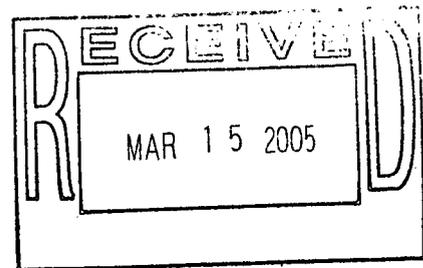


**Industrial Area and Buffer Zone  
Sampling and Analysis Plan  
Addendum #IABZ-05-02  
903 Pad  
Volatile Organic Compounds**

Approval received from the U.S. Environmental Protection Agency, Region 8  
(March 7, 2005).

Approval letter contained in the Administrative Record.



**March 2005**

ADMIN RECORD

BZ-A-000826

1/10

**TABLE OF CONTENTS**

1.0 Introduction..... 1  
2.0 Existing Information ..... 1  
3.0 Sampling ..... 4  
4.0 References..... 7

**LIST OF FIGURES**

Figure 1 903 Pad Location..... 2  
Figure 2 903 Pad Existing Soil Information and Investigation Areas ..... 3  
Figure 3 FY05 Sampling Locations for 903 Pad VOC Source Evaluation ..... 5

**LIST OF TABLES**

Table 1 Sampling Summary..... 4  
Table 2 Specifications for Additional Soil Sampling at the 903 Pad ..... 6

## ACRONYMS

AL	action level
BZ	Buffer Zone
BZSAP	Buffer Zone Sampling and Analysis Plan
DOE	U.S. Department of Energy
ft	feet
FY	Fiscal Year
IHSS	Individual Hazardous Substance Site
ug/kg	micrograms per kilogram
PID	photo-ionization detector
pCi/g	picocuries per gram
SAP	Sampling and Analysis Plan
VOC	volatile organic compound
WRW	wildlife refuge worker

## 1.0 INTRODUCTION

This Industrial Area (IA) and Buffer Zone (BZ) Sampling and Analysis Plan (SAP) (IABZSAP) Addendum #BZ-05-02 includes specifications to conduct additional soil sampling at the 903 Pad (Individual Hazardous Substance Site [IHSS] 112) during Fiscal Year (FY) 05. This IABZSAP Addendum is a supplement to the IABZSAP (DOE-2004a) and includes existing data, proposed sampling locations, sampling depths, and contaminants of concern, specifically volatile organic compounds (VOCs). This sampling is intended to determine if sources of groundwater VOC contamination are present in soil under the 903 Pad. Sampling results will also be used to refine existing depth-to-bedrock information. Such information will be used to determine step-out sampling requirements. The location of the 903 Pad is shown on Figure 1.

