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Expedited Response Action Assessment for 316-5 Process Trenches

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1.0 INTRODUCTION

On December 20, 1990, the U.S. Environmental Protection Agency (EPA) and Washington Department of Ecology (Ecology) wrote a letter encouraging the U.S. Department of Energy (DOE) to proceed with the planning necessary to implement an expedited response action (ERA) for the 300 Area (316-5) Process Trenches. The designated lead regulatory agency was the EPA, with Ecology the support agency, for the ERA. The ERA classification was non-time-critical and conducted in accordance with the following:

- The applicable section of 40 CFR 300, Subpart E
- *Hanford Federal Facility Agreement and Consent Order* (Part 3, Article XIII, Section 38) (Ecology et al. 1989)
- *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA)
- *Resource Conservation and Recovery Act of 1976*
- Washington *Model Toxic Control Act* (MTCA).

An engineering evaluation and cost analysis (EE/CA) required by the non-time-critical ERA was prepared and submitted in the ERA proposal for 316-5 Process Trenches (DOE-RL 1991). The proposal underwent a 45-day public comment period. An Action Agreement Memorandum (Appendix A), issued by EPA in July 1991 authorized implementation of the proposed ERA activities.

From the initiation of the ERA process in December 1990, it took almost 9 months before field work began. The field work was accomplished in 3 months, followed by an additional 6 months to receive analytical data, validate the data, and finalize this report. This document constitutes a final reporting of the results from the ERA remediation activities and will provide the basis for EPA's completion report concluding this action.

The objective of the ERA was to reduce the potential for migration of the trench contaminants to the soil column, groundwater, and Columbia River. A reduction in the potential source of contaminants provides a reduction of risk to the river environment. The ERA activity was an interim action pending final cleanup activities for the 300-FF-1 operable unit. The ERA was conducted to minimize impacts on the 300-FF-1 and 300-FF-5 operable units remedial investigation and feasibility study (RI/FS) tasks.

The ERA goal was to reduce the measurable level of radiation in the trenches to less than three times the upper tolerance limit of background (DOE-RL 1991). This document presents the information that verifies the ERA successfully met its goal in a timely, cost efficient, and productive manner.

2.0 REMEDIATION DESCRIPTION

2.1 PHYSICAL DESCRIPTION

The 316-5 Process Trenches is an active RCRA treatment, storage, and disposal (TSD) unit located near the western boundary of the 300 FF-1 operable unit. There are two parallel trenches (east and west trenches) separated by an earthen berm. Initially the trenches were approximately 458 m (1,500 ft) in length, 3.5 m (11 ft) deep, 3 m (10 ft) wide at the bottom, and 10 m (30 ft) wide at the top.

The excavation activities resulted in the lowering of the berm (approximately 1 m [3 ft]) and shortening the length of the trenches. The trenches were shortened on the north end by approximately 90 to 110 m (300 to 370 ft) for the east and west trenches respectively. The activities also narrowed the berm, and widened the trenches by about 0.3 to 0.6 m (1 to 2 ft) on each side. Figure 1 provides the postexcavation topographic configuration of the trenches.

The trenches continued to alternately receive effluent from various locations within the 300 Area during the removal. The initial excavation began on the east trench while the effluent discharged to the west trench. After completion of the east trench, the west trench excavation commenced while effluent discharged to the east trench.

2.2 EE/CA METHOD SELECTION

The EE/CA section of the ERA proposal (DOE-RL 1991) evaluated various remedial alternatives for removing and consolidating sediments from the active environment of the process trenches. The preferred alternative was to remove, consolidate, and interim stabilize the sediments within the fenced area of the process trenches.

The actual process involved the following:

- preexcavation site preparation
- sediment removal from the two trenches
- interim stabilization of consolidated sediments
- postexcavation demobilization and evaluation.

2.3 EAST AND WEST TRENCH PREEXCAVATION OPERATIONS

In February 1991, the Ultrasonic Ranging and Data System (USRADS) radiological survey was performed over the entire site of the 316-5 Process Trenches. The USRADS is an automatic data recording system. This system recorded the gross gamma radiation levels around the surface soils of the perimeter of the trench site.

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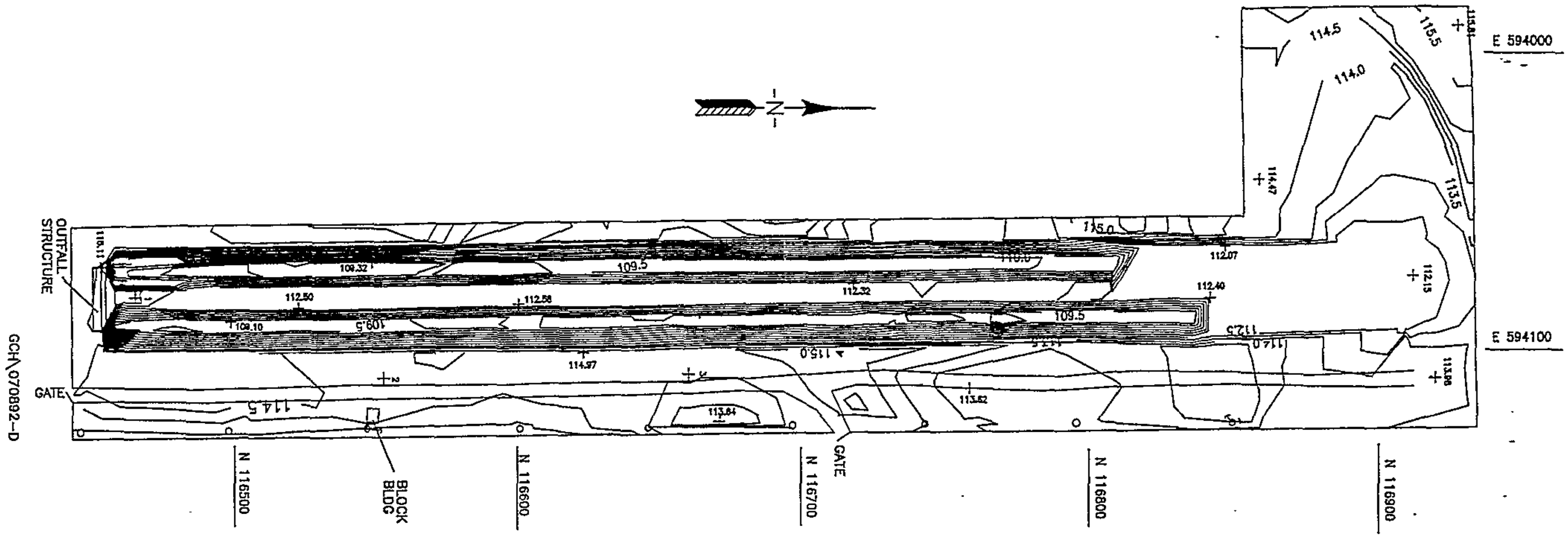

Figure 1. Postexcavation Configuration of Process Trenches.

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Preexcavation activities began on July 1, 1991. Their descriptions are as follows:

- Support Site Preparation - The first preexcavation activities included grading and graveling the roads near the south end of the trenches. This was done to allow for equipment transport and for support facilities (e.g., field office, storage area for equipment, change trailers).

- Cleaning Weir Box - The bottom of the weir box (located at the south end of the trenches) was cleaned of contaminated sediments by gravitational siphoning. The sediments were then drained into the west trench. Once siphoning commenced, the weir box was cleaned in 3 d.

- Removing Bird Screens - Approximately 500 m (1,500 ft) of bird screens rested on top of each trench. The screens were removed with a crane prior to excavation.

- Lowering Center Berm - The center berm separating the two trenches was lowered by excavation techniques. This was done to enable the backhoe and trucks to have adequate space to drive.

- Soil Sampling - Preexcavation sampling was conducted on July 30 and 31. Sampling was to identify the contaminants of concern specified in the sampling plan.

- Ambient Air Monitoring - Two temporary air monitoring stations were installed to monitor the impact of the excavation activities. These monitoring stations were additions to the already existing air monitoring stations in the general vicinity.

A timeline of all of the activities is in Appendix B.

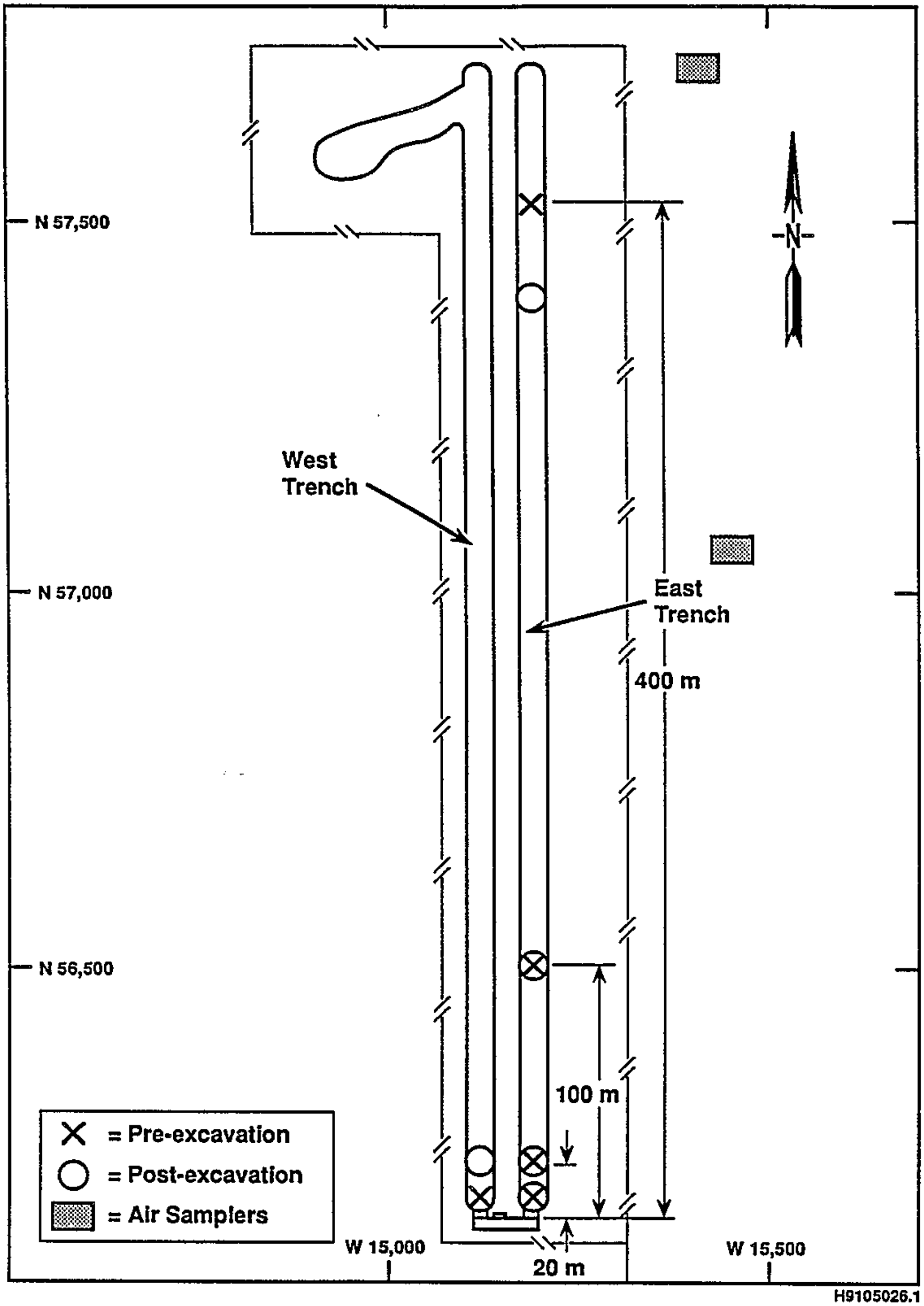
2.4 EXCAVATION OPERATIONS

Excavation on the 316-5 Process Trenches began on August 8, 1991. At that time, backhoe digging commenced on the north end of the east trench working southward. The equipment used to excavate the sediments included a backhoe, water trucks, hoses, and dumptrucks.

The soil was watered prior and during excavation to minimize fugitive dust generation during excavation. Sediments were sampled and the excavated soil was loaded onto dump trucks and transported to either the north end of the trenches or the fenced area northwest of the trenches.

Sediment samples were taken at varying distances and depths. An illustration of the sampling locations is shown in Figure 2. The backhoe removed nearly 0.3 m (1 ft) off the sides of each trench. By the end of the excavation, the trench bottoms were lower by approximately 1.2 m (4 ft). The excavation activities removed a total of 5,400 m^3 (7,000 yd^3) of sediment from each respective trench.

Figure 1. 316-5 ERA Pre and Postexcavation Sampling Locations.



9 2 1 2 6 1 8 1 5 1 6

Dumptrucks transported the more radioactive excavated sediment (>2,000 cpm) to the fenced depression located northwest of the west trench for interim stabilization. The less contaminated excavated sediment (<2,000 cpm) was relocated to north end of the trenches. This resulted in the shortening of the trenches by approxi-mately 90 to 110 m (300 and 370 ft).

The east trench excavation took 14 days. Afterward, the west trench was similarly excavated. West trench excavation began on August 30 and was completed 17 d later.

2.5 EAST AND WEST TRENCH POSTEXCAVATION OPERATIONS

After successfully excavating each trench, postexcavation sampling was performed to verify the field measurements. The bird screens were replaced on the trenches. The transported excavated sediments were leveled out and covered by a plastic barrier followed by a layer of clean aggregate. Cleanup and decontamination of equipment proceeded.

In late October and early November 1991, a post-ERA radiological survey was conducted over the entire surface surrounding the 316-5 Process Trenches using USRADS.

3.0 RESULTS

3.1 AIR SAMPLING

3.1.1 Ambient Air

Air samples were obtained from two temporary continuous sampling stations located along the east boundary fence (Figure 2).

The samples were analyzed for gross alpha and beta, then combined for a gamma energy analysis. Table 1 lists the results of the air samples from the north and south ends of the east and west trenches. The west trench excavation "average" listed in Table 1 is an average of two readings that were taken during the excavation. The 300 Area average background air concentrations are 1.9E-14 $\mu Ci/cm^3$ gross beta and 8.0E-16 $\mu Ci/cm^3$ gross alpha (PNL 1990).

The sample results from the alpha and beta readings indicated that the ERA activities caused minor fluctuations of previously reported background levels. The activities were performed well within allowable limits and no contaminant migration was observed as a result of the removal and consolidation activities.

Table 1. Air Sample Concentration Results.

Radioactivity	East Trench ($\mu Ci/cm^3$)			West Trench ($\mu Ci/cm^3$)	
	Pre-excavation	Excavation	Post-excavation[a]	Excavation Average	Post-excavation
Gross Beta (N)	1.2E-15	1.0E-14	2.8E-14	2.4E-14	1.1E-14
Gross Beta (S)	2.9E-15	1.3E-14	1.1E-14	1.8E-14	7.8E-15
Gross Alpha (N)	2.4E-15	2.9E-15	3.7E-15	1.9E-15	-1.5E-15
Gross Alpha (S)	1.9E-15	1.7E-15	3.3E-15	2.9E-16	2.9E-15
Average Background Gross Beta			1.9E-14		
Average Background Gross Alpha			8.0E-16		

NOTE: Negative values indicate concentrations at or near background levels of radioactivity.

[a]This is also the preexcavation readings for the west trench.

3.1.2 Personnel Breathing Zone

Personnel breathing zone monitoring was performed to evaluate the effectiveness of the dust control on two separate occasions. The monitoring and analyses were conducted by the Industrial Hygiene Services of the Hanford Environmental Health Foundation. The analysis tested workers for total particulate (dust) and metal concentrations in the breathing zone. The workers monitored represented truck drivers, excavator operators, heavy equipment operators, and decontamination and decommissioning workers.

The results from the total particulate analysis are in Table 2. The maximum breathing zone concentration detected was 1.9 mg/m^3. This is five times less than DOE's prescribed 8-h time weighted average (TWA) concentration limit of 10 mg/m^3.

Twenty metals were evaluated using an inductively coupled plasma (ICP) method. Table 2 lists the analytical results for the metals. The results indicated that all the metals were less than detectable concentrations.

Based on the results of two separate days of representative personnel breathing zone monitoring, the ERA activities were performed well within allowable limits. The environmental impact from the excavation offered no distinction from background conditions. No contaminant migration was observed as a result of the removal and consolidation activities.

