SUBSURFACE IM/IRA
OPERABLE UNIT NO. 2
MEETING AGENDA

- INTRODUCTION

- OPTIMIZATION & CHARACTERIZATION
  - Optimization-Preliminary Results
  - Characterization-Preliminary Results

- TEST SITE 1
  - End Post-Pilot Operations

- ACCELERATED ACTIONS FOR VADOSE ZONE SOURCE

- ADDITIONAL MEETINGS/ACTIONS ITEMS

TEST SITE 1

- SENIOR MANAGEMENT REVIEW RECOMMENDATIONS
  - » OPTIMIZATION-PLASTIC COVER INSTALLATION
  - » TRENCH CHARACTERIZATION

TARP INSTALLATION

DATE	AIR FLOW (SCFM)	CONC'N (ppm v/v) (based on FID)	REMOVAL RATE (lbs/hr) (based on FID)
		BEFORE TARP	
10/24/94	179	407	1.94
10/25/94	168	265	1.18
10/26/94	181	300	1.44
10/27/94	175	343	1.59
10/28/94	177	317	1.49
		AFTER TARP	
11/28/94	250	228	1.51
11/29/94	250	220	1.46
11/30/94	243	290	1.87
12/1/94	239	310	1.97
12/2/94	229	250	1.52

IHSS 110
CHARACTERIZATION

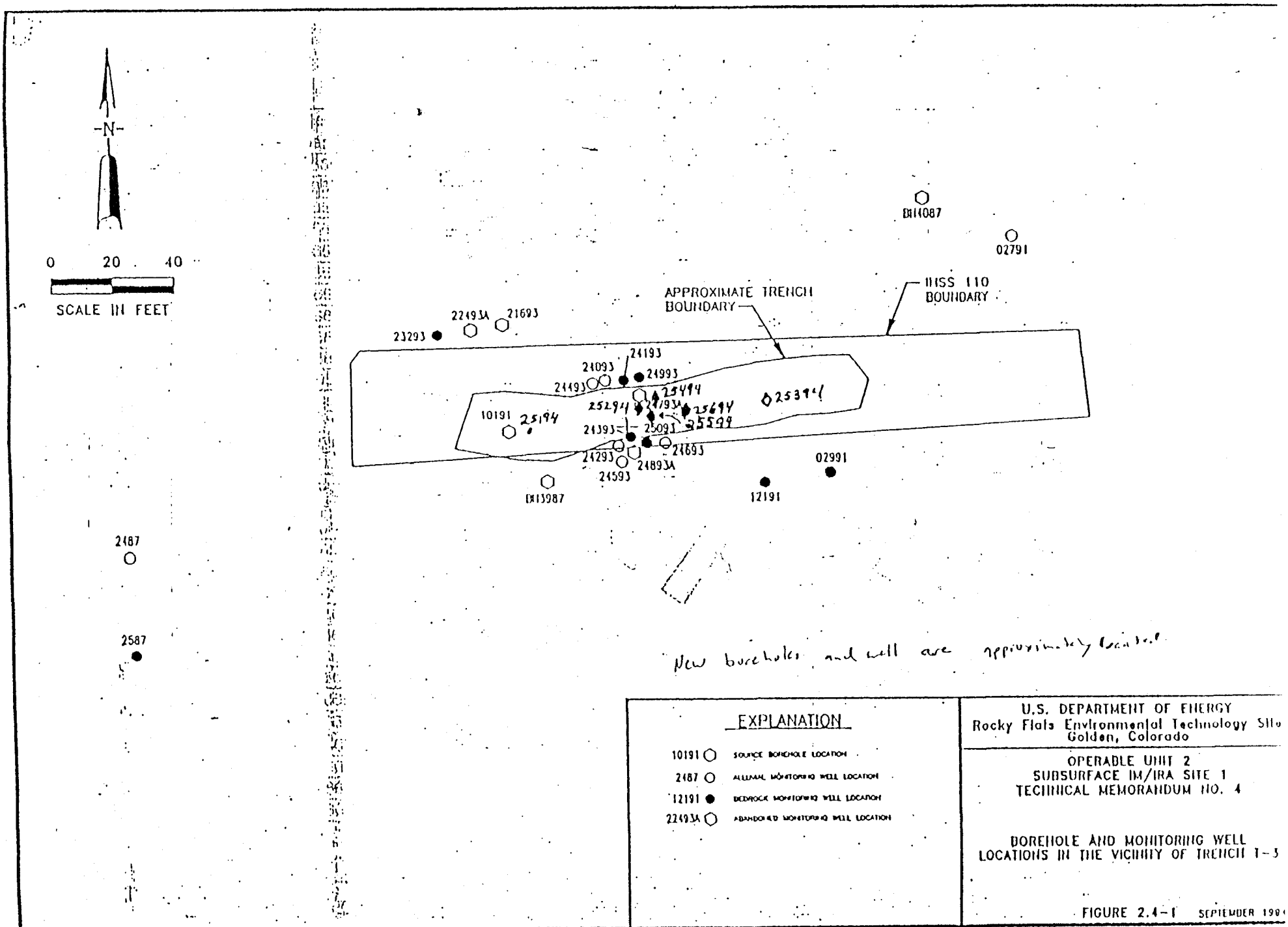
- IMMISCIBLE PHASE FREE LIQUID:
  - » 1 SAMPLE, 2 PHASES-OIL & WATER
  - » TOTAL ALPHA+BETA = 1,554,000 pCi/l
- SOIL SAMPLES FROM 4 BOREHOLES