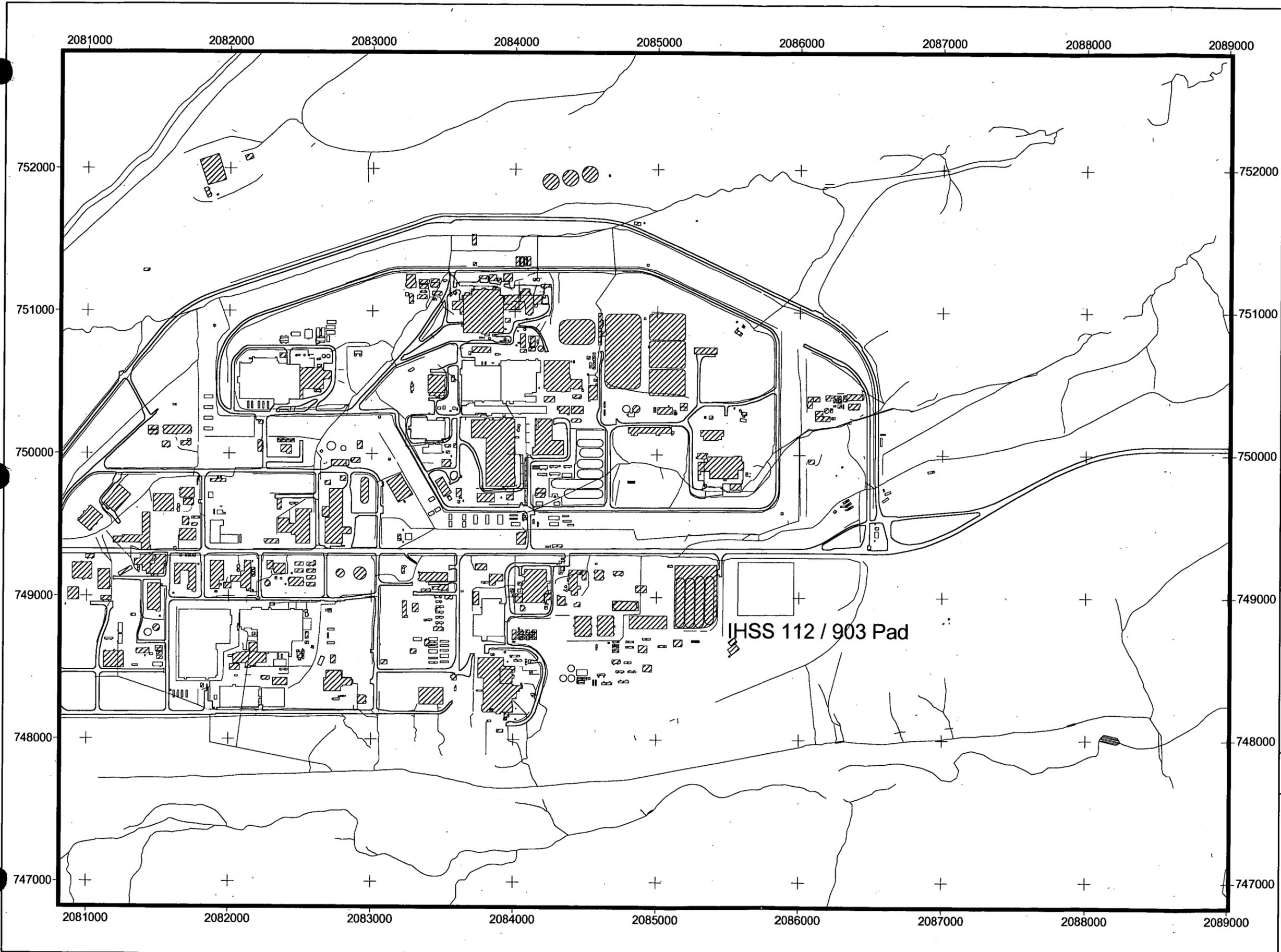
The 903 Pad area was used to store drums that contained radioactively contaminated oils and VOCs from 1958 to 1967. The liquid in the drums was primarily lathe coolant and/or carbon tetrachloride. However, hydraulic oils, vacuum pump oils, trichloroethene, tetrachloroethene, silicone oils, acetone still bottoms, and other liquids were also stored in these drums. When leaking drums were noted in 1964, the contents of the leaking drums were transferred to new drums. Soil cleanup operations began in 1967. It was suspected that approximately 420 drums leaked to some degree. The total amount of leaked material was estimated at around 5,000 gallons (DOE 2000).

## 2.0 EXISTING INFORMATION

The remedial action for the 903 Pad was completed in October 2003 with the removal of contaminated soils to a depth of at least 1 foot (ft) across the area. While the objective of the remedial action was to remove radiologically contaminated soils, it was noted that most of the excavated material was also contaminated with VOCs. The areas (cells within the 903 Pad) where high concentrations of VOCs were excavated are shown on Figure 2 in red.