Table 2. Personnel Breathing Zone Particulate and Metals Scan Concentration Results in mg/m^3.

Worker	Total Particulate Results		Metal Scan Results Analytes					
			Group 1[a]		Group 2[b]		Group 3[c]	
	Lab Result	8-h TWA	Lab Result	TWA	Lab Result	TWA	Lab Result	TWA
A	0.96	0.74	<0.05	<0.04	<0.03	<0.02	<0.01	<0.008
B	0.30	0.19	<0.08	<0.05	<0.04	<0.03	<0.02	<0.01
C	0.28	0.19	<0.08	<0.06	<0.04	<0.03	<0.02	<0.01
D	1.9	1.4	<0.05	<0.04	<0.03	<0.02	<0.01	<0.007
E	1.6	0.68	<0.1	<0.04	<0.06	<0.03	<0.02	<0.007
F	1.3	0.89	<0.06	<0.04	<0.03	<0.02	<0.10	<0.007
G	0.46	0.34	<0.05	<0.04	<0.03	<0.02	<0.01	<0.007
H	1.8	1.4	<0.07	<0.05	<0.03	<0.02	<0.01	<0.008
DOE limit		10						

[a]Aluminum, antimony, barium, beryllium, calcium, cobalt, curium, iron, lead, magnesium, manganese, nickel, thallium, vanadium, and zinc.

[b]Arsenic, cadmium, chromium, and selenium.

[c]Silver.

3.2 RADIOLOGICAL SURVEYS

Radiological measurements were obtained during the sediment removal to assist in determining the depth of excavation. These measurements, plus the final radiological surveys indicate that the goal for the ERA for reducing the radiation levels to less than three times the upper tolerance limit of background was attained.

The radiological surveys were performed using count rate meters with either a thin window "pancake" Geiger Mueller (GM) detector, a sodium iodide (NaI) detector, or a micro-R (μR) meter when available. The μR meter results indicate that the external radiation measurements were <30 μR/hr or approximately three times background.

The NaI detector measurements ranged from 2,600 to 5,100 counts per minute (cpm). Again, these measurements were approximately twice background or less. The pancake detector measurements ranged from 50 to 200 cpm compared to the goal of 325 cpm.

3.2.1 USRADS Surveys

Radiological surveys of the trench perimeter were conducted to document site conditions before and after the ERA. USRADS, in conjunction with contamination/radiation detection instruments, recorded gross gamma radiation readings and their locations and generated maps of the survey area.

Two radiological surveys and a low background survey (LBS) were conducted. The LBS and the preremediation survey were performed using a Ludlum (tradename of Ludlum Measurements Inc., Sweetwater, Texas) Model 2221 count rate meter with a Ludlum Model 44-2 1- by 1-in. NaI detector. The postremediation survey was performed using a Ludlum Model 19 µR meter in addition to the NaI detector. Note that the µR meter was not available during the preremediation activities.

The LBS was conducted on April 10, 15, and 16, 1991. It was done in the 600 Area, between the 100-D/DR and 100-H areas, about 600 m (2,000 ft) from the Columbia River. It established radiological background conditions of the undisturbed soil surfaces. A total of six (approximately 8-m [25-ft] long) sections were surveyed, covering 23,000 m^2 (250,000 ft^2). A total of 4,924 data points were collected.

The overall background level average was 1,950 cpm. USRADS chose a threshold of twice the background level, or 3,900 cpm. Their threshold classified anything above that level as surface contamination.

Appendix C, Figure C-2, illustrates the before and after excavation radiological profiles of the trench. The dotted marks shown in the preremediation map indicate surface contamination with readings above the threshold level. The lack of dotted marks in the postremediation map shows that the excavation successfully cleaned trenches' perimeter to levels below the threshold.

USRADS surveyed the site in 11 individual sections for the pre and post-excavation activities. They collected roughly 30,000 data points in each section.

Table 3 summarizes the blocked surveys results. The highest pre-excavation reading was on the northern west end of the trench site. It measured 15,000 cpm. The postexcavation reading showed the highest reading of 2,800 cpm in the trenches' perimeter. This reading is well within both USRADS' threshold limit and the goal of the ERA.

The USRADS preremediation survey revealed that the southern half of the trenches perimeter had contamination levels greater than the threshold limit. It found the highest levels of contamination within 100 m (300 ft) from the most southern end. Contamination was also detected in the depression area west of the northern end of the trenches.

Table 3. NaI Detector and µR Meter Survey Results.

Preremediation			Postremediation		
Grid	NaI detector survey (max. cpm)	µR meter survey (max. µR/h)	Grid	NaI detector survey (max. cpm)	µR meter survey (max. µR/h)
N	11,000	N/A	A	2,700	18
M	7,600	N/A	B	2,800	16
L	6,300	N/A	C	2,700	15
K	4,700	N/A	D	2,500	14
J	3,400	N/A	E	2,700	15
I	3,800	N/A	F	2,300	13
H	3,500	N/A	G	2,300	22
G	3,600	N/A	H	2,300	24
F	6,400	N/A	I	2,200	24
D	15,000	N/A	J+K	2,400	28
E	13,000	N/A	L+M	2,600	23
USRADS background threshold, cpm			3,900		
Average background, µR/h			8 to 10		

3.2.2 Trench Radiation Surveys

The postremediation radiation survey was performed in the east trench using a Ludlum Model 2221 count rate meter with a 1- by 1-in. NaI Ludlum Model 44-2 radiation detector. The NaI detector was not available for obtaining measurements in the west trench. Measurements were taken at approximately 6-m (18-ft) increments to detected elevated radiation areas. Table 4 lists the results, illustrating radiation reduction in post-excavation contamination levels to near background levels.

Table 4. East Trench NaI Detector Postexcavation Radiation Contamination Measurements.

Distance from weir box (m)	Counts per minute
0 to 6	3,600 to 4,100
6 to 12	3,400 to 5,100
12 to 18	3,200 to 4,100
18 to 24	2,800 to 3,100
24 to 30	2,600 to 3,000
30 to 37	2,600 to 2,900
37 to 43	2,600 to 3,000
43 to 49	3,000 to 3,400
49 to 55	3,000 to 4,600
>55	2,600 to 4,000

The survey measured the highest reading of 3,400 to 5,100 cpm at the 6- to 12-m (18- to 36-ft) range. The upper tolerance background limit was determined to be 2,740 cpm. (Note that three times the upper tolerance limit of background is 8,222 cpm; therefore, this survey also confirmed the successful meeting of the ERA goal.)

Another survey used a GM radiation detector and a P-11 probe. These instruments were used to take and record radiation measurements inside each trench during and/or after excavation. Table 6 lists the results of pre- and postexcavation surveys. The preexcavation readings were taken at the surface and at 20- , 100- , and 400-m (66- , 330- , and 1,320-ft) distances from the south end of the east trench. The postexcavation readings were taken at approximately 15-m (50-ft) increments beginning from the south end of the trench. Due to the redundancy of the postexcavation data, ranges were grouped where applicable in Table 5.

The pre and postexcavation readings were taken from up to 1-m (3-ft) holes dug by the backhoe. Table 5 lists any peaks of contamination detected before and after excavation.

The east trench preexcavation survey found maximum radiation readings of 15,000 cpm at 20 m. The upper tolerance limit for background as determined by Pacific Northwest Laboratory during the 300-FF-1 surface radiation survey conducted in 1990 was 108 cpm (EMO 1990). Thus, the three times background limit was 324 cpm. The maximum readings measured during postexcavations were 200 cpm. The postexcavation measurements are well within the ERA goal. Thus, this survey also confirms that the excavation activities successfully met the ERA goal.

Table 5. Thin Window Pancake Probe Radiation Measurement of Trenches.

East Trench				West Trench			
Preexcavation		Postexcavation		Postexcavation			
Location (m)	Maximum cpm	Location (m)	Maximum cpm	Location (m)	Maximum cpm	Location (m)	Maximum cpm
0	6,000	6 to 70	100	6	150	140	100
20	15,000	70 to 90	150	20	100	160	200
100	7,500	90 to 280	100	40 to 50	150	170 to 270	100
400	100	280 to 300	150	70 to 100	100	280	150
		300 to 370	100	130	150	300	200
						310 to 330	100
Background, cpm		50 to 100					
Goal, cpm (three times background)		325					

3.3 SOIL SAMPLES

Pre and postexcavation soil samples were obtained in accordance with the approved sampling plan (WHC 1992d). Soil sampling occurred at varying depths and locations for each pre and postexcavation activity. For the east trench preexcavation, sampling was conducted at 0- , 20- , 100- , and 400-m (0- , 66- , 328- , and 1,300-ft) distances on the surface at 1- and 1.5-m (3- and 5-ft) depths. The east trench postexcavation sampling was performed on the surface at approximately the same distances. The west trench preexcavation sampling was conducted at the 0-m distance at 0- , 1- , and 1.5-m (0- , 3- , and 5-ft) depths. Postexcavation sampling on the west trench was conducted at the 20-m (66-ft) distance at the 0- , 0.5- , 2- , 3- , and 5-m (0- , 1.5- , 6- , 11- , and 16-ft) depths.

The samples were analyzed for radionuclides, volatile organics, polychlorinated biphenyls (PCB), semivolatile organic compounds, and metals. The field observations and measurements indicated decreased contaminants resided in the first 0.5 m (1.6 ft) of the soil column prior to removal of material. Preexcavation laboratory data verified the field work. Table 6 lists some of the detected readings from the east trench pre and post-excavation soil sample results. The postexcavation field and laboratory data indicate that the ERA substantially reduced the concentrations of contaminants in the active portion of each trench. Similarly, Table 8 lists selected west trench pre and postexcavation soil sample results. Appendix C (Figures 3 through 18) contains graphic illustrations of the east trench soil sample concentrations results. The graphs compare the pre and post excavation results on a semilog scale. The graphs show major decreases in concentrations due to the excavation activities. The maximum concentrations are marked an labeled for the pre and post excavation sample results. Appendix C contains a more detailed listing of the soil sample results (WHC 1992a).

Table 6. East Trench Pre and Postexcavation Soil Selected Sample Results.

	Preexcavation				Postexcavation			
Sample location, m	0	20	100	400	0	20	100	400
Depth from surface, m	0	0	0	0	0	0	0	0
Radionuclides	Sample readings results at sample locations, pCi/g							
Gross alpha	3,120	4,450[a]	24	55	3	7	4	7
Gross beta	5,420	12,200[a]	37	81	15	16	9	15
Uranium-234	3,900	11,900[a]	110	87	4	9	7	6
Uranium-235	320	1,600[a]	10	4.2	0.04	1	1	1
Uranium-238	2,900	9,130[a]	77	69	3	6	5	5
Metals	Sample readings results at sample locations, mg/kg							
Copper	1,469	3,560[a]	974	445	14.4	18.4	102	69.4
Zinc	225	305[a]	212	196	22.8	20.1	36.4	42
Lead	95.8	164[a]	39.4	17.4	1.33	1.4	1.2	1.4

[a]Maximum reading from two samples.

Table 7. West Trench Pre and Postexcavation Soil Selected Sample Results.

	Preexcavation				Postexcavation				
Sample location, m	0	0	0	0	20	20	20	20	20
Depth from surface, m	0[a]	0	1	1.5	0	0.5	2	3	5
Radionuclide	Sample readings results at sample locations, pCi/g								
Gross alpha	520	2,692	147	43	188[b]	98	20	22[b]	72
Gross beta	340	2,773	151	40	120[b]	73	30	22[b]	34
Uranium-234	350	2,650	127	22	63[b]	46	9	14[b]	27
Uranium-235	8	216	5	3	8[a]	6	1	2[b]	4
Uranium-238	200	1,780	93	15	44[a]	32	6	11[b]	19
Metals	Sample readings results at sample locations, mg/kg								
Copper	357	1,500[b]	317	29	60[b]	54	26	38[b]	69
Zinc	327	588[b]	182	35	93[b]	96	58	64[b]	59
Lead	56	96[b]	18	3	6	6	5	3[b]	4

[a]Weir box.

[b]Maximum reading from two or more samples.

The soil sample results confirms that the removal of the contaminated material obtained the objective and goal of the ERA as specified in the ERA proposal.

3.4 X-RAY FLUORESCENCE SCREENING

A portable x-ray fluorescence (XRF) spectrophotometer was used to perform field screening during the ERA. The XRF measurements obtained during the preexcavation sampling indicated elevated levels of copper, uranium, and zirconium. The system was configured for the screening using a "scan" model, which provided indications of anomalous concentrations of heavy metals. The pre and postexcavation surveys of the west process trench indicated that the levels of contamination were reduced to background levels (WHC 1992b). In addition, four postexcavation samples from the east trench were analyzed by XRF at an onsite mobile laboratory. The results for the samples indicated the presence of the following metals:

aluminum	53,000 to 56,000 mg/kg
antimony	<10
cadmium	<4
chromium	150 to 180
copper	<26 to 170
iron	71,000 to 73,000
lead	<6
manganese*	760 to 1,500
mercury	<10
nickel	<4
silver	<10
uranium	<10 to 11
zinc	96 to 130.

The combination of using the field scan model to detect anomalies, field screening XRF to provide quick turnaround data, and the COP data from the offsite laboratories proved to be effective tools for use during the ERA. The use of the XRF provided satisfactory results when compared t the CLP data for the primary contaminant (uranium). The data generated by the mobile laboratory XRF while using higher detection levels than the CLP methods still provided confirmatory information as to the reduction in levels of contaminants during the ERA. Based on the limited number of mobile laboratory sample results and the scan results, the decisions made in the field were adequate to meet the objective and goal specified in the ERA. Further discussion of the scan model and results obtained by this method are provided in *Summary of XRF Field Screening Data from the 316-5 Process Trenches Expedited Response Action* (WHC 1992b).

3.5 COST ANALYSIS

The ERA proposal (DOE-RL 1991) estimated cost for performing this excavation was $2.2 million.

The initial estimate for the ERA activities was 120 working days. However, due to the initiative of the field personnel, the actual field work was completed in only 76 days. This resulted in the savings of about $100,000 in labor costs. Table 8 is a comparison of the budgeted and actual costs for the ERA.

The overall cost for performing the excavation was $2.0 million. Thus, the excavation project successfully met its goal while netting savings of $200,000.

Table 8. ERA Cost Comparison.

Activity	Estimated, $	Actual, $	Net, $
Implementation			
Labor	690,000	590,000	-100,000
Materials and supplies	200,000	400,000[a]	200,000
Analytical services	300,000	310,000	10,000
Engineering and administration	520,000	740,000	220,000
Subtotal	1,710,000	2,040,000	330,000
Contingency (30%)	513,000		
TOTAL	2,223,000	2,040,000	-183,000

[a]Includes purchase of backhoe.

4.0 REFERENCES

DOE-RL, 1991, *Expedited Response Action Proposal for 316-5 Process Trenches*, DOE/RL-91-11, U.S. Department of Energy, Richland Operations, Richland, Washington.

EMO, 1990, *Final Report: Surface Radiation Survey for the Phase 1 Remedial Investigation of the 300-FF-1 Operable Unit on Hanford Site*, EMO-1008, Environmental Management Operations, Richland, Washington.

PNL, 1990, *Hanford Site Environmental Report for Calendar Year 1989*, PNL-7346, Pacific Northwest Laboratory, Richland, Washington.

WHC, 1992a, *Data Limitations and Validation Report for 316-5 Expedited Response Action, U.S. Department of Energy Site, Hanford, Washington*, WHC-SD-EN-TI-024, Rev. 0, prepared by Ebasco Services Incorporated and Hart Crowser, Inc., for Westinghouse Hanford Company, Richland, Washington.

WHC, 1992b, *Summary of XRF Field Screening Data from 316-5 Process Trenches Expedited Response Action*, WHC-SD-EN-TI-013, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992c, *316-5 Process Trench Site USRADS Survey*, WHC-SD-EN-TI-018, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992d, *316-5 Process Trenches Expedited Response Action Sampling and Analysis Plan*, WHC-SD-EN-AP-055, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

ACTION AGREEMENT MEMORANDUM

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United States Environmental Protection Agency
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EPA

July 15, 1991

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Deputy Manager
Environmental Management and Projects
U.S. Department of Energy
Richland Operations Office
P.O. Box 550, A7-50
Richland, Washington 99352

Re: Action Memorandum Approval: 316-5 Process Trenches, U.S. Department of Energy (DOE) Hanford Site, Richland, Washington

Dear Mr. Bixby:

This letter constitutes approval of the subject Action Memorandum. Public comments were required and received although none affected the proposal plan. Therefore, we approve this plan.