TRENCH T-3 (IHSS 110)
DRILLING CHARACTECIZATION
NOVEMBER 1994

Location Number	Location Type	Start Date	End Date	Total Depth (ft)(BGS)	Top of Bedrock	RFEDS Sample Number	Waste Sample Number	Sample Start Depth (ft)(BGS)	Sample End Depth (ft)(BGS)	Analysis Requested	Comments
25194	BH/EW	11/2/94	11/10/94	5.3	NE	BH20665WC	95N0058	3.6	5.3	VBR, BDR, WW, RH	Liquid sample
						DR00010WC		0	4	RH, V, B, M, RA, RB, RC	Drum composite
						DR00016WC		0	4	RH, V, B, M, RA, RB, RC	Drum composite
25294	BH	11/2/94	11/4/94	8	NE	BH20654WC		6.75	7	RH, VBR	Discrete VOA
						BH20655WC		6	8	RH, BDR	Composite
						DR00011WC		0	8	RH, V, B, M, RA, RB, RC	Drum composite
25394	BH	11/4/94	11/4/94	9	NE	BH20651WC		4	6	RH, WH, BDR	Composite
						BH20650WC		5.75	6	RH, VBR	Discrete VOA
						BH20653WC		6	8	RH,GQB	Composite
						DR00012WC		0	9	RH, V, B, M, RA, RB, RC	Drum composite
25494	BH	11/7/94	11/7/94	3.5	NE	DR00013WC		0	3.5	RH, V, B, M, RA, RB, RC	Drum composite
25594	BH	11/7/94	11/8/94	16	15.5	BH20658WC		15.75	16	RH, VBR	Discrete VOA
						BH20659WC		9	10	RH, BDR, WW	Composite
						BH20660WC		9.8	10	RH, VBR	Discrete VOA
						DR00014WC		0	16	RH, V, B, M, RA, RB, RC	Drum composite
25694	BH	11/8/94	11/9/94	14	NE	BH20652WC		12	14	RH, GQB	Composite
						BH20656WC		11.8	12	RH, VBR	Discrete VOA
						BH20657WC		4	6	RH, GQB	Composite
						DR00015WC		0	14	RH, V, B, M, RA, RB, RC	Drum composite

Explanation:

BH	Borehole
EW	Extraction well
BGS	Below ground surface
RH	Radionuclide screen
RA	Gross alpha and beta
RB	Plutonium-239/240, Americium-241
RC	Uranium-233,234, Uranium-235, Uranium-238
V	VOA-CLP
VBR	VOA (8240)
B	BNA-CLP
BDR	BNA (8270)
M	Total Metals-CLP
GQB	Soil moisture content
WH	Total organic carbon
WW	Total petroleum hydrocarbons (8015 modified)