Pre-remedial action borehole and soil gas data also indicate the presence of subsurface VOC-contaminated soils (DOE 2000). Based on the borehole data, VOC-contaminated soils are found in two zones: near surface soils (less than 6 ft below ground surface), and deeper soils near or at the bedrock surface. One sampling location (BH90998) had VOC concentrations in near-surface soil that exceeded action levels (ALs) for the wildlife refuge worker (WRW). However, the near-surface at this location was excavated, and the data are no longer representative. Figure 2 does not show these data. It only presents existing conditions (representative VOC data) and does not show radionuclide activities.

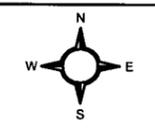
Areas where subsurface VOC-contaminated soils may be present were identified using historical borehole and soil gas data, as well as existing bedrock information. In addition, the VOC data collected for the waste containers was linked back to the excavated cell and used to indicate what was previously at that location (Figure 2). While this material has been removed, it indicates areas where higher concentrations of VOCs may remain. These data were overlain with the recent remedial action excavation depths to determine what may still remain as a potential source of groundwater contamination.



**Figure 1  
903 Pad Location**

**KEY**

-  IHSS 112
-  Asphalt
-  Standing structure
-  Demolished structure
-  Stream or ditch



200 0 200 400 600 800 1000 Feet

Scale = 1:8,000

State Plane Coordinate Projection  
Colorado Central Zone  
Datum: NAD 27

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

Prepared by:



Prepared for:



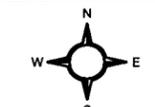
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**Figure 2  
903 Pad  
Existing Soil VOC Data  
and Investigation Areas**

**KEY**

- Existing soil sampling location with VOC concentrations < WRW ALs (only concentrations greater than mdl/r)
- Existing soil sampling location (all VOC concentrations less than mdl/r)
- 903 Pad grid
- Investigation area
- ▨ Area excavated (> 4 ft)
- ▨ Area excavated with high VOC concentrations based on waste analysis
- Bedrock contour
- - - Inferred bedrock contour

mdl -- method detection limit  
ug/kg -- micrograms per kilogram  
NA -- not applicable  
pCi/g -- picocuries per gram  
rl -- reporting limit  
Sbd -- sample beginning depth  
Sed -- sampling ending depth



100 0 100 Feet

Scale = 1:1,500

State Plane Coordinate Projection  
Colorado Central Zone  
Datum: NAD 27

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

Prepared by:



