treatability testing objectives Any such modifications will be closely documented in a field memorandum

*by using Document Control  
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## 2 5 Sampling Equipment

The equipment requirements to execute the Section 2 4 Sampling Procedures include but are not limited to the items in Table 2 1 Any additional items not included on the table but necessary to execute the FSP shall be provided by the drilling contractor

<b>TABLE 2 1 SAMPLING EQUIPMENT REQUIREMENTS</b>
Drill rig equipped for drilling and sampling with hollow stem augers
Continuous core auguring equipment (including 4 1/4 ID sample barrel and 2 1/2 ID sample barrel) suitable for 2 foot sample rods
4 OD split spoon sampler and 2 OD split spoon sampler
24 3 5 OD x 24 length clear plastic sleeve insert liners
Teflon® film (cut in 4 x 4 squares) and electrical tape
Plastic end caps for sleeve insert liners
12 Bulk plastic containers with air tight lids (1 gallon jugs preferred)
36 clear glass 1/2 quart containers (glass) with air tight lids
Self adhesive sample labels
Ice chests or coolers with blue ice
High pressure steamer/sprayer
Long handled bristle brushes
Wash/rinse tubs
Phosphate-free lab grade detergent (e g Liquinox)
Location map

TABLE 2 1 SAMPLING EQUIPMENT REQUIREMENTS Continued
Photoionization detector (PID) capable of achieving an ionization potential of 11.7 eV
Weighted tape measure
Water level probe
Distilled water
Aluminum foil
Drums for containment of cuttings
Appropriate health & safety equipment
Field book
Boring log forms
Chain-of-custody forms

**2.6 Sample Handling & Shipment**

Samples shall be collected, handled, and shipped in accordance with appropriate SOPs as referenced in Section 2.4 above. Particularly relevant are SOPs FO 10, FO 13, FO 14, and FO 18.

Samples which are collected for submittal to the treatability laboratory as specified in Section 2.4 above shall be shipped via overnight express service in coolers. The address and individual contact at the treatability testing laboratory will be provided to the drilling contractor by the EG&G RFP oversight engineer prior to the initiation of field work.

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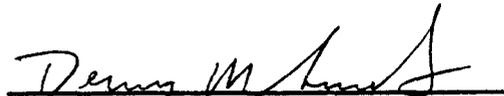
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### 3.0 HEALTH AND SAFETY REQUIREMENTS

The following EM field procedures are to be followed in executing this FSP

- SOP 3.2 Drilling and Sampling Using Hollow Stem Auger Techniques
- SOP 1.13 Containerizing Preserving Handling and Shipping of Soil and Water Samples
- SOP 1.15 Use of Photoionization and Flame Ionization Detectors
- SOP 1.16 Field Radiological Measurements

In addition to the specific requirements of each of the procedures referenced above particular attention should be made in equipment decontamination prior to leaving an operable unit in order to prevent inadvertent cross-contamination

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*7, 30, 92*  
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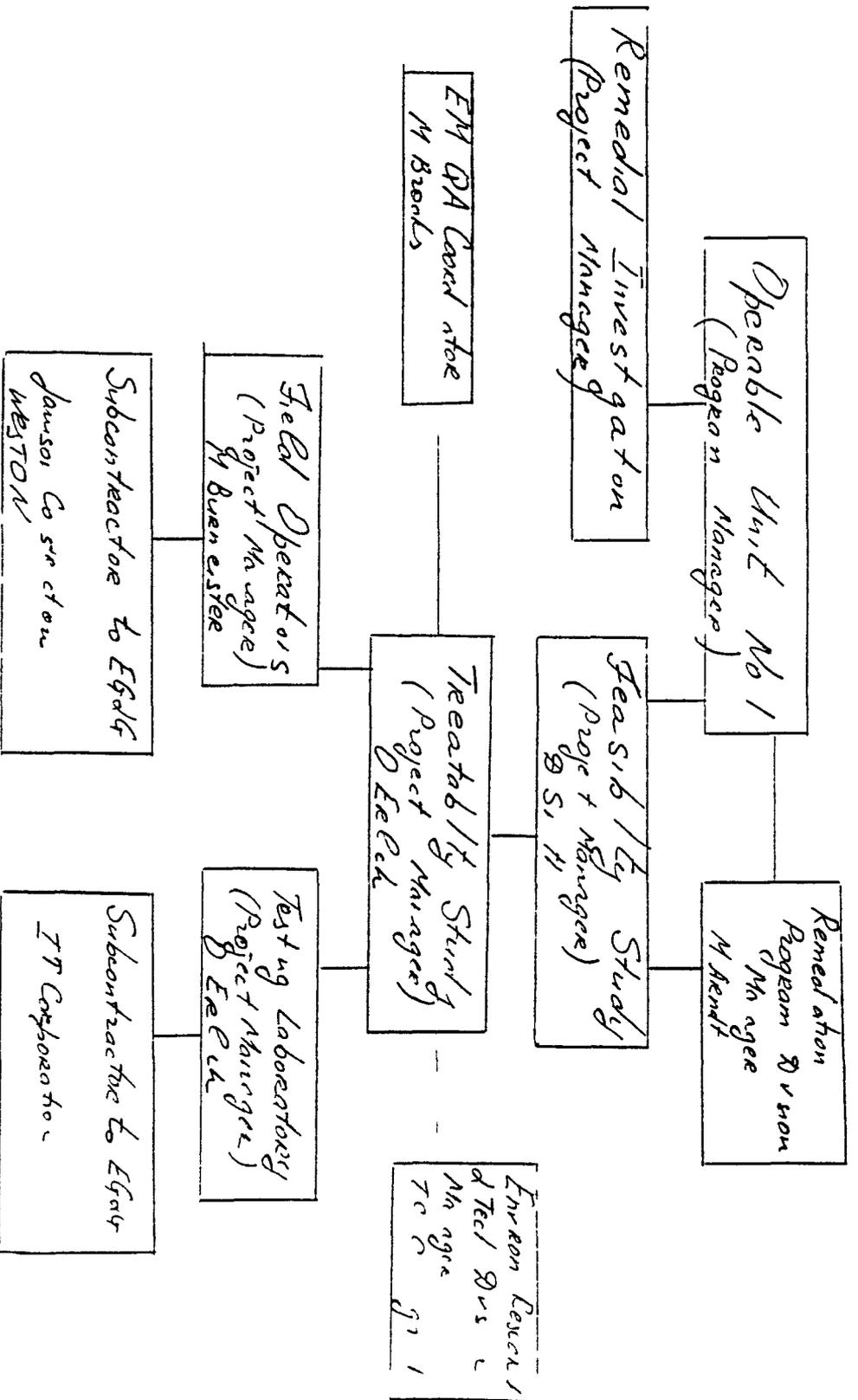
#### 4 0 REFERENCES