U.S. DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site
Golden, Colorado

OPERABLE UNIT 2
SUBSURFACE IM/IRA SITE 1
TECHNICAL MEMORANDUM NO. 4

BOREHOLE AND MONITORING WELL LOCATIONS IN THE VICINITY OF TRENCH T-3

FIGURE 2.4-1 SEPTEMBER 199

SVLTM014 1-40

11-21-94
47073-03

TRENCH T-3 (HISS 110)
ANALYTICAL SUMMARY
NOVEMBER 1994

Location Number	Sample Number	Matrix	Depth From	Depth To	Detected Chemical	Concentration (ppm)	Lab Qualifier
25194	BH20665WC	Flowing oil	3.6	5.3	1,1,1-TCA	18	
25194	BH20665WC	Flowing oil	3.6	5.3	1,1-DCA	1.1	
25194	BH20665WC	Flowing oil	3.6	5.3	2,4-Dimethylphenol	100	
25194	BH20665WC	Flowing oil	3.6	5.3	2-Methylnaphthalene	450	
25194	BH20665WC	Flowing oil	3.6	5.3	2-Methylphenol	20	J
25194	BH20665WC	Flowing oil	3.6	5.3	4-Methylphenol	74	J
25194	BH20665WC	Flowing oil	3.6	5.3	Acetone	3.1	
25194	BH20665WC	Flowing oil	3.6	5.3	bis(2-Ethylhexyl)phthalate	310	
25194	BH20665WC	Flowing oil	3.6	5.3	CHCl3	5.5	
25194	BH20665WC	Flowing oil	3.6	5.3	Di-n-butylphthalate	120	
25194	BH20665WC	Flowing oil	3.6	5.3	Diesel	370000	
25194	BH20665WC	Flowing oil	3.6	5.3	Ethylbenzene	0.92	
25194	BH20665WC	Flowing oil	3.6	5.3	Fluorane	58	J
25194	BH20665WC	Flowing oil	3.6	5.3	Gasoline	170000	G
25194	BH20665WC	Flowing oil	3.6	5.3	m,p-Xylene	8.2	
25194	BH20665WC	Flowing oil	3.6	5.3	Naphthalene	220	
25194	BH20665WC	Flowing oil	3.6	5.3	o-Xylene	2.2	
25194	BH20665WC	Flowing oil	3.6	5.3	PCE	37000	D,E
25194	BH20665WC	Flowing oil	3.6	5.3	Phenanthrene	200	
25194	BH20665WC	Flowing oil	3.6	5.3	TCE	7100	D
25194	BH20665WC	Flowing oil/Water	3.6	5.3	Gross alpha (pCi/L) Rad Screen	749000	
25194	BH20665WC	Flowing oil/Water	3.6	5.3	Gross beta (pCi/L) Rad Screen	803000	
25194	BH20665WC	Water	3.6	5.3	1,1,1-TCA	0.41	D
25194	BH20665WC	Water	3.6	5.3	1,1-DCA	0.092	D
25194	BH20665WC	Water	3.6	5.3	2-Butanone	0.66	D
25194	BH20665WC	Water	3.6	5.3	2-Methylphenol	14	E
25194	BH20665WC	Water	3.6	5.3	4-Methylphenol	9.5	E
25194	BH20665WC	Water	3.6	5.3	Acetone	5.1	E,D
25194	BH20665WC	Water	3.6	5.3	bis(2-Ethylhexyl)phthalate	0.87	
25194	BH20665WC	Water	3.6	5.3	CHCl3	0.42	D
25194	BH20665WC	Water	3.6	5.3	Di-n-butylphthalate	0.62	

TRENCH T-3 (IHSS 110)
ANALYTICAL SUMMARY
NOVEMBER 1994

Location Number	Sample Number	Matrix	Depth From	Depth To	Detected Chemical	Concentration (ppm)	Lab Qualifier
25194	BH20665WC	Water	3.6	5.3	Diesel	3.7	
25194	BH20665WC	Water	3.6	5.3	Gasoline	1.9	G
25194	BH20665WC	Water	3.6	5.3	m,p-Xylene	0.24	D
25194	BH20665WC	Water	3.6	5.3	Methylene Chloride	0.057	D
25194	BH20665WC	Water	3.6	5.3	o-Xylene	0.084	
25194	BH20665WC	Water	3.6	5.3	PCE	650	D
25194	BH20665WC	Water	3.6	5.3	Phenanthrene	0.53	
25194	BH20665WC	Water	3.6	5.3	TCE	97	D
25294	BH20654WC	Soil	6.8	7	Acetone	0.026	BJ
25294	BH20654WC	Soil	6.8	7	Ethylbenzene	0.008	
25294	BH20654WC	Soil	6.8	7	Methylene Chloride	0.009	J
25294	BH20654WC	Soil	6.8	7	PCE	0.17	
25294	BH20654WC	Soil	6.8	7	TCE	0.003	J
25294	BH20654WC	Soil	6.8	7	Toluene	0.02	
25294	BH20654WC	Soil	6.8	7	Total Xylenes	0.026	
25294	BH20655WC	Soil	6	8	Gross alpha (pCi/g) Rad Screen	25.06	
25294	BH20655WC	Soil	6	8	Gross beta (pCi/g) Rad Screen	19.29	
25394	BH20650WC	Soil	5.8	6	Acetone	0.063	BJ
25394	BH20650WC	Soil	5.8	6	Gross alpha (pCi/g) Rad Screen	18.97	
25394	BH20650WC	Soil	5.8	6	Gross beta (pCi/g) Rad Screen	26.83	
25394	BH20650WC	Soil	5.8	6	Methylene Chloride	0.003	J
25394	BH20650WC	Soil	5.8	6	PCE	0.005	
25394	BH20651WC	Soil	4	6	bis(2-Ethylhexyl)phthalate	0.13	BJ
25394	BH20651WC	Soil	4	6	Gross alpha (pCi/g) Rad Screen	14.12	
25394	BH20651WC	Soil	4	6	Gross beta (pCi/g) Rad Screen	21.54	
25394	BH20651WC	Soil	4	6	TOC	11	
25394	BH20653WC	Soil	4	6	Gross alpha (pCi/g) Rad Screen	12.23	
25394	BH20653WC	Soil	4	6	Gross beta (pCi/g) Rad Screen	14.81	