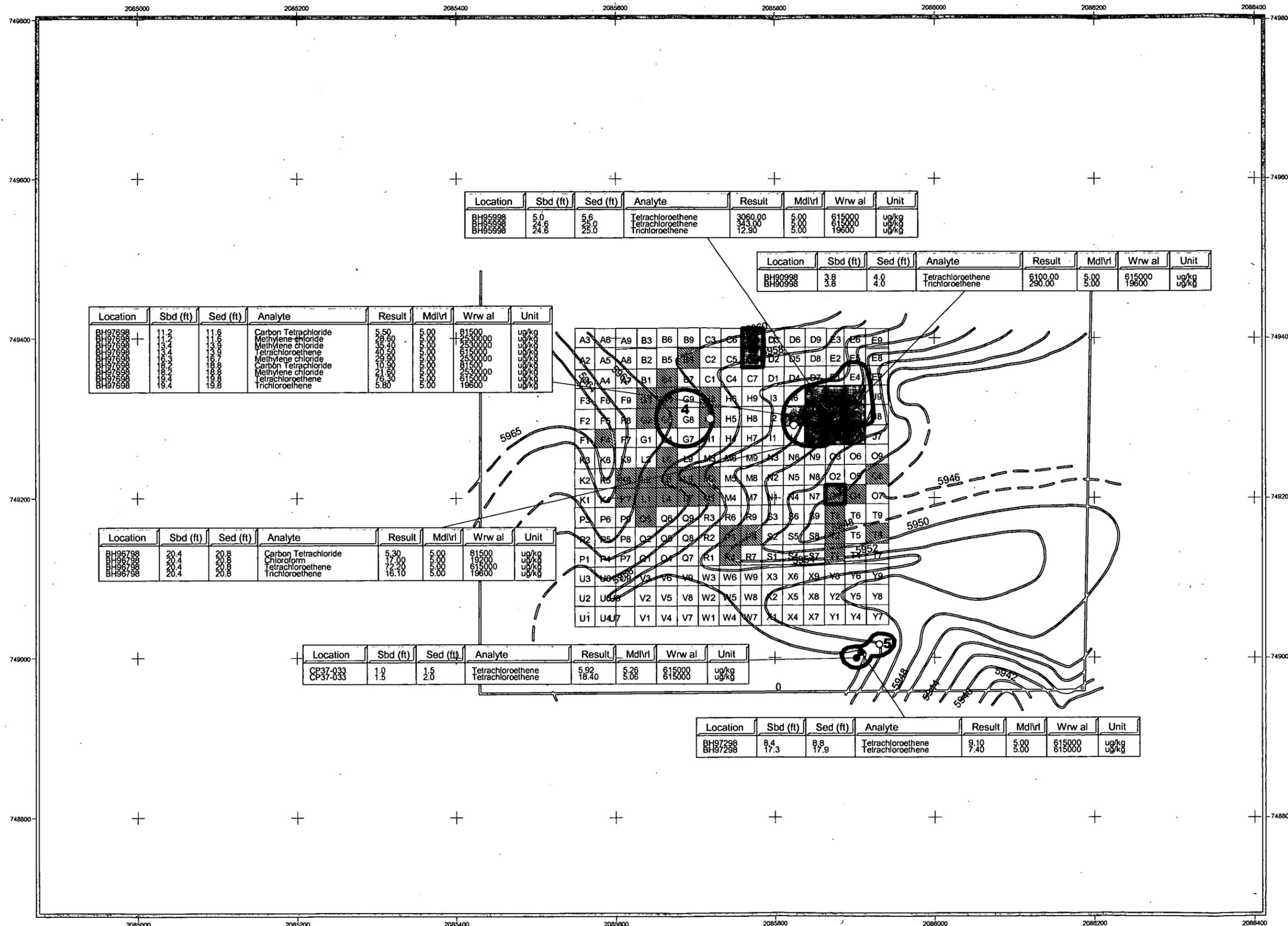
Prepared for:



**KAISER-HILL  
COMPANY**

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Date: 01/25/05



Location	Sbd (ft)	Sed (ft)	Analyte	Result	Mdl/rl	Wrw al	Unit
BH95998	5.0	5.6	Tetrachloroethene	3060.00	5.00	615000	ug/kg
BH95998	24.6	25.0	Tetrachloroethene	343.00	5.00	615000	ug/kg
BH95998	24.6	25.0	Trichloroethene	12.90	5.00	19600	ug/kg

Location	Sbd (ft)	Sed (ft)	Analyte	Result	Mdl/rl	Wrw al	Unit
BH90998	3.8	4.0	Tetrachloroethene	6100.00	5.00	615000	ug/kg
BH90998	3.8	4.0	Trichloroethene	290.00	5.00	19600	ug/kg

Location	Sbd (ft)	Sed (ft)	Analyte	Result	Mdl/rl	Wrw al	Unit
BH97698	11.2	11.6	Carbon Tetrachloride	5.50	5.00	81500	ug/kg
BH97698	11.2	11.6	Methylene chloride	28.60	5.00	2530000	ug/kg
BH97698	11.2	11.6	Methylene chloride	38.40	5.00	2530000	ug/kg
BH97698	13.4	13.8	Tetrachloroethene	40.50	5.00	615000	ug/kg
BH97698	13.4	13.8	Methylene chloride	29.90	5.00	2530000	ug/kg
BH97698	13.4	13.8	Carbon Tetrachloride	10.30	5.00	81500	ug/kg
BH97698	13.4	13.8	Methylene chloride	21.90	5.00	2530000	ug/kg
BH97698	15.6	16.0	Tetrachloroethene	76.30	5.00	615000	ug/kg
BH97698	15.6	16.0	Trichloroethene	5.80	5.00	19600	ug/kg