I: PURPOSE

The purpose of this action is to mitigate the threat to public health and the environment caused by contaminant migration from the sediments in the process trenches to the soil column, groundwater, and Columbia River. The action is an interim action pending the final cleanup activities associated with the 300-FF-1 operable unit.

II. BACKGROUND

Pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the U.S. Environmental Protection Agency (EPA) proposed the 300 and 400 Areas (the 300 Aggregate Area) at the U.S. Department of Energy (DOE) Hanford Site for inclusion on the National Priorities List (NPL) on June 24, 1988. In November 1989, the 300 Aggregate Area was included on the NPL.

A. Site Description

A cluster of radioactive mixed waste sites is located within the 300 Aggregate Area. The 300 Aggregate Area has been further subdivided into five operable units, including 300-FF-1. The 300-FF-1 is known as a process liquid operable unit because it contains all of the liquid waste disposal facilities within the 300 Area (WHC 1989a).

The 316-5 Process Trenches are an active treatment, storage, and disposal (TSD) facility under the Resource Conversation and Recovery Act of 1976 (RCRA) within the 300 Area of the Hanford Site operating under RCRA Interim Status. The trenches are located near the western boundary of the 300-FF-1 operable unit approximately 300 m (1000 ft) west of the Columbia River and 1 mile north of the City of Richland in Benton County. The two trenches are approximately 1500 feet in length, 11 feet deep, 30 feet wide at the top, and 10 feet wide at the bottom and are separated by an earthen berm. There is a lake at the north end of the west trench which had been an active part of the trench from 1975 to 1990 when it was separated from the trenches by an earthen berm. The trenches are unlined and were designed to allow effluent water to percolate through the soil column while filtering out contaminant particulates.

The process trenches were constructed and activated in 1975. Process liquid effluent from various locations within the 300 Area is collected in the process sewer and transferred to the trenches via the concrete inlet weir box located in the south end of the trenches. The trenches receive effluent discharge alternately, allowing one trench to "dry out" while the other is in use. The discharge to a trench was switched when the water level reached operational capacity. Historically the trenches received effluent discharges of 1200 gal/min. Peak discharges may have been as high as 3,000,000 gal/day. The process sewer system is currently connected to 45 buildings in the 300 Area. In addition to fuel fabrication process water, the sewer system receives, or has received, cooling water, steam condensate, water treatment salts, and a wide variety of waste liquids from laboratory drains throughout the 300 Area. Prior to 1985, when administrative controls were instituted to eliminate discharges of hazardous material to the process trenches, groundwater monitoring indicates that radioactive and hazardous waste were released.

B. <u>Site Characterization</u>

Soil sample data from the process trenches have been obtained from two separate sampling events. The first sampling consisted of six composite samples obtained from the west trench. These samples were analyzed for a range of metals (DOE, 1985). More extensive sampling was implemented in 1986 (Zimmerman and Kossick 1987). The samples were taken along the trench bottoms at 100 foot intervals from depths of 0, 0.3, and 1.5 feet.

The samples were subjected to screening analyses limited to metals, gross alpha and beta, total organic halogen (TOX), and total organic carbon (TOC). Seventeen of the 66 samples were subjected to a full analysis and six surface samples were tested for extraction procedure toxicity. Six exploratory borings were drilled along the berm separating the process trenches to a maximum depth of 40 to 45 feet. Of the 48 samples taken from the borings, 9 were analyzed for a full analyses while the remainder were analyzed for the screening analyses. Several metals, including antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc were detected at elevated levels. Elevated levels of gross beta and alpha indicate the presence of radionuclides in the sediments. Based on the estimated volumes of waste constituents discharged to the process trenches, uranium is the dominant radionuclide present. Though several organic compounds were identified in the soil, only methlyene chloride and tetrachloroethylene were detected in more than one sample. In the deep borings only beryllium and mercury were identified in elevated concentrations.

Groundwater data from wells within and adjacent to 300-FF-1 indicate radionuclide contamination in the shallow aquifer (Schalla et al. 1988, Hulstrom 1989, Pacific Northwest Laboratory 1988). A plume of uranium contamination can be delineated from these data beneath the 300 Area. The highest levels of uranium are found in the areas near the process trenches with the greatest concentrations near the south end in proximity to the inlets. This is consistent with the soil concentration data showing higher concentrations of alpha towards the southern end of the trenches (Zimmerman and Kossick 1987).

III. THREAT TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT

A. Present Conditions

Current efforts for the process trenches include reduction of flow through engineering and administrative controls and the design and construction of a process treatment facility. Even with waste minimization efforts, and in consideration of the fact that the effluent stream is currently less contaminated than in the past, contaminant migration from the sediments in the trenches will continue to influence the soil column, groundwater, and Columbia River. The Columbia River is a source of recharge for the Richland water well supply and irrigation for the area. The

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State of Washington has designated the section of the Columbia River, known as the Hanford reach and including the area along the Hanford 300 Area, as a Class A (excellent) surface water [WAC 173-201-080(20)]. This designation requires that the water quality be maintained for domestic, industrial, and agricultural supply, stock watering, fish migration, and fish and shellfish rearing, spawning and harvesting, wildlife habitat, recreation (including primary contact), and commerce and navigation uses [WAC 173-201-045(2)(b)].

B. Types of Substances Present

Groundwater monitoring data for the 300 Area indicate a plume of uranium contamination emanating from the process trenches in a southeasterly direction, corresponding to the direction of groundwater flow, toward the Columbia River.

Past field sampling (Zimmerman and Kossick 1987) suggest that the higher concentration of metals exist in the upper 1.5 feet of the trenches. The potential exists for further migration of these contaminants to groundwater and eventually to the Columbia River.

Another concern of the process trenches deals with the surface contamination. During regular operations effluent is discharged to one trench while the other is left to dry. The potential exists for emission of radionuclides or metals by way of fugitive dusts. This could have a direct effect on nearby workers in the 300 Area or carry directly to the Columbia River.

C. Applicable or Relevant and Appropriate Requirements

The Remedial Investigation/Feasibility Study (RI/FS) process for the 300-FF-1 Operable Unit will identify the final cleanup standards and applicable or relevant and appropriate requirements (ARARs) that will be applied during remediation.

The ERA will be conducted in accordance with 40 CFR 300, Subpart E; the Hanford Federal Facility Agreement and Consent Order (Part 3, Article XIII, Section 38); the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), the Resource Conservation and Recovery Act of 1976 (RCRA); and the State of Washington Model Toxics Control Act (Chapter 173-340 WAC (i.e., MTCA)

Interim Response Actions or ERAs conducted prior to the final cleanup actions for a site are not required to meet final cleanup standards. WAC 173-340 is an applicable ARAR, but attainment of the soil cleanup standards MTCA are not required for the EPA.

IV. PROPOSED ACTION AND ESTIMATED COSTS

Westinghouse Hanford Company (WHC), as the DOE contractor, prepared an engineering evaluation/cost analysis (EE/CA) concerning technologies that were applicable to the process trenches. An initial screening was done prior to the EE/CA to eliminate technologies that were not considered appropriate. The proposal was submitted to the EPA and Washington State Department of Ecology by DOE for review and reflects the recommendations of the regulatory agencies. The proposal was also made available for public comment for the period of 45 (45) days, however, no comments were received that impacted the expedited response action. After an initial remedial alternative selection process the following alternatives were evaluated:

A. No Action - This alternative would not mitigate the potential threat to public health and the environment.

B. Soil Removal with Disposal at the Central Waste Complex - This action involves the excavation of contaminated sediments from each trench. Excavated material would be placed in appropriate 55 gallon drums and transported to the central waste storage facility until such time that a permitted mixed waste disposal facility is available. Excavation of the material would be done using a large backhoe and a system capable of mixing and dispensing the treated sediments into individual drums.

This alternative would reduce the source of contamination in the process trenches with an estimated costs by Westinghouse Hanford Company (WHC) of $57,460,000. The major cost of this alternative is the transportation and disposal costs of the drums.

C. Soil Removal with Interim Stabilization in the North Process Pond - This option involves the excavation of the contaminated material from each trench using a large backhoe. The material would be loaded into dump trucks and hauled to the north process pond. Once the soil removal is complete, cover material would be placed over the spoils pile.
This alternative would reduce both potential environmental and public health threat through the removal of an intermediate source. The WHC estimated cost would be $2,235,600.

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D. Soil Excavation and Interim Stabilization in the Process Trenches - Based on the preliminary screening and the feasibility screening and selection criteria of the EE/CA, this option was the <u>preferred alternative</u>. This option involved the excavation of contaminated sediments from each trench using a large backhoe. The sediments will be removed from the bottom of the trench and part way up the sides using field screening instruments to aid in determining the extent of excavation. The material will be loaded into dump trucks and hauled to the north end of the inactive trench and to the northwest lobe. When the excavation and hauling are complete in each trench, a berm of clean fill will be placed between the sediments and the active trench area. Waste minimization efforts by Westinghouse Hanford Company (WHC) for reduction of effluent discharge will allow for a reduction in the required trench length, therefore an earthen berm will suffice. Once all excavation is complete, a plastic cover will be placed over the sediments and covered with gravel. This cover will serve as a temporary barrier to minimize infiltration of precipitation and eliminate fugitive dust emissions from the contaminated spoils pile. Final remedial action for the spoils pile and process trenches will be completed as part of the 300-FF-1 operable unit.

As part of the alternative, sampling and analysis will be done. Prior to excavation, samples in the east trench will be taken in four locations at depths of 0-2, 2-4, and 4-6 feet. The west trench will have confirmatory sampling at one location in the same intervals. After excavation is complete, each trench will be sampled in the same locations.

The estimated costs done by WHC are based on 120 day project duration. The schedule and plans for implementation of this action are discussed in the Department of Energy proposal. The project cost estimate is as follows (DOE/RL-91-11 Draft B):

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Implementation

Labor	$ 692,000
Materials & Supplies	$ 200,000
Analytical Services	$ 300,000
Engineering & Administration	$ 520,000
Subtotal	$1,712,000
30% Contingency	$ 513,000
Subtotal with Contingency	$2,225,600
Annual Operation/Maintenance (5 Yrs)	$ 10,000
Total	$2,235,600

V. RECOMMENDATION

This decision document represents the selected removal (Option D Section IV) action for the 316-5 Process Trenches of the DOE Hanford Site in Richland, Washington developed in accordance with CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the administrative record for this project. Because conditions at the site meet the NCP section 300.415(b)(2) criteria for action, it is recommended that the preferred alternative be approved.

If you have further questions, please contact Paul Day (509) 376-6623.

Charles E. Findley
Director
Hazardous Waste Division
U.S. Environmental Protection Agency
Region 10

Roger Stanley
Manager
Nuclear and Mixed Waste Program
Washington State Department of Ecology

cc: Administrative Record

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APPENDIX B

TIMELINE

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EXCAVATION ACTIVITIES TIMELINE

Activities and approvals required for the excavation of the trenches are in the timelines shown below.

Preexcavation Documentation and Reviews

2/91	Pre-ERA USRADS Survey
12/15/90 - 4/20/91	NEPA Documentation Acquisition
12/15/90 - 4/5/91	Safety Assessment/Hazard Classification Performance
12/01/90 - 2/15/91	Site Historical Data Evaluation
01/07/91 - 3/22/91	ERA Proposal (with EE/CA) Issuance
03/22/91 - 5/16/91	DOE, EPA, Ecology Review
5/16/91 - 7/15/91	Public Review
7/15/91	Action Agreement Memorandum issuance

Preexcavation Site Preparation

7/01/91 - 7/30/91	Lower center berm; clean out weir box; remove east trench bird screens (with crane)
7/30/91 - 7/31/91	East trench preexcavation sampling
8/26/91 - 8/28/91	Remove west trench bird screens (with crane)
8/30/91	West trench preexcavation sampling

Excavation

8/01/91 - 8/14/91	East trench excavation
8/30/91 - 9/16/91	West trench excavation

Post Excavation Activities

8/16/91 - 8/20/91	Replace east trench bird screens; post-excavation samples from east trench
8/16/91	Switch effluent to east trench
9/20/91	Postexcavation samples from west trench
9/24/91 - 9/26/91	Replace west trench bird screens
9/23/91 - 10/07/91	Install interim cover over consolidated materials
10/91	Equipment decontamination/release from site

Postexcavation Documentation and Reviews

10/91 - 2/92	Data evaluation/report generation
11/2/92	Post-ERA USRADS survey
11/20/92	Final KEH (Kaiser) site survey

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APPENDIX C

SOIL SAMPLE DATA

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DATA PRESENTATION

Appendix C contains the soil sample data results and locations as referenced in the 316-C Process Trenches final ERA document.

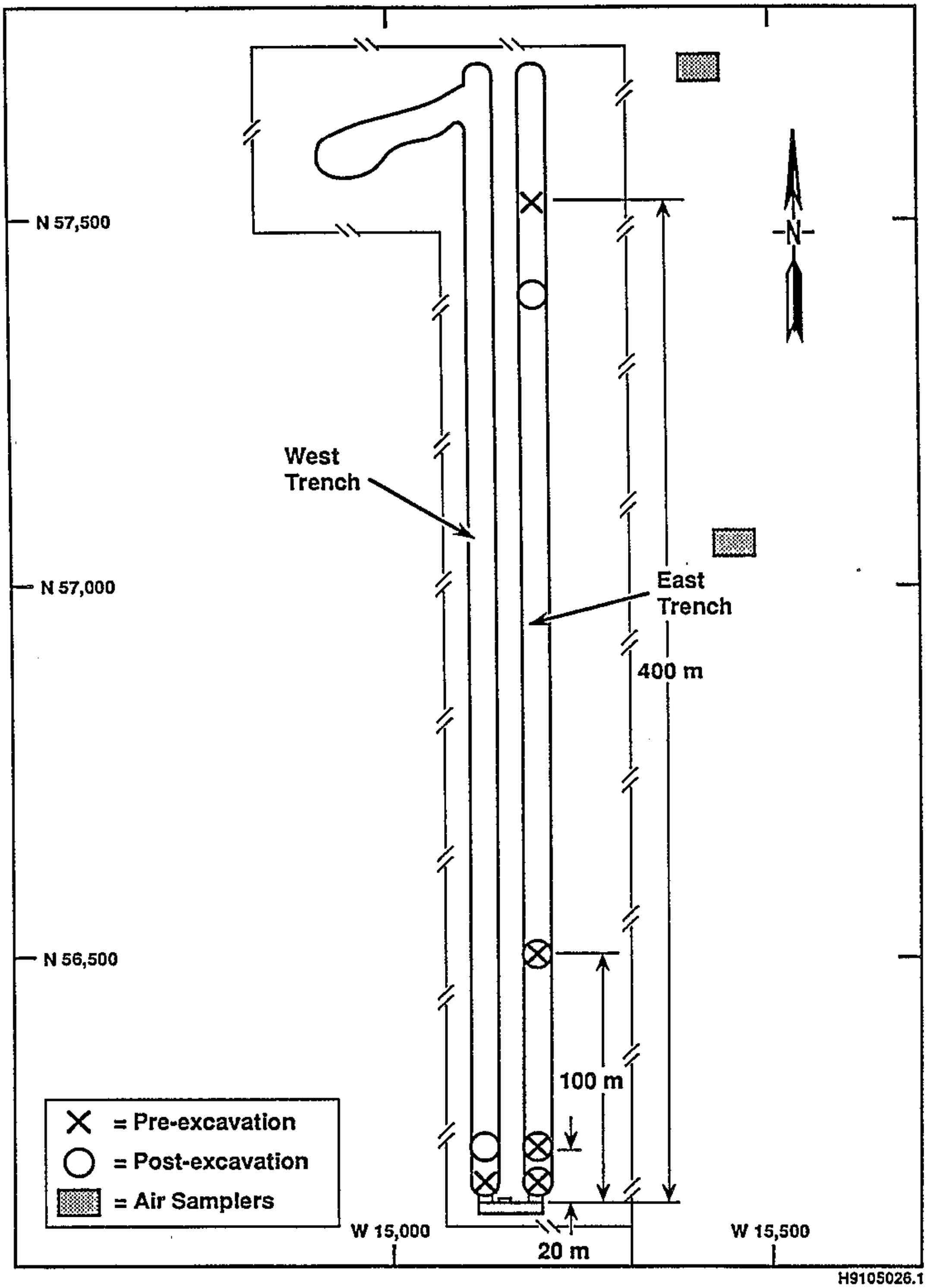
Figure C-1 is an illustrtion of the two trenches, with the pre and post-excavation sample locations labeled. The approximate locations of the two air sampling ports are displayed also.