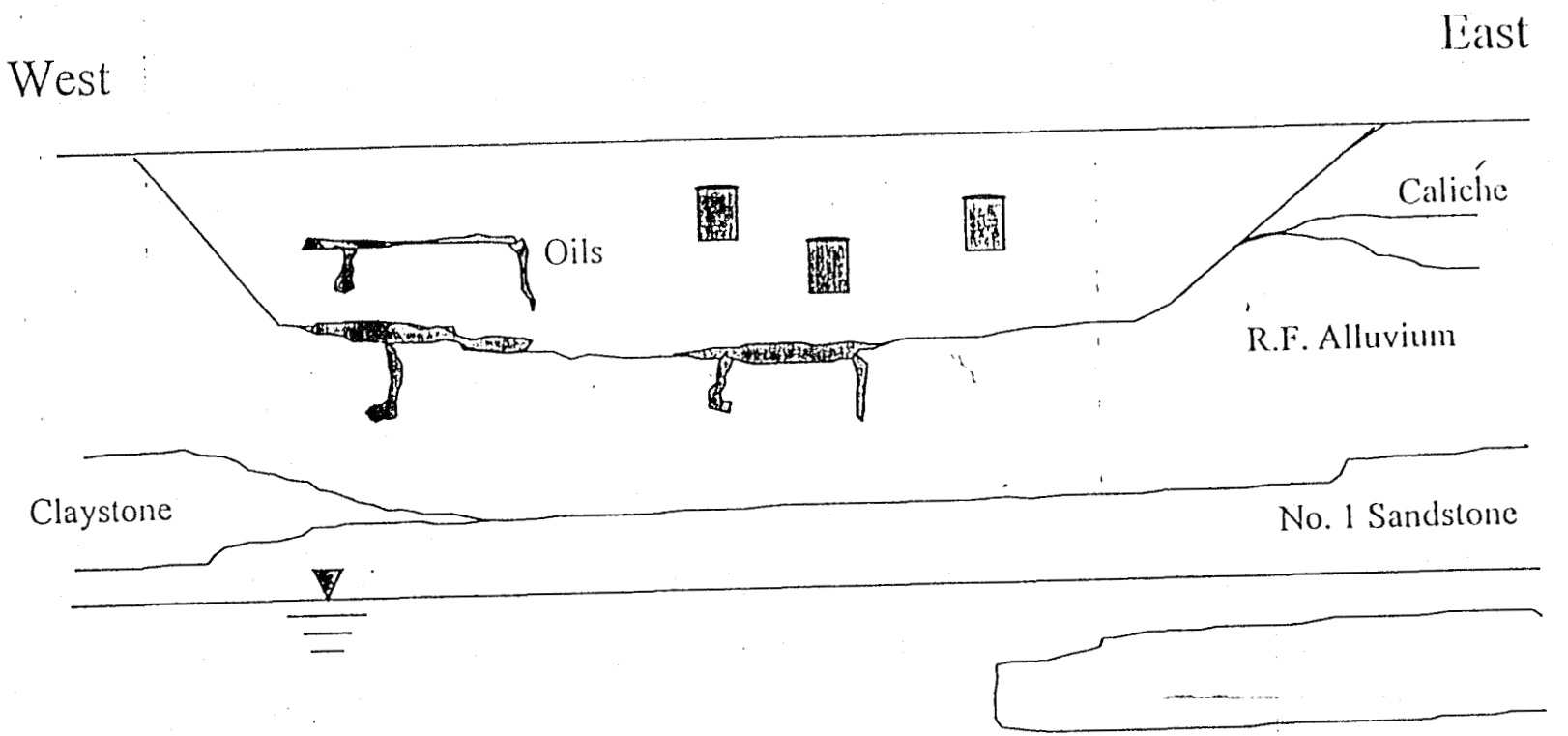
TRENCH T-3 (IHSS 110)
ANALYTICAL SUMMARY
NOVEMBER 1994

Location Number	Sample Number	Matrix	Depth From	Depth To	Detected Chemical	Concentration (ppm)	Lab Qualifier
25394	BH20653WC	Soil	4	6	Gross beta (pCi/g) Rad Screen	14.81	
25594	BH20658WC	Soil	15.8	16	Acetone	5.7	
25594	BH20658WC	Soil	15.8	16	Gross alpha (pCi/g) Rad Screen	13.68	
25594	BH20658WC	Soil	15.8	16	Gross beta (pCi/g) Rad Screen	9.897	
25594	BH20658WC	Soil	15.8	16	Methylene Chloride	17	BJ
25594	BH20658WC	Soil	15.8	16	PCE	620	
25594	BH20659WC	Soil	9	10	Gross alpha (pCi/g) Rad Screen	12.71	
25594	BH20659WC	Soil	9	10	Gross beta (pCi/g) Rad Screen	15.39	
25594	BH20659WC	Soil	9	10	HBH (Fuel Oil # 2)	6000	
25594	BH20659WC	Soil	9	10	Butylbenzylphthalate	0.3	BJ
25594	BH20660WC	Soil	9.8	10	Gross alpha (pCi/g) Rad Screen	11.92	
25594	BH20660WC	Soil	9.8	10	Gross beta (pCi/g) Rad Screen	14.09	
25594	BH20660WC	Soil	9.8	10	Methylene Chloride	9.2	BJ
25594	BH20660WC	Soil	9.8	10	PCE	490	
25594	BH20660WC	Soil	9.8	10	Total Xylenes	9.1	J
25694	BH20652WC	Soil	12	14	Gross alpha (pCi/g) Rad Screen	12.37	
25694	BH20652WC	Soil	12	14	Gross beta (pCi/g) Rad Screen	19.61	