Location	Sbd (ft)	Sed (ft)	Analyte	Result	Mdl/rl	Wrw al	Unit
BH96798	20.4	20.8	Carbon Tetrachloride	5.30	5.00	81500	ug/kg
BH96798	20.4	20.8	Chloroform	17.00	5.00	19200	ug/kg
BH96798	20.4	20.8	Tetrachloroethene	72.20	5.00	615000	ug/kg
BH96798	20.4	20.8	Trichloroethene	16.10	5.00	19600	ug/kg

Location	Sbd (ft)	Sed (ft)	Analyte	Result	Mdl/rl	Wrw al	Unit
CP37-033	1.0	2.0	Tetrachloroethene	5.92	5.00	615000	ug/kg
CP37-033	1.3	2.0	Tetrachloroethene	16.40	5.00	615000	ug/kg

Location	Sbd (ft)	Sed (ft)	Analyte	Result	Mdl/rl	Wrw al	Unit
BH97298	8.4	8.8	Tetrachloroethene	9.10	5.00	615000	ug/kg
BH97298	17.3	17.9	Tetrachloroethene	7.40	5.00	615000	ug/kg

Based on this information, five areas were identified for further investigation to determine if there are potential sources of groundwater VOC contamination (DOE 2004b). These areas are shown on Figure 2 and listed in order of priority as follows.

- Area 1 – Area with soil gas anomaly and VOC contamination in upper 3 ft (removed during remedial action). There is known VOC contamination at depth (greater than 25 ft), but at low concentrations (tetrachloroethene at 110 ug/kg, trichloroethene at 27 ug/kg).
- Area 2 – Two cells with elevated VOC contamination in excavated material. This area was not deeply excavated.
- Area 3 – One cell with elevated VOC contamination in excavated material. This area was excavated to a depth greater than 4 ft.
- Area 4 – Area with soil gas anomaly and VOC contamination at depth (23-27 ft). Excavated material at this location contained moderate concentrations of VOCs.
- Area 5 – Area south of the 903 Pad with VOCs in near surface soils.

### 3.0 SAMPLING

Biased soil sampling will be conducted to augment the existing information and data presented on Figure 2. Proposed biased sampling locations (25) are shown on Figure 3. Proposed sampling and analysis specifications for the 903 Pad area are summarized in Table 1 and listed, by investigation area and sampling location, in Table 2.