Figure C-2 displays the pre and postremediation sections surveyed by USRADS. USRADS was used to conduct two radiological surveys of the area surrounding the trenches. Figure C-2 illustrates the general locations identified by the maps generated by USRADS of the survey.

The pre and postexcavation soil sample results from the east and west trenches are shown in Table C-1 through C-4, respectively. The soil sample results measured radio-nuclide, volatile organic compound, semivolatile organic compound, and metal concentrations in the soil with respect to the sample number and location.

Figures C-3 through C-18 illustrate the pre and postexcavation soil sampling results of contaminants of concern. The figures demonstrate how the excava-tion activities successfully reduced measured soil sample concentrations to appropriate levels.

Figure C-1. 316-5 Process Trenches ERA Pre and Postexcavation Sampling Locations.



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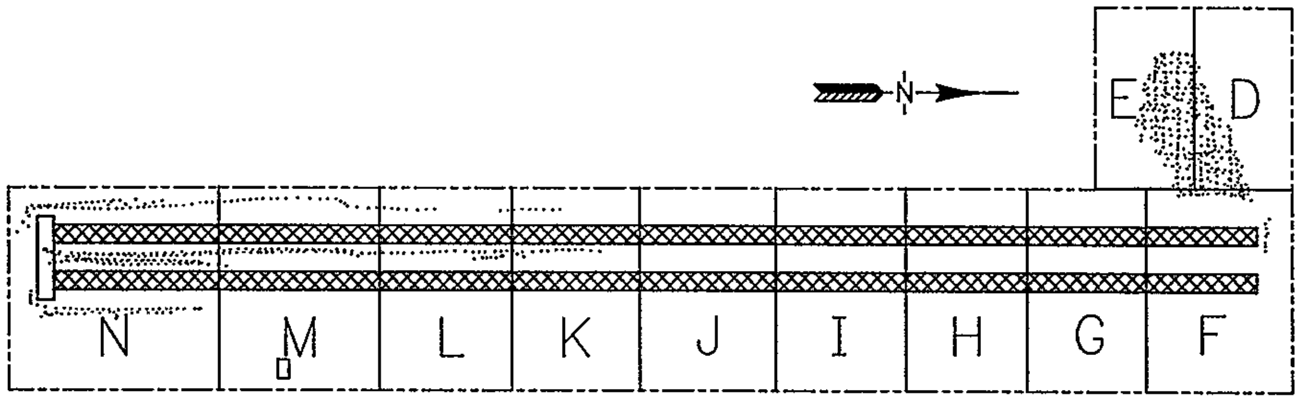
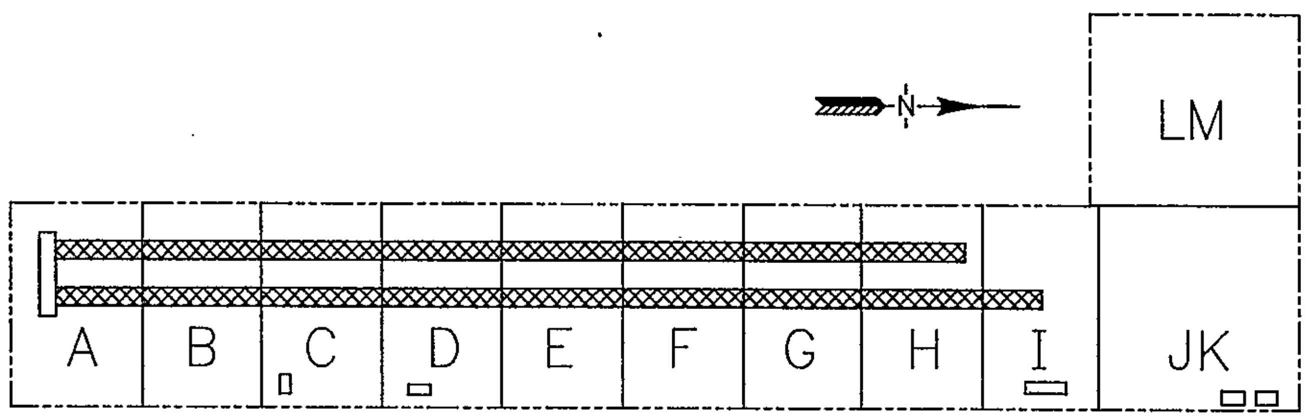


Pre-Remediation USRADS Surveys Grid Layout Feb 1991
(Denotes >3900 CPM W/NaI)



Post-Remediation USRADS Surveys Grid Layout Oct/Nov 1991

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Figure C-2. Pre and Postremediation USRADS Survey Grid Layouts.

Table C-1. Preexcavation Sample Results for the West Process Trench.

SAMPLE NUMBER	B01016	B014Q2	B014Q3	B014Q4
SAMPLE LOCATION	20 M	20 M	20 M	20 M
SAMPLE DEPTH	SURFACE	SURFACE	1.5 FT	6 FT
RADIONUCLIDES (pCi/g +/- 2s)				
Gross alpha	165 +/- 12	188 +/- 13	98 +/- 10	20 +/- 6
Gross beta	120 +/- 4	119 +/- 4	73 +/- 3	30 +/- 3
Strontium-90	<1	<1	<1	<1
Technicium-99				
Uranium-234	63.4 +/- 5.5	61.6 +/- 5	46.1 +/- 4.5	8.6 +/- 0.9
Uranium-235	3.9 +/- 1.4	7.7 +/- 0.8	6.1 +/- 0.8	1.1 +/- 0.2
Uranium-238	44.1 +/- 3.9	43.5 +/- 3.6	32.3 +/- 3.3	6 +/- 0.7
Plutonium-238	<0.1	N/A	N/A	N/A
Plutonium-239,240	<0.1	N/A	N/A	N/A
Total Uranium	80 +/- 9	N/A	N/A	N/A
Gamma Spec:				
Potassium-40	7.218 +/- 0.754	8.267 +/- 0.771	9.547 +/- 0.855	19.46 +/- 7.04
Chromium-51	<0.9605	<1.078	<0.9212	<6.22
Cobalt-60	0.1424 +/- 0.0575	<0.07825	<0.05906	<0.4242
Zinc-65	<0.1205	<0.1143	<0.1049	<0.975
Cesium-134	<0.05109	<0.0558	<0.05146	<0.3948
Cesium-137	1.212 +/- 0.084	1.465 +/- 0.086	0.9067 /- 0.075	<0.3612
Cerium-141	0.8498 +/- 0.1737	N/A	N/A	N/A
Radium-226	0.3171 +/- 0.091	0.3518 +/- 0.0933	0.3719 +/- 0.0673	1.572 +/- 0.666
Thorium-228	0.4134 +/- 0.0522	0.5904 +/- 0.1014	0.4772 +/- 0.0527	0.8292 +/- 0.4104
Thorium-232	0.3834 +/- 0.1843	0.7381 +/- 0.2444	0.599 +/- 0.1864	<1.632
Uranium-235	1.13 +/- 0.231	1.332 +/- 0.245	1.238 +/- 0.214	N/A
Uranium-238	25.4 +/- 6.69	25.07 +/- 6.37	20.22 +/- 5.55	N/A
METALS (mg/kg)				
Aluminum	5530	5130	8850	9120
Antimony	2.2	6.1	5.5	5.9
Arsenic	1.70	1.8	2.1	2.1
Beryllium	0.26	0.2	0.46	0.42
Cadmium	0.40	0.39	0.47	0.44
Chromium	6.20	8.60	7.2	7
Copper	53.20	60.4	53.7	25.5
Iron	23100.00	21700	27400	26600
Lead	3.90	3.70	6.10	5.1
Manganese	528.00	525	638	396
Mercury	0.12	0.14	0.1	0.1
Nickel	29.20	32.3	29.1	12
Selenium	0.86	0.82	0.95	0.86
Silver	0.66	0.87	1	0.44
Thallium	0.64	0.61	0.71	0.64
Vanadium	57.60	50.1	57.9	57.3
Zinc	86.90	93.4	95.9	58
ORGANICS (mg/kg)				
1,2-dichloroethylene	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
pH	N/A	7.74	7.99	8.1
PCBs (mg/kg)				
Arochlor1248	0.088	ND	ND	ND

Table C-1. Continued.

SAMPLE NUMBER	B014Q5	B014Q6	B014Q7	B014Q8
SAMPLE LOCATION	20 M	20 M	20 M	20 M
SAMPLE DEPTH	11 FT	11 FT	11 FT	16 FT
RADIONUCLIDES (pCi/g +/- 2s)				
Gross alpha	20 +/- 5		22.5 +/- 5	72 +/- 8
Gross beta	20 +/-2		22 +/- 3	34 +/- 3
Strontium-90	0.9 +/- .31		<1	<1
Technicium-99				
Uranium-234	16.2 +/- 0.9		14 +/- 9	26.5 +/- 1.8
Uranium-235	2.1 +/- 0.2		2.1 +/- 0.2	3.6 +/- 0.4
Uranium-238	11.3 +/- 0.7		9.7 +/- 0.7	18.6 +/- 1.3
Plutonium-238	N/A		N/A	N/A
Plutonium-239,240	N/A		N/A	N/A
Total Uranium	N/A		N/A	N/A
Gamma Spec:				
Potassium-40	6.692 +/- 0.846		7.539 +/- 0.836	7.467 +/- 0.667
Chromium-51	<0.6822		<0.7037	<0.6145
Cobalt-60	<0.04313		<0.04479	<0.05575
Zinc-65	<0.1177		<0.1232	<0.09836
Cesium-134	<0.04859		<0.04877	<0.04095
Cesium-137	<0.04275		.1466 +/- .0507	0.4475 +/- 0.0541
Cerium-141	N/A			
Radium-226	0.3692 +/- 0.0926		0.3366 +/- 0.073	0.3766 +/- 0.0673
Thorium-228	<0.0874		0.4799 +/- 0.0768	0.4309 +/- 0.0427
Thorium-232	0.4472 +/- 0.1652		0.5053 +/- 0.1886	0.6014 +/- 0.1559
Uranium-235	0.3931 +/- 0.1328		0.2896 +/- 0.1336	0.6691 +/- 0.1507
Uranium-238	10.92 +/- 6.03		6.229 +/- 3.718	12.65 +/- 3.55
METALS (mg/kg)				
Aluminum	5230	3930	5320	6000
Antimony	22.9	3.89	14.5	13.4
Arsenic	1.9	0.77	2.4	2.5
Beryllium	0.33	0.35	0.37	0.39
Cadmium	0.69	0.43	0.64	0.68
Chromium	4.1	2.2	3.6	5.4
Copper	38.3	28.7	31.2	68.6
Iron	21500	14400	21500	21900
Lead	3.1	2.5	3.1	3.6
Manganese	324	224	279	331
Mercury	0.11	0.11	0.1	0.2
Nickel	16	12.5	15.4	17
Selenium	0.88	0.43	0.85	0.85
Silver	0.92	13.6	0.85	0.9
Thallium	0.22	0.43	0.21	0.22
Vanadium	45.3	19.9	52.3	47.9
Zinc	63.8	45.7	55.3	59
ORGANICS (mg/kg)				
1,2-dichloroethylene	ND	0.006	ND	ND
Methylene chloride	ND	0.014	ND	ND
Tetrachloroethylene	ND	0.006	ND	ND
Trichloroethylene	ND	0.006	ND	ND
pH	8.16	8.1	8.53	8.04
PCBs (mg/kg)				
Arochlor1248	ND	0.086	ND	ND

Table C-2. Postexcavation Sample Results for the West Process Trench.

SAMPLE NUMBER	B01016	B014Q2	B014Q3	B014Q4
SAMPLE LOCATION	20 M	20 M	20 M	20 M
SAMPLE DEPTH	SURFACE	SURFACE	1.5 FT	6 FT
RADIONUCLIDES (pCi/g +/				
Gross alpha	165 +/- 12	188 +/- 13	98 +/- 10	20 +/- 6
Gross beta	120 +/- 4	119 +/- 4	73 +/- 3	30 +/- 3
Strontium-90	<1	<1	<1	<1
Technicium-99				
Uranium-234	63.4 +/- 5.5	61.6 +/- 5	46.1 +/- 4.5	8.6 +/- 0.9
Uranium-235	3.9 +/- 1.4	7.7 +/- 0.8	6.1 +/- 0.8	1.1 +/- 0.2
Uranium-238	44.1 +/- 3.9	43.5 +/- 3.6	32.3 +/- 3.3	6 +/- 0.7
Plutonium-238	<0.1	N/A	N/A	N/A
Plutonium-239,240	<0.1	N/A	N/A	N/A
Total Uranium	80 +/- 9	N/A	N/A	N/A
Gamma Spec:				
Potassium-40	7.218 +/- 0.754	8.267 +/- 0.771	9.547 +/- 0.855	19.46 +/- 7.04
Chromium-51	<0.9605	<1.078	<0.9212	<6.22
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Zinc-65	<0.1205	<0.1143	<0.1049	<0.975
Cesium-134	<0.05109	<0.0558	<0.05146	<0.3948
Cesium-137	1.212 +/- 0.084	1.465 +/- 0.086	0.9067 /- 0.075	<0.3612
Cerium-141	0.8498 +/- 0.1737	N/A	N/A	N/A
Radium-226	0.3171 +/- 0.091	0.3518 +/- 0.0933	0.3719 +/- 0.0673	1.572 +/- 0.666
Thorium-228	0.4134 +/- 0.0522	0.5904 +/- 0.1014	0.4772 +/- 0.0527	0.8292 +/- 0.4104
Thorium-232	0.3834 +/- 0.1843	0.7381 +/- 0.2444	0.599 +/- 0.1864	<1.632
Uranium-235	1.13 +/- 0.231	1.332 +/- 0.245	1.238 +/- 0.214	N/A
Uranium-238	25.4 +/- 6.69	25.07 +/- 6.37	20.22 +/- 5.55	N/A
METALS (mg/kg)				
Aluminum	5530	5130	8850	9120
Antimony	2.2	6.1	5.5	5.9
Arsenic	1.70	1.8	2.1	2.1
Beryllium	0.26	0.2	0.46	0.42
Cadmium	0.40	0.39	0.47	0.44
Chromium	6.20	8.60	7.2	7
Copper	53.20	60.4	53.7	25.5
Iron	23100.00	21700	27400	26600
Lead	3.90	3.70	6.10	5.1
Manganese	528.00	525	638	396
Mercury	0.12	0.14	0.1	0.1
Nickel	29.20	32.3	29.1	12
Selenium	0.86	0.82	0.95	0.86
Silver	0.66	0.87	1	0.44
Thallium	0.64	0.61	0.71	0.64
Vanadium	57.60	50.1	57.9	57.3
Zinc	86.90	93.4	95.9	58
ORGANICS (mg/kg)				
1,2-dichloroethylene	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
pH	N/A	7.74	7.99	8.1
PCBs (mg/kg)				
Arochlor1248	0.088	ND	ND	ND

Table C-2. Continued.