25694	BH20656WC	Soil	11.8	12	Gross alpha (pCi/g) Rad Screen	12.23	
25694	BH20656WC	Soil	11.8	12	Gross beta (pCi/g) Rad Screen	27.09	
25694	BH20656WC	Soil	11.8	12	Methylene Chloride	0.44	BJ
25694	BH20656WC	Soil	11.8	12	PCE	24	
25694	BH20656WC	Soil	11.8	12	Acetone	3.8	B
25694	BH20656WC	Soil	11.8	12	TCE	0.25	J
25694	BH20657WC	Soil	4	6	Gross alpha (pCi/g) Rad Screen	168.6	
25694	BH20657WC	Soil	4	6	Gross beta (pCi/g) Rad Screen	126.7	

CHEMICAL PROPERTIES: VOLATILE ORGANIC COMPOUNDS

CONSTITUENT @ 25 C	Mol. Wt. g/mol	Pv mm Hg (vapor pressure)	Solubility mg/l	bp C° (boiling point)
Acetone	58	270	1E+6	56
Carbon Tet	154	90	757	76
Benzene	78	95	1750	80
Chloroform	119	151	8200	81
TCE	131	58	1100	87
Toluene	92	28	535	111
1,1,1-TCA	133	123	1500	113
PCE	166	18	150	121
p-Xylene	106	10	198	138

IHSS 110 Trench



SUBSURFACE IM/IRA: OBJECTIVES

- To address residual, free-phase contamination within the subsurface of OU 2
- To gain site-specific remedial information to support final actions at OU 2
- To demonstrate the Soil Vapor Extraction technology at three distinct subsurface environments within OU 2