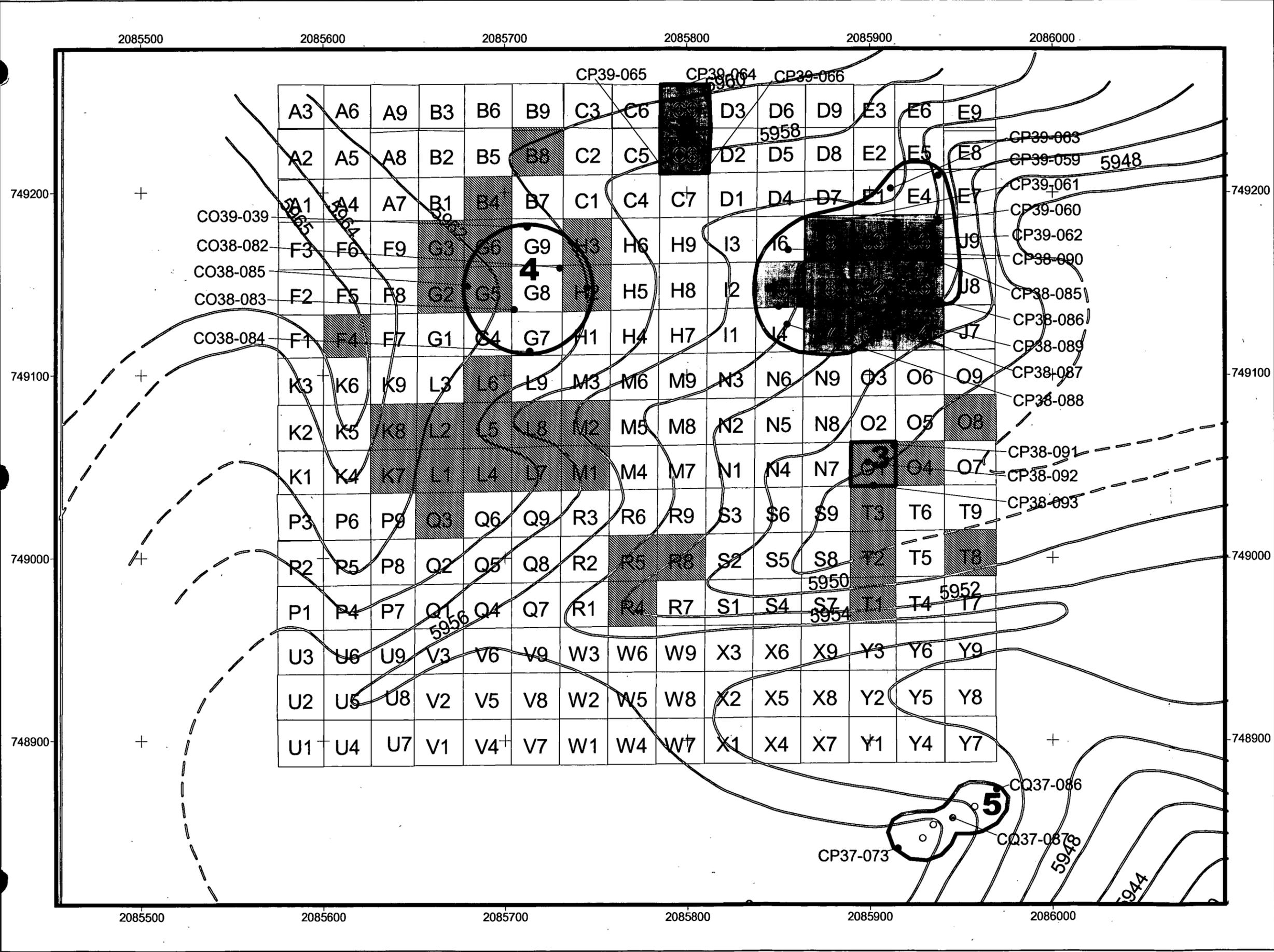
Sampling will start from either the ground surface or the bottom of 903 Pad excavated areas. All intervals from the start of sampling to 6 ft will be collected and analyzed. Intervals from 6 ft to bedrock will be cored and visually inspected for staining or other signs of contamination. A photo-ionization detector (PID) or similar instrument will be used over the core to detect additional VOC contamination, if present. VOC samples will be collected for core intervals with stained soils or elevated PID readings. VOC samples will be collected for the sample intervals immediately above and immediately below the bedrock surface. If the bedrock surface falls within one sample interval, then two samples will be collected within that interval. Depth to bedrock will be noted, and depth to groundwater will be noted as possible.

The actual number of samples collected will depend on the depth to bedrock and the number of intervals with stains or elevated PID readings. Depth to bedrock in the area ranges from 14 to 24 ft below ground surface (DOE 2000). In addition, the number of samples may change after characterization starts based on field conditions and/or sampling results. For example, additional step-out samples will be added as necessary to define the areas of VOC contamination. Changes to sampling specifications will be considered in consultation with the regulatory agencies.