SAMPLE NUMBER	B014Q5	B014Q6	B014Q7	B014Q8
SAMPLE LOCATION	20 M	20 M	20 M	20 M
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RADIONUCLIDES (pCi/g +/				
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Gross beta	20 +/-2		22 +/- 3	34 +/- 3
Strontium-90	0.9 +/- .31		<1	<1
Technicium-99				
Uranium-234	16.2 +/- 0.9		14 +/- 9	26.5 +/- 1.8
Uranium-235	2.1 +/- 0.2		2.1 +/- 0.2	3.6 +/- 0.4
Uranium-238	11.3 +/- 0.7		9.7 +/- 0.7	18.6 +/- 1.3
Plutonium-238	N/A		N/A	N/A
Plutonium-239,240	N/A		N/A	N/A
Total Uranium	N/A		N/A	N/A
Gamma Spec:				
Potassium-40	6.692 +/- 0.846		7.539 +/- 0.836	7.467 +/- 0.667
Chromium-51	<0.6822		<0.7037	<0.6145
Cobalt-60	<0.04313		<0.04479	<0.05575
Zinc-65	<0.1177		<0.1232	<0.09836
Cesium-134	<0.04859		<0.04877	<0.04095
Cesium-137	<0.04275		.1466 +/- .0507	0.4475 +/- 0.0541
Cerium-141	N/A			
Radium-226	0.3692 +/- 0.0926		0.3366 +/- 0.073	0.3766 +/- 0.0673
Thorium-228	<0.0874		0.4799 +/- 0.0768	0.4309 +/- 0.0427
Thorium-232	0.4472 +/- 0.1652		0.5053 +/- 0.1886	0.6014 +/- 0.1559
Uranium-235	0.3931 +/- 0.1328		0.2896 +/- 0.1336	0.6691 +/- 0.1507
Uranium-238	10.92 +/- 6.03		6.229 +/- 3.718	12.65 +/- 3.55
METALS (mg/kg)				
Aluminum	5230	3930	5320	6000
Antimony	22.9	3.89	14.5	13.4
Arsenic	1.9	0.77	2.4	2.5
Beryllium	0.33	0.35	0.37	0.39
Cadmium	0.69	0.43	0.64	0.68
Chromium	4.1	2.2	3.6	5.4
Copper	38.3	28.7	31.2	68.6
Iron	21500	14400	21500	21900
Lead	3.1	2.5	3.1	3.6
Manganese	324	224	279	331
Mercury	0.11	0.11	0.1	0.2
Nickel	16	12.5	15.4	17
Selenium	0.88	0.43	0.85	0.85
Silver	0.92	13.6	0.85	0.9
Thallium	0.22	0.43	0.21	0.22
Vanadium	45.3	19.9	52.3	47.9
Zinc	63.8	45.7	55.3	59
ORGANICS (mg/kg)				
1,2-dichloroethylene	ND	0.006	ND	ND
Methylene chloride	ND	0.014	ND	ND
Tetrachloroethylene	ND	0.006	ND	ND
Trichloroethylene	ND	0.006	ND	ND
pH	8.16	8.1	8.53	8.04
PCBs (mg/kg)				
Arochlor1248	ND	0.086	ND	ND

Table C-3. Preexcavation Sample Results for the East Process Trench.

SAMPLE NUMBER	B01032	B01033	B01034	B01035
SAMPLE LOCATION	0 M	0 M	0 M	20 M
DEPTH FROM SURFACE	5 FT	3 FT	SURFACE	5 FT
RADIONUCLIDES (pCi/g +/- 2s)				
Gross alpha	24 +/- 10	316 +/- 25	3120 +/- 80	49 +/- 12
Gross beta	30 +/- 6	454 +/- 12	5420 +/- 50	66 +/- 5
Strontium-90	0.2 +/- 0.7	1.3 +/- 1	15 +/-3	0.2 +/- 0.6
Technicium-99	3.8 +/- 0.2	99 +/- 3	738 +/- 9	2250 +/- 30
Total Uranium	28 +/- 6	1000 +/- 200	6700 +/- 1300	110 +/- 20
Uranium-234	13 +/- 1	520 +/- 30	3900 +/- 300	69 +/- 7
Uranium-235	1.7 +/- 0.3	74 +/- 9	320 +/- 120	9.2 +/- 1.2
Uranium-238	9.2 +/- 1	360 +/- 20	2900 +/- 200	50 +/- 5
Plutonium-238	0.19 +/- 0.15	0.07 +/- 0.06	0.23 +/- 0.14	0 +/- 0.06
Plutonium-239,240	1.4 +/- 0.5	0.17 +/- 0.07	1.6 +/- 0.5	0 +/-0.05
Gamma Spec.				
Potassium-40	10.58 +/- 0.47	9.295 +/- 0.416	5.226 +/- 0.629	9.417 +/- 0.431
Cobalt-60	0.2202 +/- 0.0322	0.113 +/- 0.0261	0.5536 +/- 0.0712	0.08216 +/- 0.0238
Cesium-137	0.5229 +/- 0.0334	0.5534 +/- 0.0426	1.083 +/- 0.121	0.393 +/- 0.0291
Radium-226	0.4213 +/- 0.0449	0.4849 +/- 0.0581	1.244 +/- 0.201	0.3934 +/- 0.042
Uranium-235	0.6952 +/- 0.11	30.79 +/- 0.28	219.3 +/- 1.1	2.074 +/- 0.168
Uranium-238	0.9821 +/- 0.2557	448 +/- 7.6	3196 +/- 29	26.46 +/- 3.26
Thorium-228	0.6424 +/- 0.0287	1.533 +/- 0.065	5.385 +/- 0.133	0.5725 +/- 0.0272
Thorium-232	0.5937 +/- 0.1114	0.6262 +/- 0.1175	1.429 +/- 0.251	0.5938 +/- 0.1018
METALS (mg/kg)				
Aluminum	4130	3780	7390	4210
Antimony	3.6	3.7	4.5	11.4
Arsenic	1.3	1.1	3.1	1.1
Beryllium	0.21	0.22	0.48	0.21
Cadmium	0.64	0.65	0.8	0.64
Chromium	4.9	3.3	34.7	4.3
Copper	81	147	1460	144
Iron	18200	17000	17600	19000
Lead	3.4	11.8	95.8	3.5
Manganese	229	200	213	427
Mercury	0.1	0.11	1.1	0.1
Nickel	16.6	14.3	160	31.6
Selenium	0.82	0.88	1.1	0.86
Silver	1.8	0.86	38.7	1.1
Thallium	0.62	0.66	0.8	0.64
Vanadium	33.9	36.6	80.7	42
Zinc	65.5	60.5	225	91.7
ORGANICS (mg/kg)				
1,2-dichloroethylene	ND	ND	ND	ND
Methylene chloride	ND	0.006	0.007	ND
Tetrachloroethylene	ND	ND	0.01	ND
Trichloroethylene	ND	ND	ND	ND
pH	7.67	7.81	7.74	7.6
PCBs (mg/kg)				
Arochlor1248	ND	ND	ND	ND

Table C-3. Continued.

SAMPLE NUMBER	B01036	B01037	B01038	B01040
SAMPLE LOCATION	20 M	20 M	20 M	20 M
DEPTH FROM SURFACE	3 FT	SURFACE	SURFACE	SURFACE
RADIONUCLIDES (pCi/g +/- 2s)				
Gross alpha	1620 +/- 60		3090 +/- 70	4450 +/- 90
Gross beta	1790 +/- 30		1120 +/- 10	12200 +/- 100
Strontium-90	6.7 +/- 3.6		12 +/- 2	18 +/- 7
Technicium-99	691 +/- 7		3600 +/- 80	3450 +/- 60
Total Uranium	2100 +/- 400		16000 +/- 3000	20000 +/- 4000
Uranium-234	1530 +/- 80		8790 +/- 740	11900 +/- 1100
Uranium-235	140 +/- 30		1600 +/- 200	380 +/- 300
Uranium-238	1070 +/- 60		6030 +/- 52	9130 +/- 840
Plutonium-238	0.16 +/- 0.09		1.2 +/- 0.4	0.6 +/- 0.4
Plutonium-239,240	0.53 +/- 0.16		4.1 +/- 0.9	4.7 +/- 1.5
Gamma Spec.				
Potassium-40	7.921 +/- 0.506		24 +/- 0.659	3.132 +/- 0.917
Cobalt-60	0.3592 +/- 0.0486		0.7881 +/- 0.0976	0.9625 +/- 0.134
Cesium-137	0.528 +/- 0.0688		0.8917 +/- 0.1383	1.14 +/- 0.15
Radium-226	0.4036 +/- 0.0917		0.9942 +/- 0.2591	0.9713 +/- 0.3195
Uranium-235	84.64 +/- 0.55		638.4 +/- 1.7	691 +/- 2.2
Uranium-238	1246 +/- 15		9143 +/- 43	9659 +/- 51
Thorium-228	<0.1286		15.73 +/- 0.2	16.79 +/- 0.38
Thorium-232	0.8278 +/- 0.1782		1.751 +/- 0.38	1.656 +/- 0.478
METALS (mg/kg)				
Aluminum	4270	4270	10000	10000
Antimony	7.4	5.08	16.1	10.3
Arsenic	1.8	2	5.2	5.2
Beryllium	0.22	1.4	1.9	1.5
Cadmium	2.5	1.4	1	0.96
Chromium	74.2	80.4	177	129
Copper	1190	1310	3300	3560
Iron	20100	11600	17400	16800
Lead	19	78.3	154	167
Manganese	456	260	192	321
Mercury	0.65	1.7	3.6	3
Nickel	127	270	612	959
Selenium	4.5	1.9	5.3	4.4
Silver	54.5	60.6	144	128
Thallium	0.67	0.56	1	0.97
Vanadium	176	108	161	176
Zinc	260	173	305	302
ORGANICS (mg/kg)				
1,2-dichloroethylene	ND	0.006	ND	ND
Methylene chloride	ND	0.046	0.01	0.014
Tetrachloroethylene	0.02	0.04	0.01	0.012
Trichloroethylene	ND	0.06	ND	ND
pH	7.56		7.59	7.51
PCBs (mg/kg)				
Arochlor1248	ND	6.5	ND	ND

Table C-3. Continued.

SAMPLE NUMBER	B01041	B01042	B01043
SAMPLE LOCATION	100 M	100 M	100 M
DEPTH FROM SURFACE	5 FT	3 FT	SURFACE
RADIONUCLIDES (pCi/g +/- 2s)			
Gross alpha	11 +/- 8	63 +/- 13	24 +/- 8
Gross beta	17 +/- 3	120 +/- 7	37 +/- 4
Strontium-90	0.04 +/- .48	0.6 +/- 0.9	0.4 +/- 1
Technicium-99	1.3 +/- 0.4	22 +/- 1	27 +/- 0.8
Total Uranium	16 +/- 3	62 +/- 12	140 +/- 30
Uranium-234	13 +/- 2	46 +/- 7	110 +/- 10
Uranium-235	2.1 +/- 0.5	7.4 +/- 1.4	10 +/- 3
Uranium-238	8.6 +/- 1.2	33 +/- 5	77 +/- 10
Plutonium-238	0 +/- 0.06	0 +/- 0.2	0.22 +/- 0.08
Plutonium-239,240	0 +/- 0.07	0 +/- 0.1	0.2 +/- 0.08
Gamma Spec.			
Potassium-40	9.36 +/- 0.388	9.652 +/- 0.497	8.846 +/- 0.473
Cobalt-60	0.08434 +/- 0.02272	0.06691 +/- 0.02448	0.1369 +/- 0.0317
Cesium-137	0.03751 +/- 0.01315	0.3407 +/- 0.0325	0.6079 +/- 0.0441
Radium-226	0.3898 +/- 0.0365	0.3818 +/- 0.0467	0.402 +/- 0.0595
Uranium-235	0.3918 +/- 0.0764	3.013 +/- 0.177	8.784 +/- 0.2
Uranium-238	4.33 +/- 2.477	46.01 +/- 4.06	129.6 +/- 6.1
Thorium-228	0.5627 +/- 0.0227	0.655 +/- 0.0445	0.8045 +/- 0.0604
Thorium-232	0.5624 +/- 0.0866	0.651 +/- 0.1184	0.5658 +/- 0.1122
METALS (mg/kg)			
Aluminum	3840	4730	7040
Antimony	16.7	11.7	8.6
Arsenic	0.83	0.87	3.1
Beryllium	0.21	0.21	0.36
Cadmium	0.64	0.64	0.6
Chromium	2.2	9.4	173
Copper	72.7	209	974
Iron	19500	23200	31000
Lead	3.3	5.4	39.4
Manganese	281	264	276
Mercury	0.09	0.12	1.4
Nickel	13.3	25.5	186
Selenium	4.2	4	0.82
Silver	0.85	3	71.6
Thallium	0.63	0.61	0.61
Vanadium	43.2	53.5	91.4
Zinc	48.9	72.9	212
ORGANICS (mg/kg)			
1,2-dichloroethylene	0.05	ND	ND
Methylene chloride	0.03	0.03	0.03
Tetrachloroethylene	0.05	ND	ND
Trichloroethylene	0.05	ND	ND
pH	7.57	0.95	7.7
PCBs (mg/kg)			
Arochlor1248	ND	ND	ND

Table C-3. Continued.

SAMPLE NUMBER	B01044	B01045	B01046
SAMPLE LOCATION	400 M	400 M	400 M
DEPTH FROM SURFACE	5 FT	3 FT	SURFACE
RADIONUCLIDES (pCi/g +/- 2s)			
Gross alpha	19 +/- 8	8 +/- 7	55 +/- 11
Gross beta	38 +/- 4	14 +/- 4	81 +/- 5
Strontium-90	0.4 +/- 0.2	0.2 +/- 0.6	0.6 +/- 2.1
Technicium-99	13 +/- 1	12 +/- 1	24 +/- 4
Total Uranium	75 +/- 15	12 +/- 2	150 +/- 30
Uranium-234	42 +/- 4	5.7 +/- 0.7	87 +/- 7
Uranium-235	2.9 +/- 1.3	0.068 +/- 0.018	4.2 +/- 2.5
Uranium-238	30 +/- 3	4.3 +/- 0.6	69 +/- 6
Plutonium-238	0.06 +/- 0.05	0 +/- 0.08	0 +/- 0.2
Plutonium-239,240	0.09 +/- 0.05	0 +/- 0.06	0.3 +/- 0.23
Gamma Spec.			
Potassium-40	9.56 +/- 0.434	9.162 +/- 0.442	12.07 +/- 0.53
Cobalt-60	0.3088 +/- 0.0301	0.04497 +/- 0.02085	1.034 +/- 0.051
Cesium-137	0.6851 +/- 0.036	0.344 +/- 0.0214	1.067 +/- 0.048
Radium-226	0.4223 +/- 0.049	0.4342 +/- 0.0419	0.5547 +/- 0.0628
Uranium-235	1.717 +/- 0.154	N/A	3.443 +/- 0.217
Uranium-238	26.74 +/- 3.17	N/A	53.18 +/- 5.94
Thorium-228	0.6154 +/- 0.029	0.5178 +/- 0.025	0.7128 +/- 0.0311
Thorium-232	0.5833 +/- 0.1015	0.5178 +/- 0.093	0.6739 +/- 0.1367
METALS (mg/kg)			
Aluminum	5520	3580	7980
Antimony	10.3	9.5	19.5
Arsenic	1.5	0.78	1.7
Beryllium	0.2	0.21	0.33
Cadmium	0.6	0.62	0.56
Chromium	26.7	1.7	33.4
Copper	282	30.2	445
Iron	18200	17200	21700
Lead	13.4	2	17.4
Manganese	275	217	340
Mercury	0.63	0.09	0.54
Nickel	41.1	6.7	61.7
Selenium	3.9	3.9	0.77
Silver	16.2	0.83	23.2
Thallium	0.59	0.58	0.58
Vanadium	41.4	25.4	46.6
Zinc	120	21.6	196
ORGANICS (mg/kg)			
1,2-dichloroethylene	ND	ND	ND
Methylene chloride	ND	0.03	0.04
Tetrachloroethylene	ND	ND	ND
Trichloroethylene	ND	ND	ND
pH	7.84	7.71	7.65
PCBs (mg/kg)			
Arochlor1248	ND	ND	ND

Table C-4. Postexcavation Sample Results for the East Process Trench.