EG&G Rocky Flats EMD Operating Procedures Manual No 5 21000-OPS-GT Volume III  
Geotechnical

EG&G Rocky Flats EMD Operating Procedures Manual No 5 21000-OPS-FO Volume I Field  
Operations

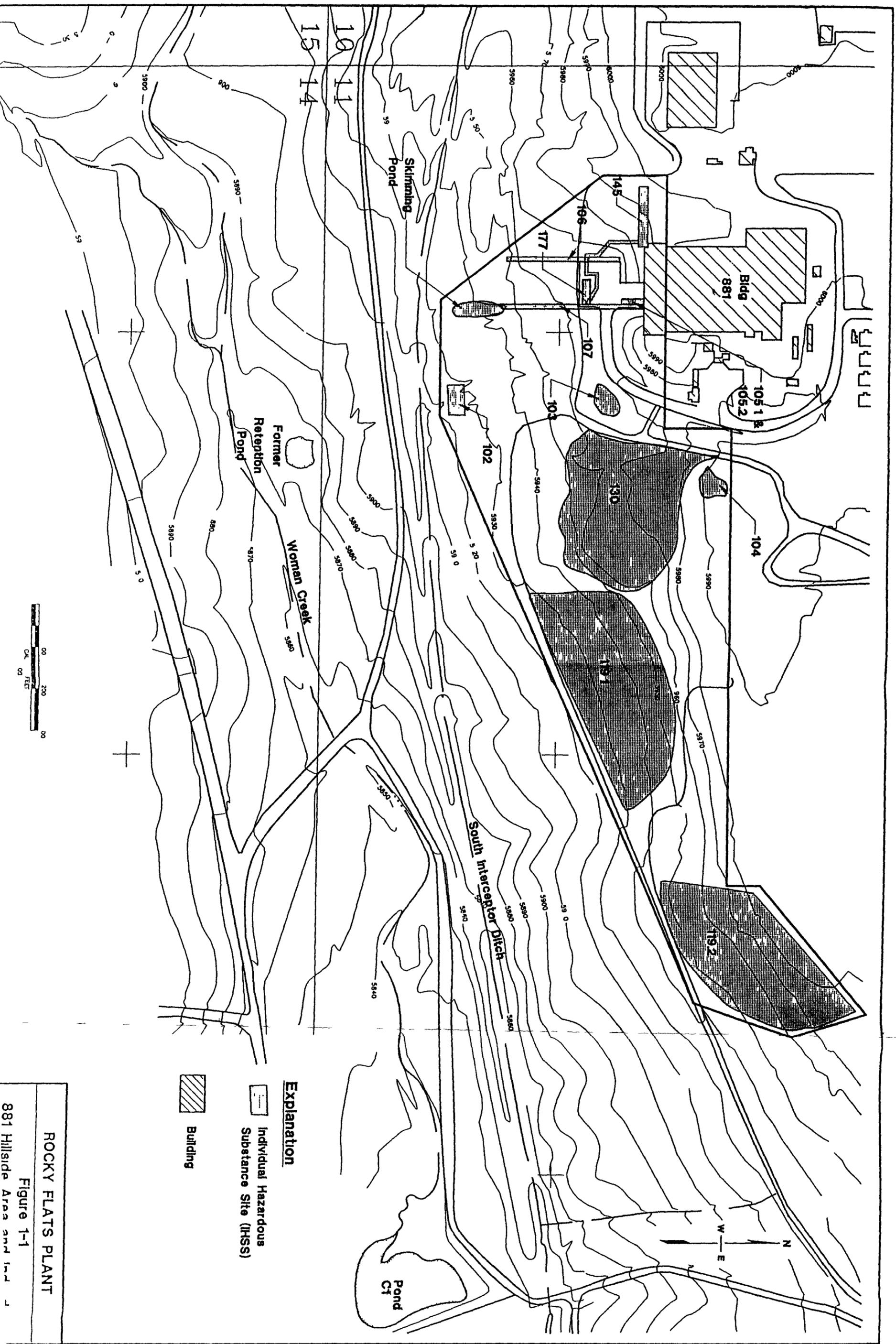
US EPA Guide for Conducting Treatability Studies Under CERCLA EPA/540/2 89/058  
December 1989

US DOE Final Phase III RCRA Facility Investigation/Remedial Investigation Work Plan  
Revision 1 Rocky Flats Plant 881 Hillside Area March 1991



Operable Unit Treatability Study-specific organization





**Explanation**

 Individual Hazardous Substance Site (IHSS)

 Building

**ROCKY FLATS PLANT**  
 Figure 1-1  
 881 Hillside Area and Ind