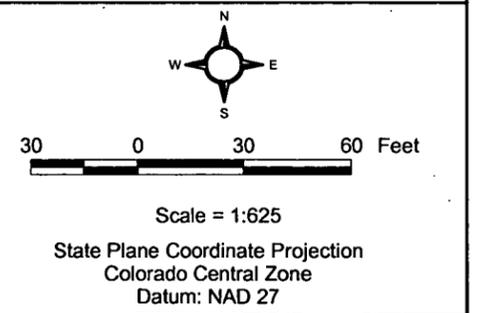
**Table 1 Sampling Summary**

Category	Total
Number of Sampling Locations	25
Number of Samples Collected	247 (estimated maximum)
Number of VOC Analyses	247 (estimated maximum)

**Figure 3**  
**FY05 Sampling Locations**  
**for 903 Pad VOC Source**  
**Evaluation**



- KEY**
- Proposed soil sampling location
  - ⊙ Existing soil sampling location
  - 903 Pad grid
  - - - Investigation area
  - ▨ Area excavated (> 4 ft)
  - ▩ Area excavated with high VOC concentrations based on waste analysis



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

Prepared by: **RADMS**

Prepared for: **KAISER HILL COMPANY**

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**Table 2**  
**Specifications for Additional Soil Sampling at the 903 Pad**

Area	Location	Easting	Northing	Media	Depth Intervals (maximum)	Analyte	On-Site Laboratory Method	Off-Site Laboratory Method
1	CP39-059	2085932.923	749199.627	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP39-060	2085932.923	749174.604	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP38-085	2085933.786	749151.953	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP38-086	2085933.570	749130.597	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP38-087	2085893.662	749120.243	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP38-088	2085850.519	749118.086	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP38-089	2085840.596	749137.932	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP38-090	2085851.166	749158.856	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP39-061	2085867.129	749170.936	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP39-062	2085897.545	749163.818	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
1	CP39-063	2085907.037	749192.508	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
2	CP39-064	2085791.935	749247.882	Subsurface Soil	C-M (2.5-24.5 ft)	VOCs	8260	8260
2	CP39-065	2085784.345	749201.585	Subsurface Soil	C-M (2.5-24.5 ft)	VOCs	8260	8260
2	CP39-066	2085805.921	749202.019	Subsurface Soil	C-M (2.5-24.5 ft)	VOCs	8260	8260
3	CP38-091	2085908.959	749051.861	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
3	CP38-092	2085894.366	749042.626	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
3	CP38-093	2085897.581	749029.847	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
4	CO38-082	2085725.782	749148.975	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
4	CO39-039	2085708.115	749171.459	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
4	CO38-083	2085700.799	749126.312	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
4	CO38-084	2085709.365	749103.471	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
4	CO38-085	2085675.103	749139.161	Subsurface Soil	D-M (4.5-24.5 ft)	VOCs	8260	8260
5	CQ37-086	2085965.012	748863.511	Subsurface Soil	B-M (0.5-24.5 ft)	VOCs	8260	8260
5	CQ37-087	2085940.791	748847.874	Subsurface Soil	B-M (0.5-24.5 ft)	VOCs	8260	8260
5	CP37-073	2085910.897	748831.318	Subsurface Soil	B-M (0.5-24.5 ft)	VOCs	8260	8260

The actual number of samples collected will depend on the depth to bedrock and the number of intervals with stains or elevated PID readings.

#### **4.0 REFERENCES**

DOE, 2000, Characterization Report for the 903 Drum Storage Area, 903 Lip Area and Americium Zone, RF/RMRS-99-427.UN, Rev. 1, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 2004a, Industrial Area and Buffer Zone Sampling and Analysis Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 2004b, Draft Interim Measure/Interim Remedial Action for Groundwater at the Rocky Flats Environmental Technology Site, Rocky Flats Environmental Technology Site, Golden, Colorado, December.