SAMPLE NUMBER	B01031	B01029	B01025	B01027
SAMPLE LOCATION	0 M	20 M	100 M	370 M
DEPTH FROM SURFACE	SURFACE	SURFACE	SURFACE	SURFACE
RADIONUCLIDES (pCi/g +/- 2s)				
Gross alpha	3 +/- 4	7 +/- 4	4 +/- 5	7 +/- 4
Gross beta	15 +/- 2	16 +/- 2	9 +/- 2	15 +/- 2
Strontium-90	<2	0.39 +/- .22	<0.07	<0.2
Technicium-99	0.5 +/- 0.2	0.3 +/- 0.1	0.8 +/- 0.1	1.7 +/- 0.1
Uranium-234	3.5 +/- 0.2	8.6 +/- 0.9	7.1 +/- 0.6	6.2 +/- 0.6
Uranium-235	.04 +/- .01	1.1 +/- 0.2	1 +/- 0.2	0.9 +/- 0.2
Uranium-238	2.5 +/- 0.2	6.0 +/- 0.7	5.4 +/- 0.5	4.7 +/- 0.5
Plutonium-238	<0.1	<0.01	<0.04	<0.02
Plutonium-239,240	<0.1	<0.02	<0.02	<0.03
Total Uranium	<32	<33	<30	<29
Gamma Scan:				
Potassium-40	6.404 +/- 0.607	6.491 +/- 0.617	7.848 +/- 0.686	6.337 +/- 0.563
Cobalt-60	0.03528 +/- 0.02895	0.02137 +/- 0.01984	0.0506 +/- 0.03051	0.3224 +/- 0.0512
Cesium-137	0.03528 +/- 0.02895	0.02137 +/- 0.01984	0.2376 +/- .0425	0.6981 +/- 0.05
Noibium-95		0.06478 +/- 0.04621		
Radium-226	0.2372 +/- 0.0565	0.2665 +/- 0.0543	0.3489 +/- 0.0731	0.2557 +/- 0.0507
Thorium-228	0.3338 +/- 0.0353	0.3479 +/- 0.0354	0.4437 +/- 0.0614	0.3741 +/- 0.0375
Thorium-232	0.2665 +/- 0.1177	0.367 +/- 0.1339	0.4834 +/- 0.1494	0.3797 +/- 0.1545
Uranium-235	N/A	0.2544 +/- 0.1417	0.2838 +/- 0.1626	0.2041 +/- 0.1517
Uranium-238	N/A	N/A	7.41 +/- 4.114	N/A
METALS (mg/kg)				
Aluminum	2155	2758	3055	2745
Antimony	2.03	1.3	0.98	0.24
Arsenic	0.77	0.7	0.82	0.7
Beryllium	0.13	0.16	-0.02	-0.21
Cadmium	0.15	0.04	0.36	0.22
Chromium	-2.3	-1.8	-3.1	-1.16
Copper	14.4	18.4	102	69.4
Iron	9483	9934	13890	12330
Lead	1.33	1.41	1.2	1.41
Manganese	274.2	151.4	163	213
Mercury	0.007	0.066	0.066	0.066
Nickel	5.6	15.8	8.6	9.1
Selenium	0.2	0.2	0.2	0.2
Silver	0.22	-0.41	0.86	2.1
Thallium	0.2	<0.2	<0.2	<0.2
Vanadium	8.2	9.2	11	10.5
Zinc	22.8	20.1	36.4	42
ORGANICS (mg/kg)				
1,2-dichloroethylene	ND	ND	ND	ND
Methylene chloride	4	3	8	9
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
PCBs (mg/kg)				
Arochlor1248	ND	ND	ND	ND

9 2 1 2 6 4 8 1 5 5 3

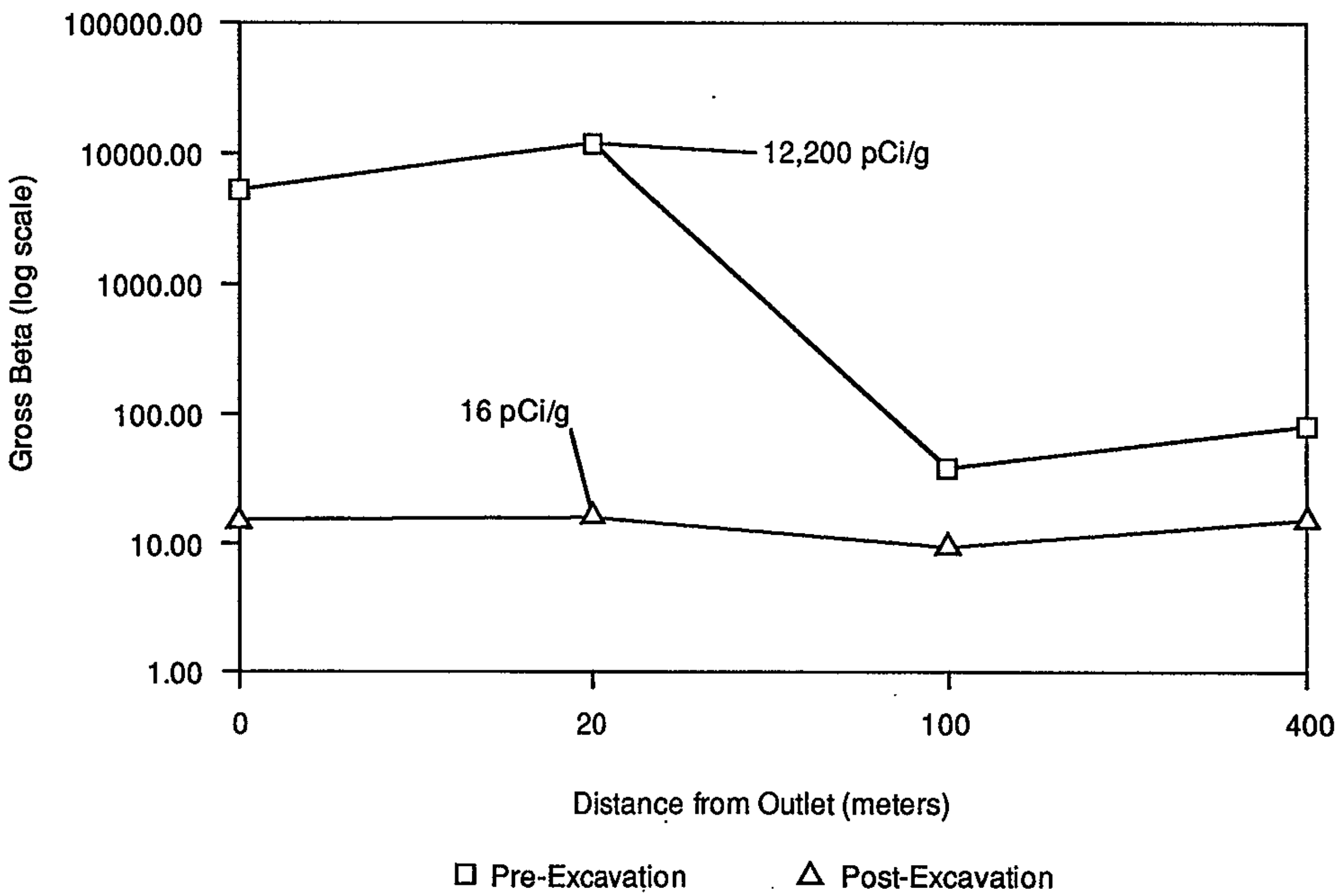
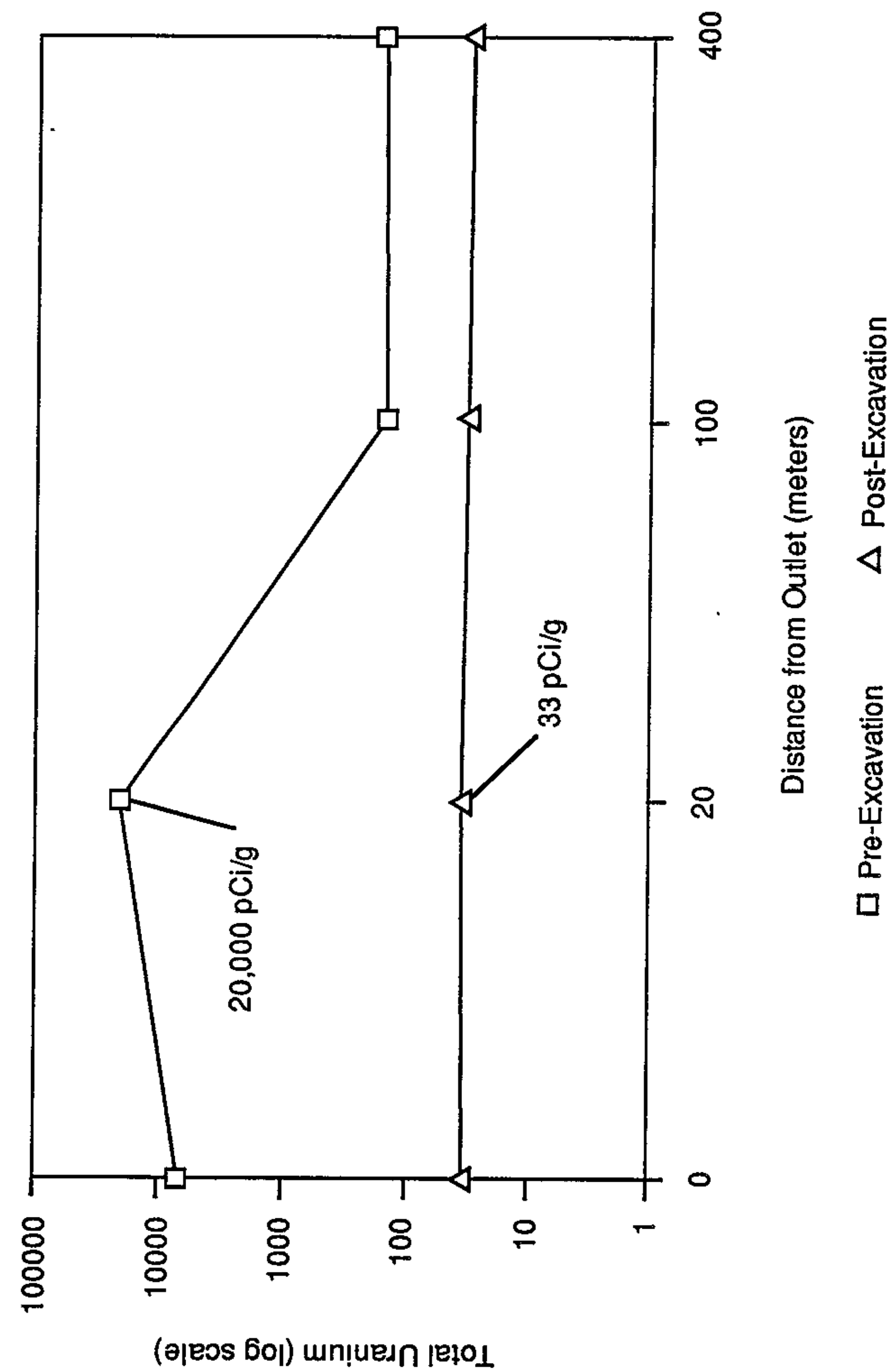


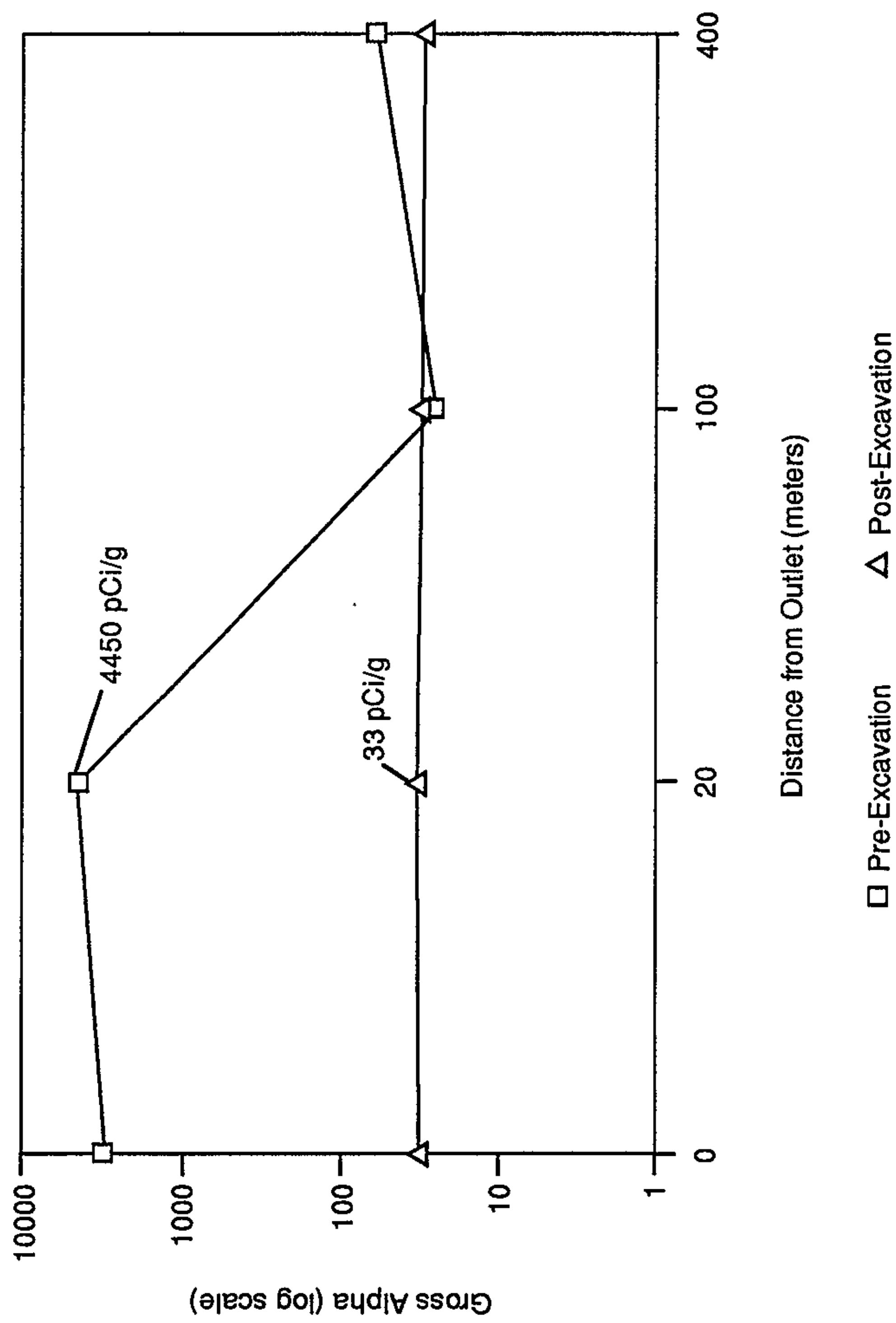
Figure C-3. Gross Beta Concentrations from East Process Trench.

Figure C-4. Total Uranium Concentrations from East Process Trench.



9 2 1 2 5 1 8 1 5 5 4

Figure C-5. Gross Alpha Concentrations from East Process Trench.



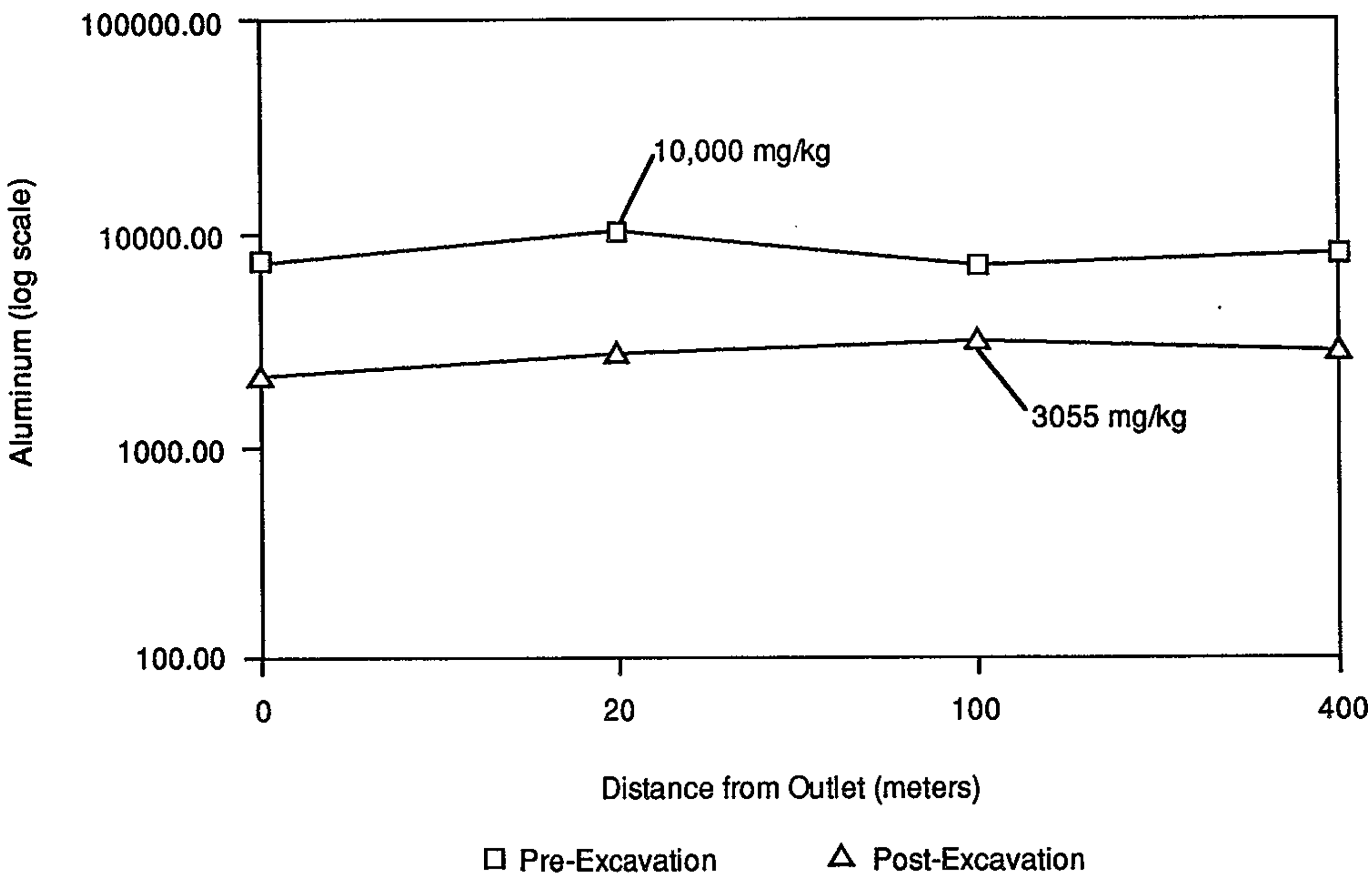


Figure C-6. Aluminum Concentrations from East Process Trench.