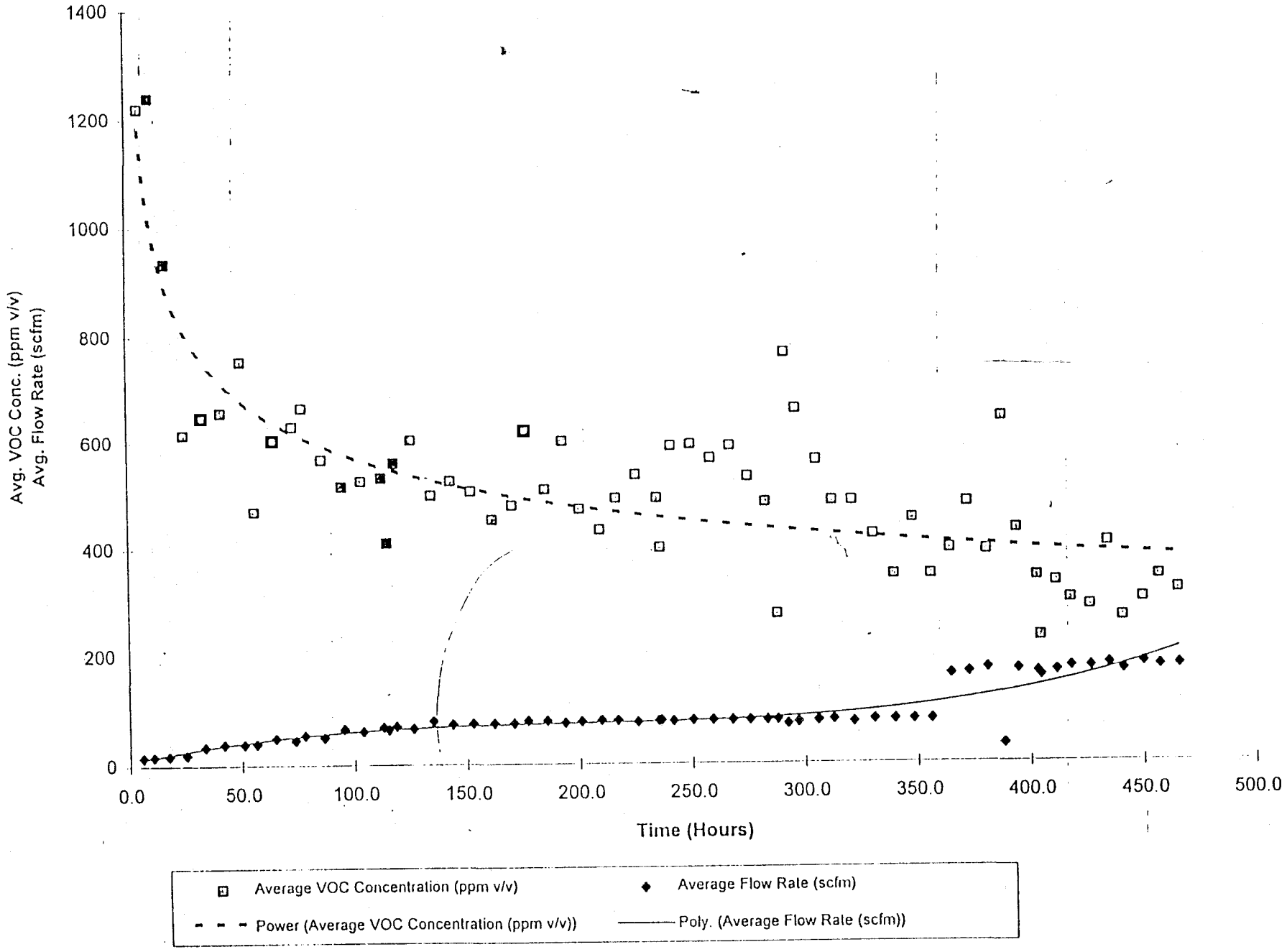
TEST SITE 1

- PILOT TESTING
  - » 13 TESTS-
    - – ALLUVIAL EXTRACTION/INJECTION (ACTIVE/ PASSIVE)
    - – SANDSTONE EXTRACTION/INJECTION (ACTIVE/ PASSIVE, DE-WATERING)
- SUSTAINED OPERATIONS
  - » ALLUVIAL EXTRACTION (1 WELL)
- POST PILOT OPERATIONS
  - » ALLUVIAL EXTRACTION (2 WELLS)