Figure C-7. Antimony Concentrations from East Process Trench.

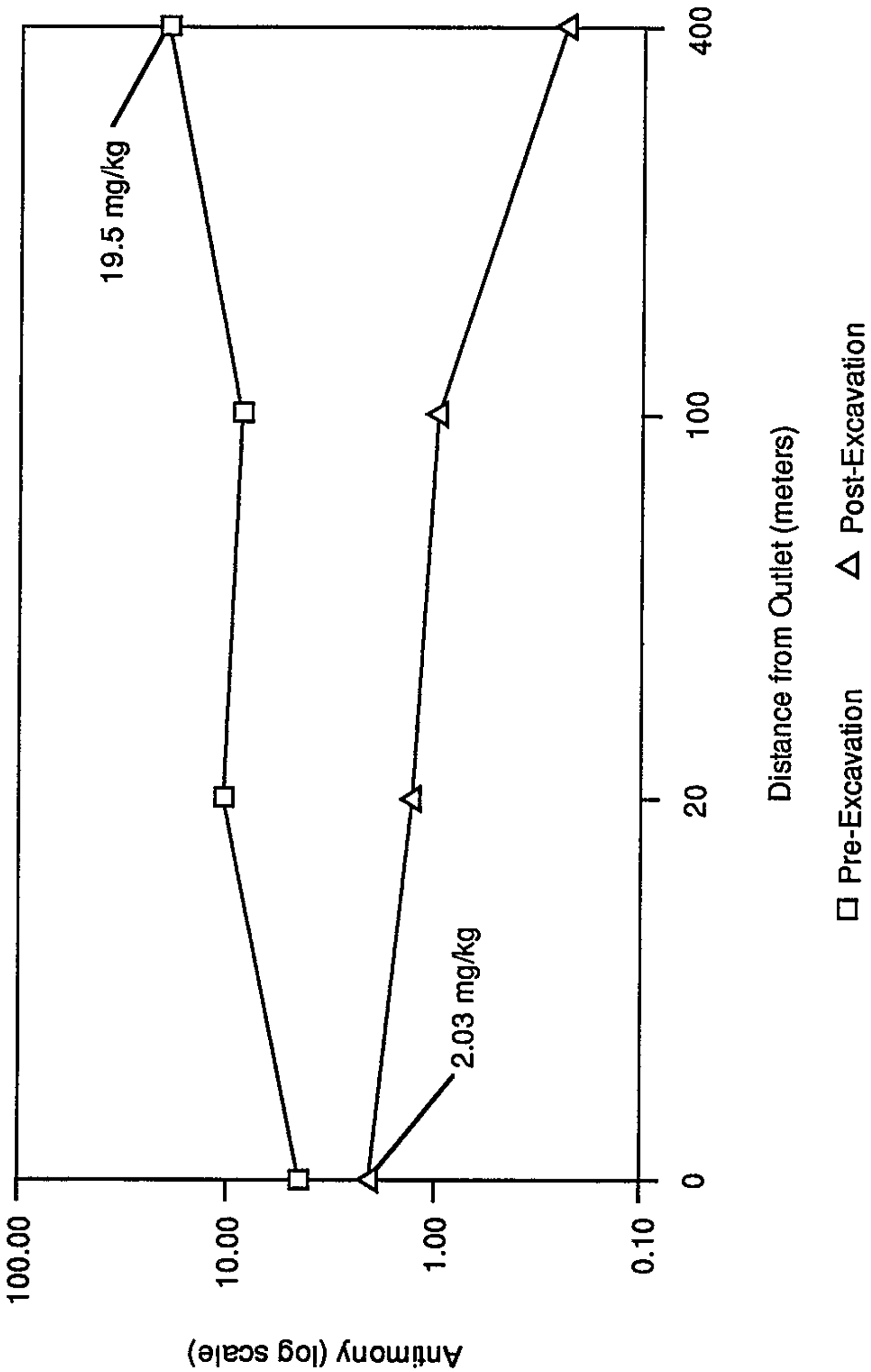
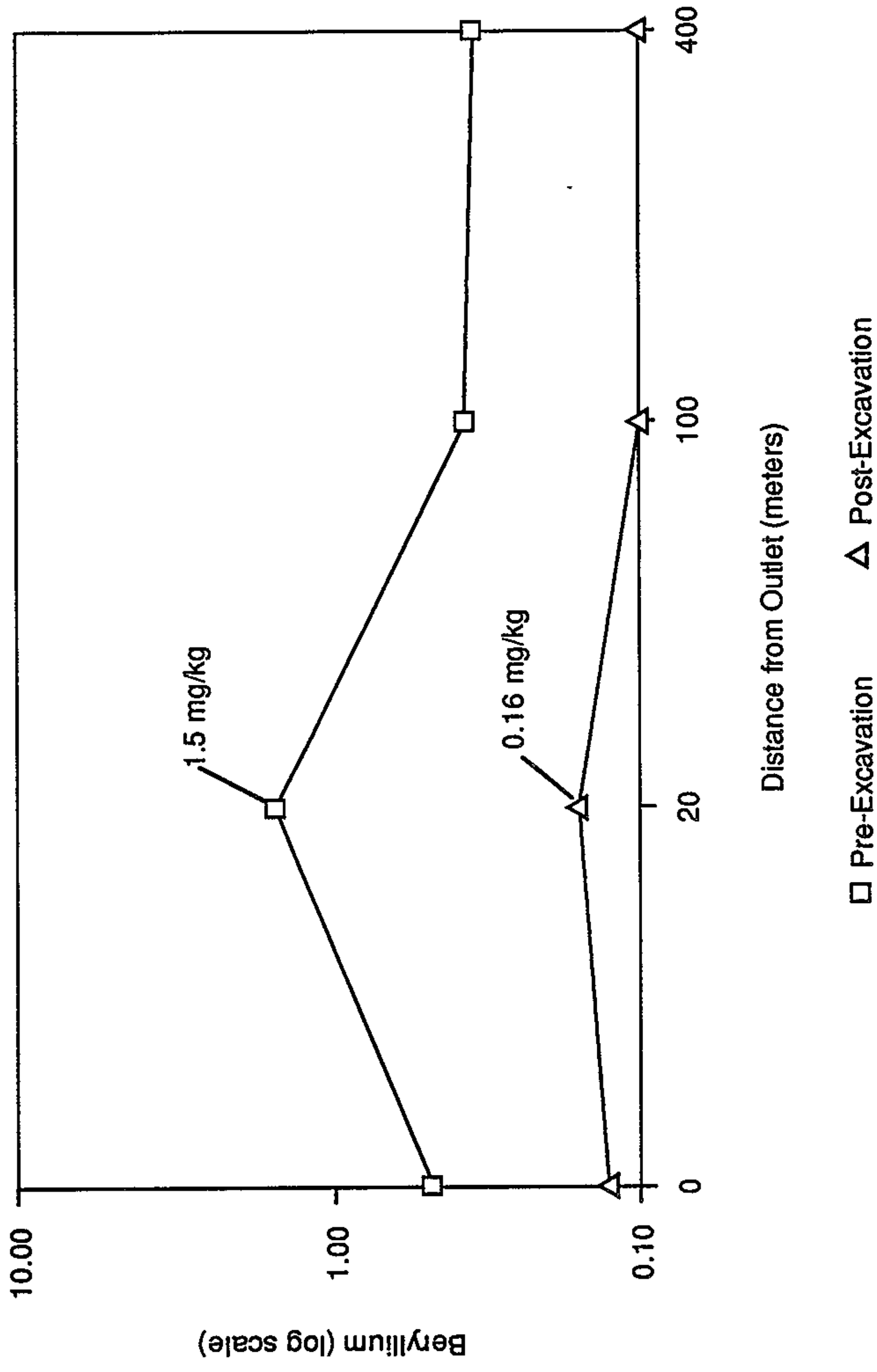
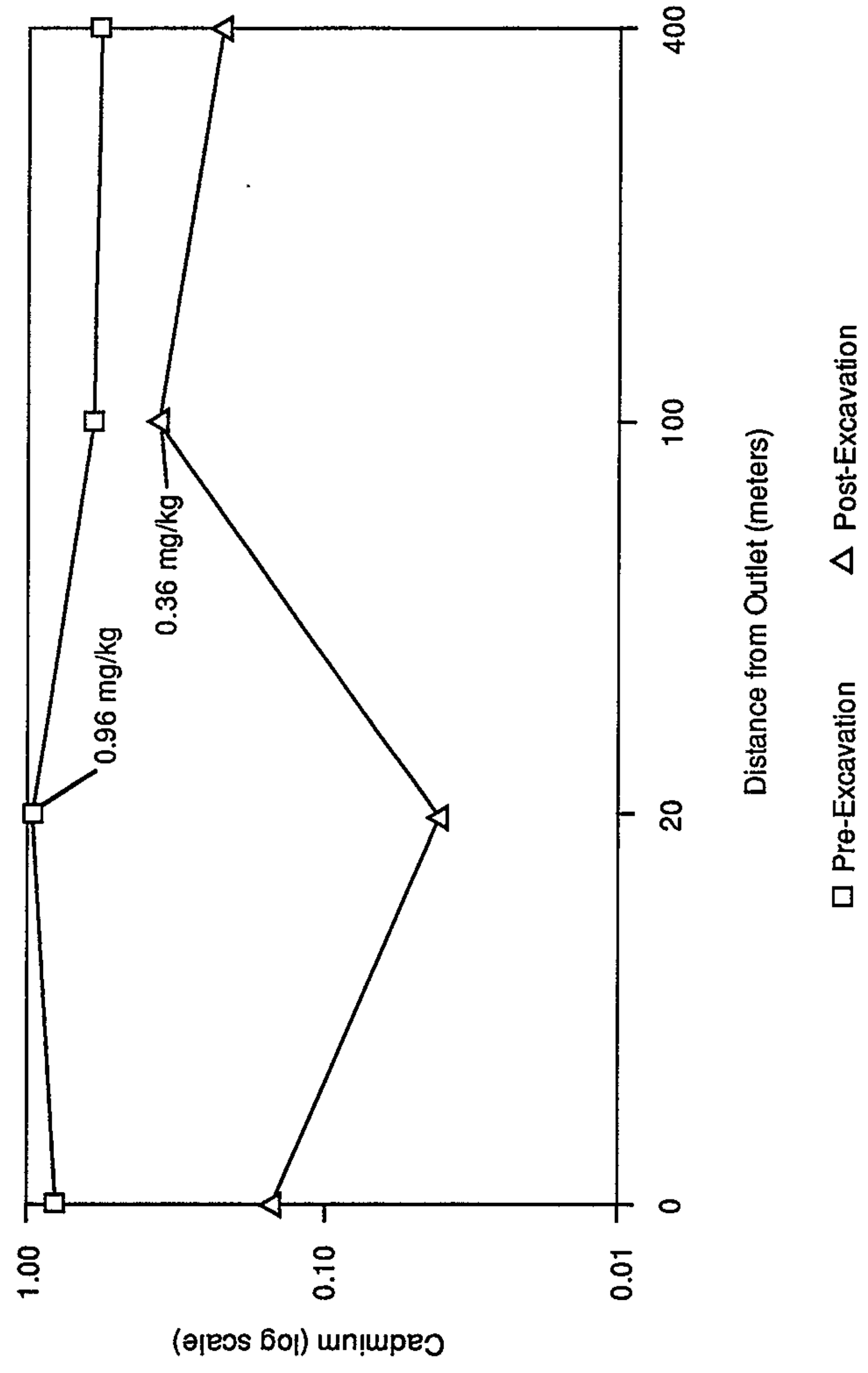


Figure C-8. Beryllium Concentrations from East Process Trench.



9 2 1 2 5 1 3 1 5 5 8

Figure C-9. Cadmium Concentrations from East Process Trench.