SVE Operations

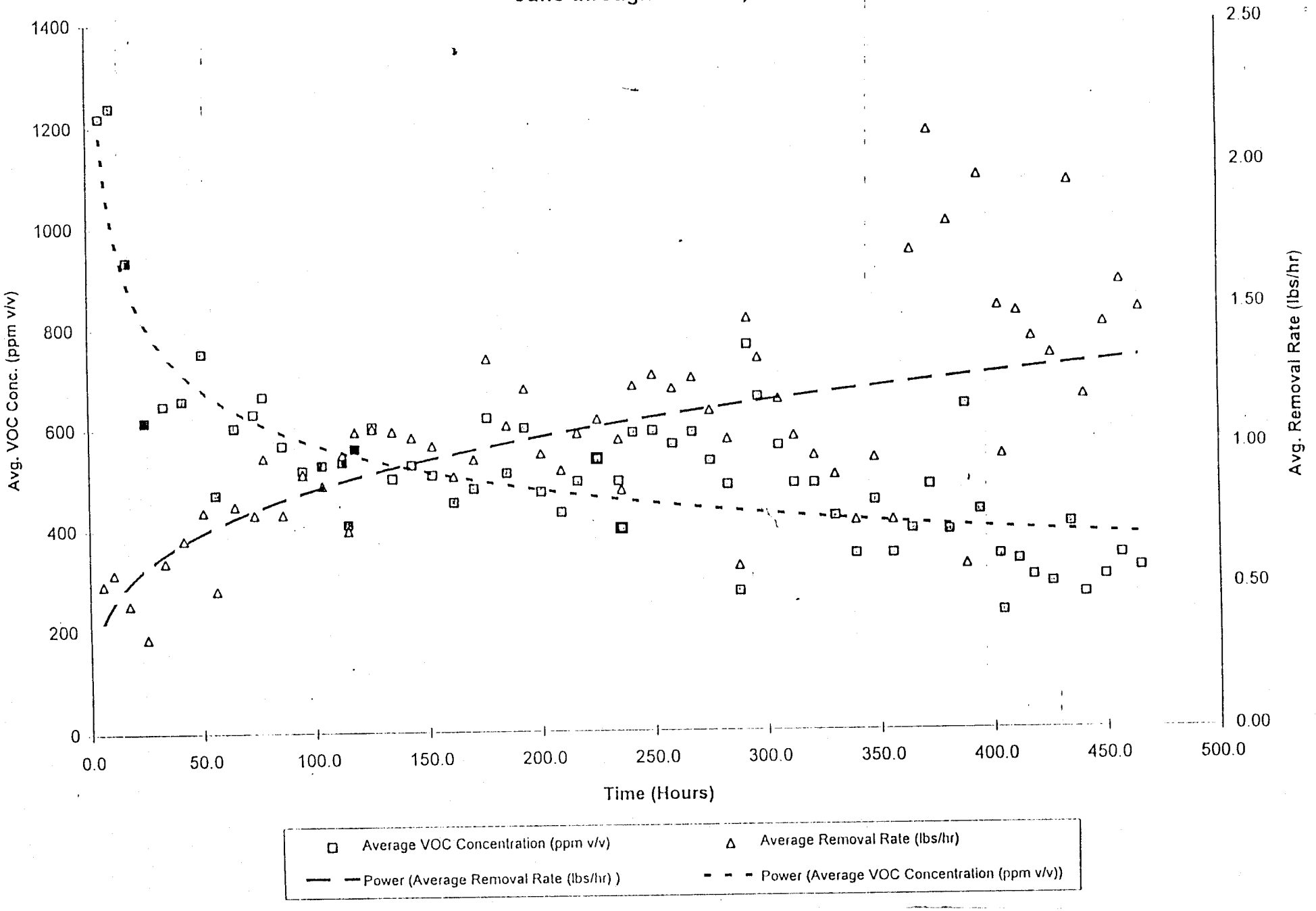
June through October, 1994

Post-Pilot



Avg. Conc. and Avg. Removal Rate

June through October, 1994



TEST SITE 1

- Free product in trench acting as a source zone
- SVE ineffective on free liquids-time to remediate would be very long
- Main objectives of IM/IRA met through Test Site 1
- Future resources can be devoted to source zone removal

SUBSURFACE IM/IRA TEST SITE 1 CONCLUSIONS

- OBJECTIVES OF IM/IRA ACHIEVED THROUGH TEST SITE 1
- MINIMAL RISK REDUCTION ACHIEVED THROUGH CONTINUED SVE OPERATION
- LIMITED MASS REMOVAL AT $12,000/WK
- BETTER USE OF RESOURCES ACHIEVED THROUGH IMPLEMENTATION OF OTHER PROJECTS

SUBSURFACE IM/IRA RECOMMENDATIONS

- END TEST SITE 1 POST-PILOT OPERATIONS IMMEDIATELY
- PURSUE VADOSE ZONE IMMISCIBLE PHASE SOURCE REMOVAL ACTION
  accelerated

VADOSE ZONE SOURCE REMOVAL ACTION

IN

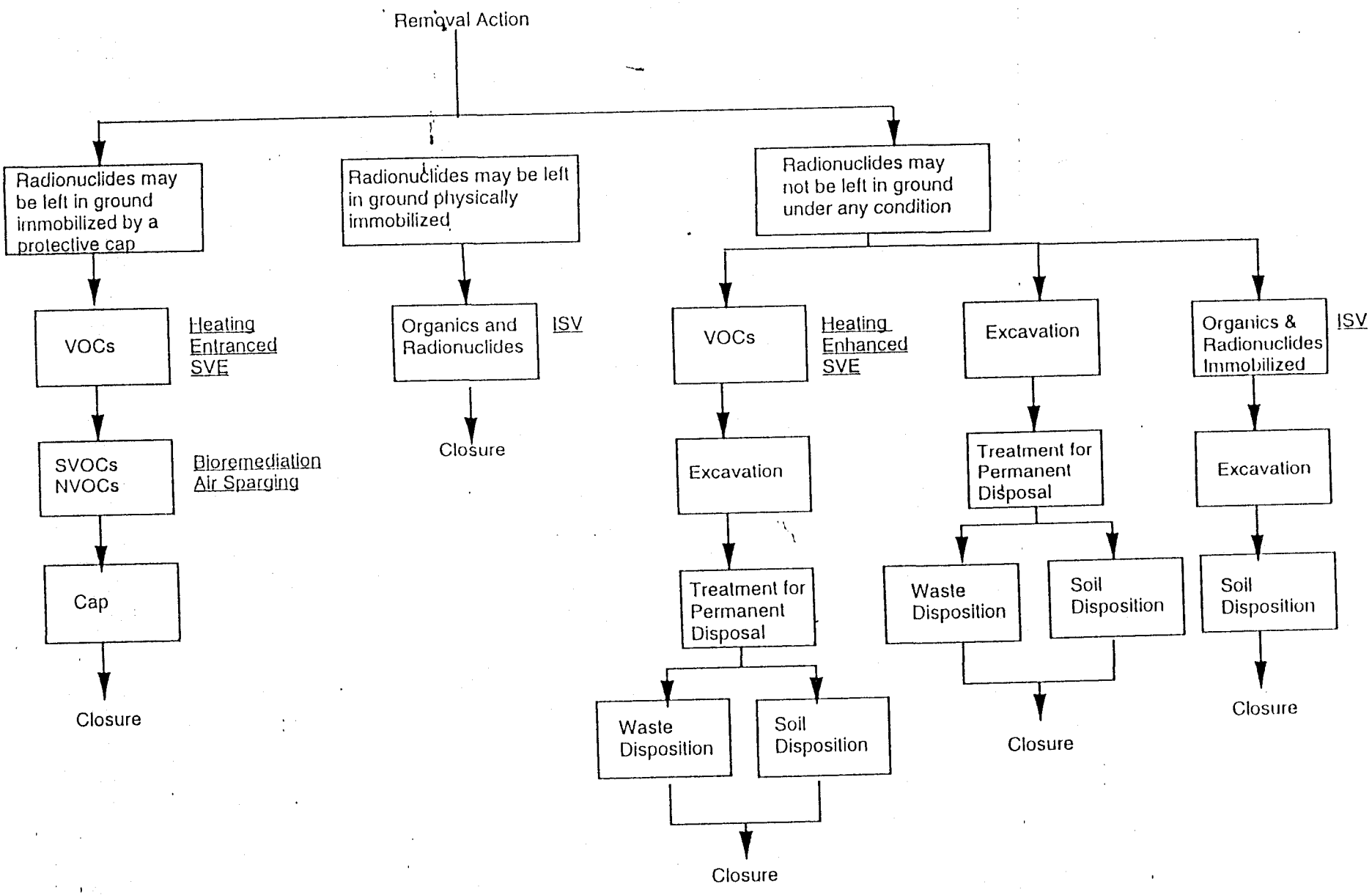
VOCs
SVOCs
Radionuclides
Non-VOCs
Metals

→ **ACTION** →

OUT

Most Desirable →		Least Desirable
• Minimal Waste	• Disposable Waste	• Stored Waste w/no practical treatment possible
• Low Cost • High Prob. Success • Low H&S Risk		• High Cost • Low Prob. Success • High H&S Risk
• Complete Remediation/ No Further Action Required	• Source removal/ Sig. Risk Reduc.	• Minimal Risk Reduction

VADOSE ZONE SOURCE



VADOSE ZONE
IMMISCIBLE PHASE SOURCE
Accelerated ~~REMOVAL~~ ACTION

- FORMULATE STRATEGIES FOR OU 2 AS A NAPL CONTAMINATED SYSTEM INSTEAD OF AS SPECIFIC SITES
- BASE DECISION ABOUT ~~REMOVAL~~ OPTIONS ON FATE OF RADIONUCLIDES IN SUBSURFACE
- EVALUATE OPTIONS FOR VADOSE ZONE SOURCE ~~REMOVAL~~ CONTROL
- USE "SAFER" APPROACH TO ~~REMOVAL~~ PROCESS