9212618 1559

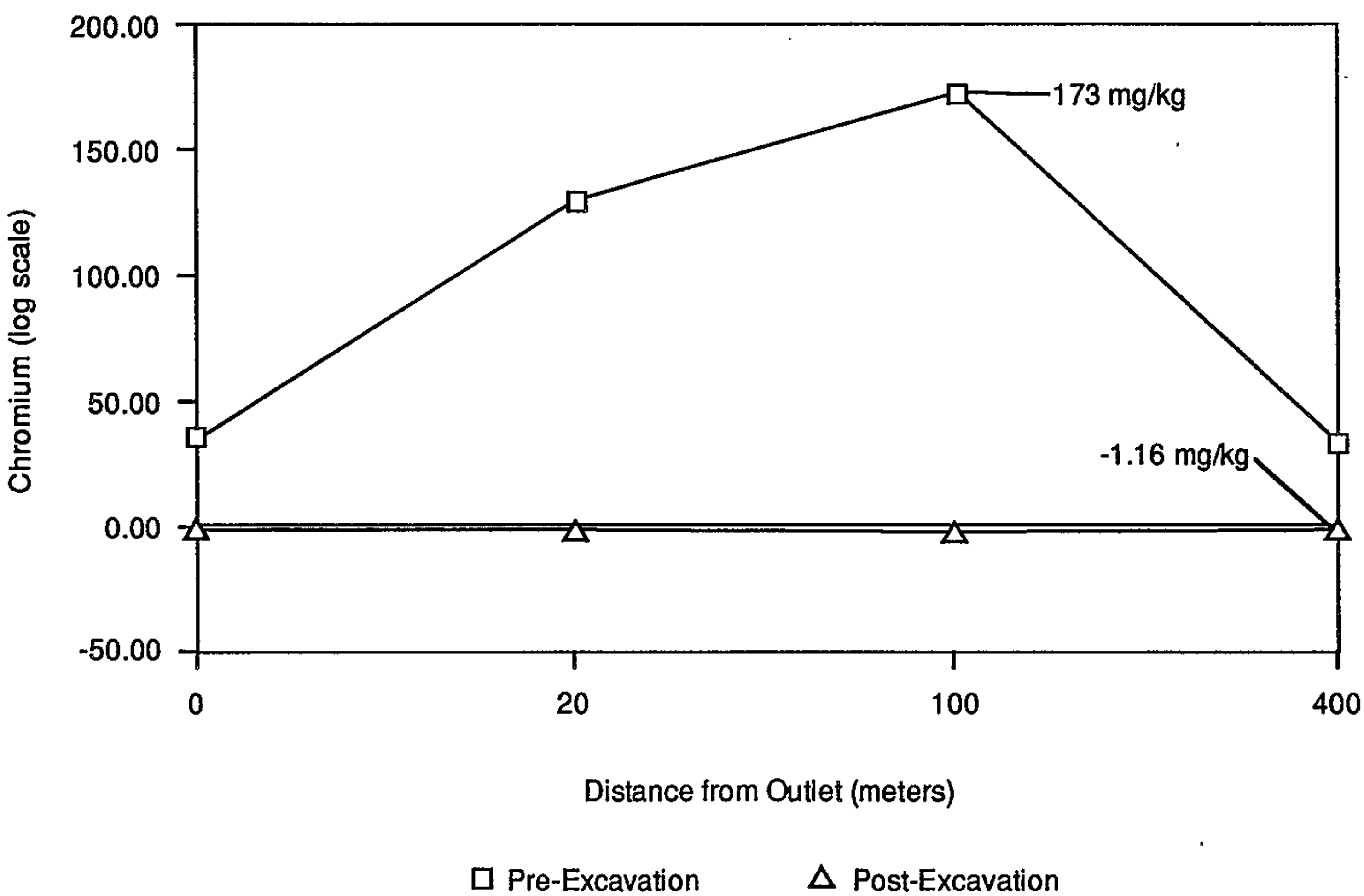
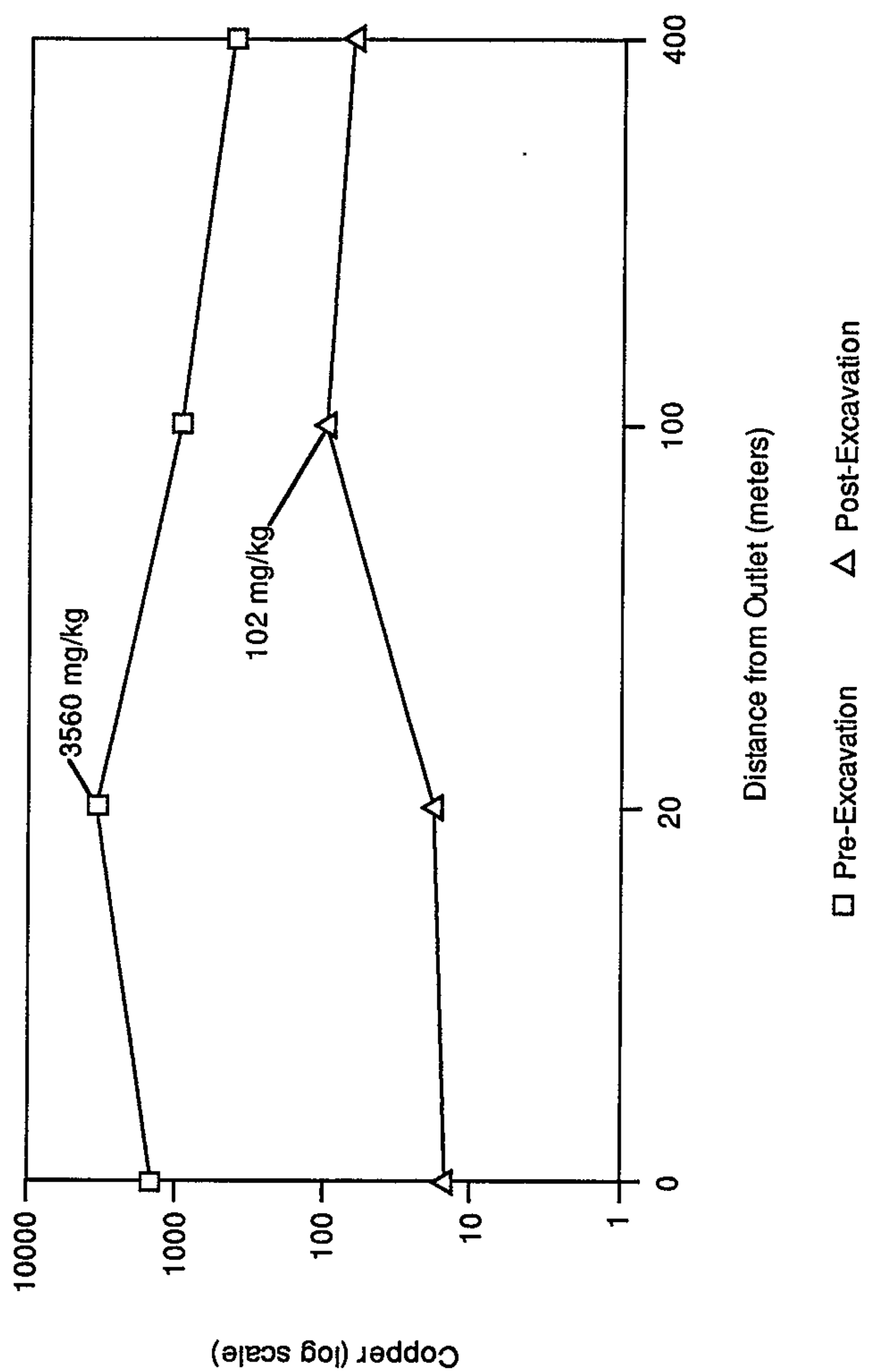


Figure C-10. Chromium Concentrations from East Process Trench.

Figure C-11. Copper Concentrations from East Process Trench.



9 2 1 2 6 4 8 1 5 6 2

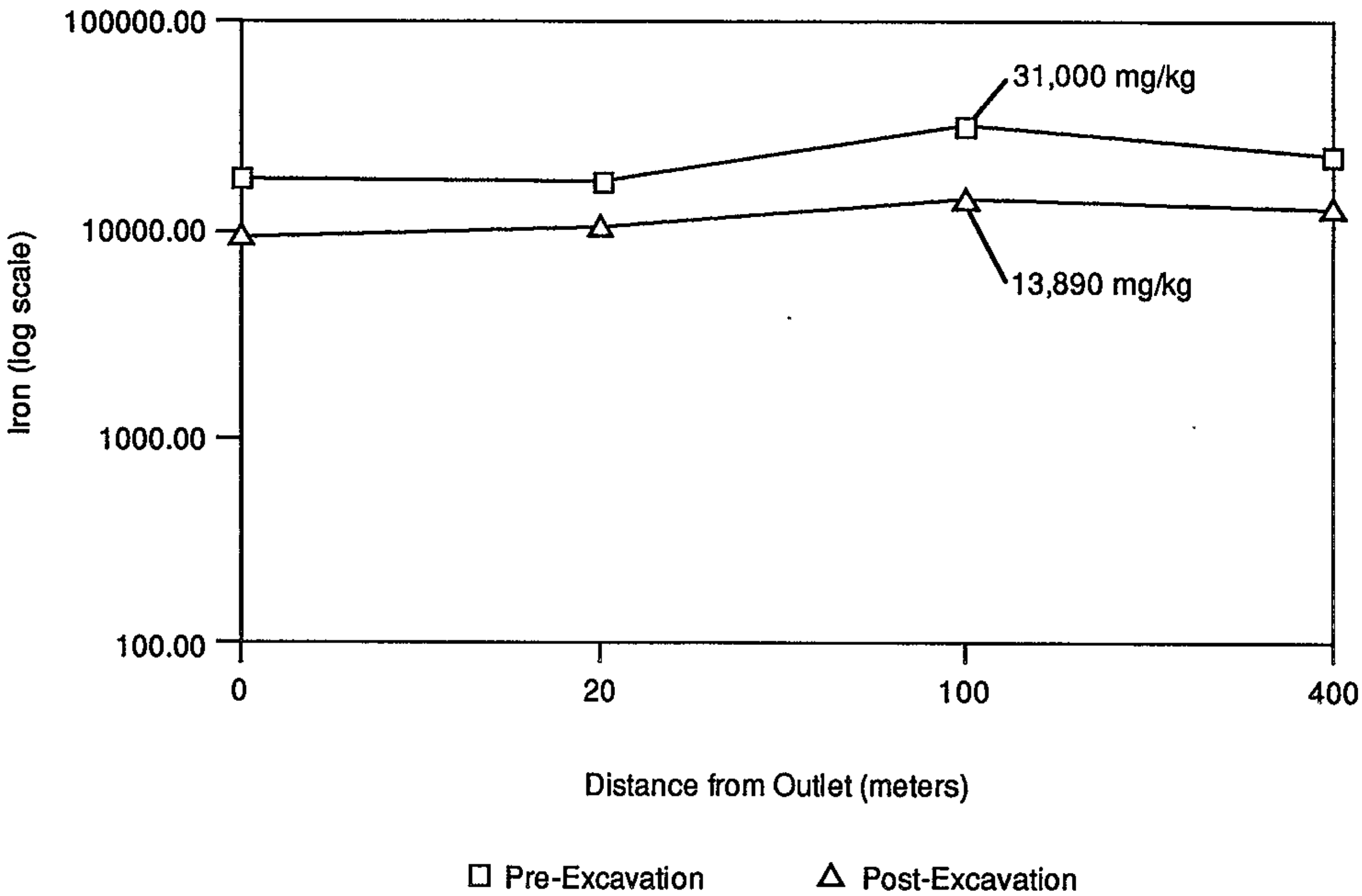


Figure C-12. Iron Concentrations from East Process Trench.

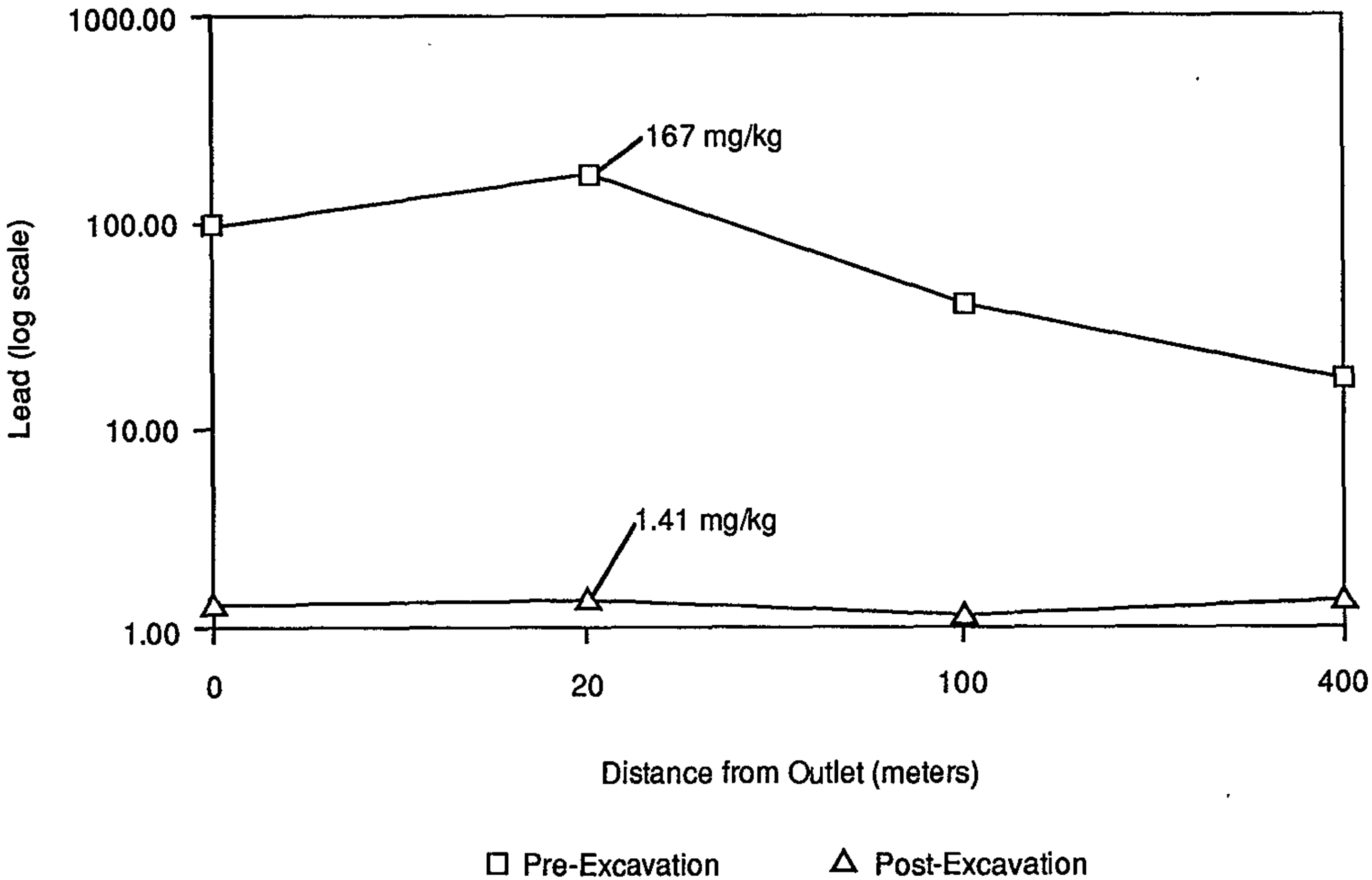
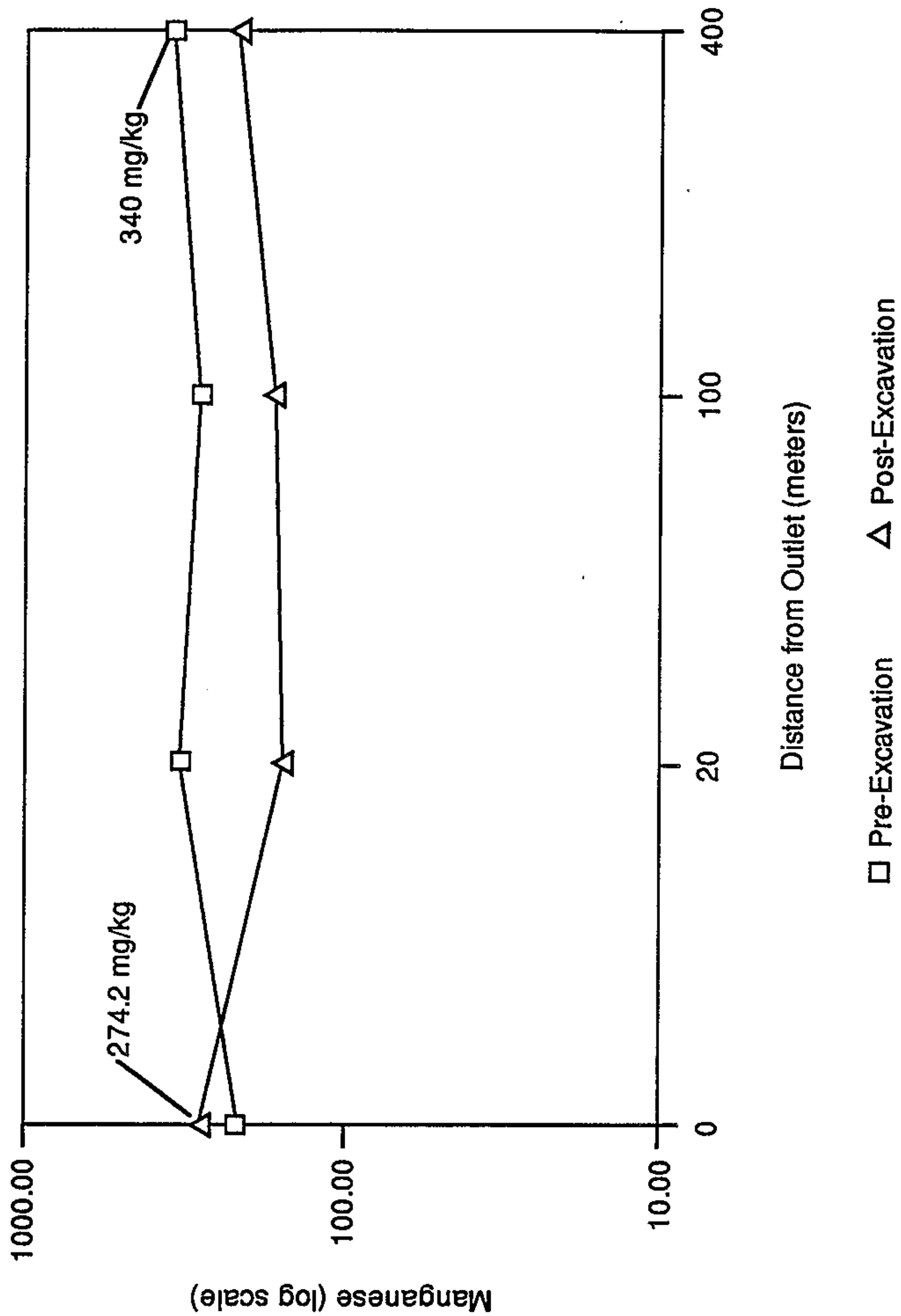


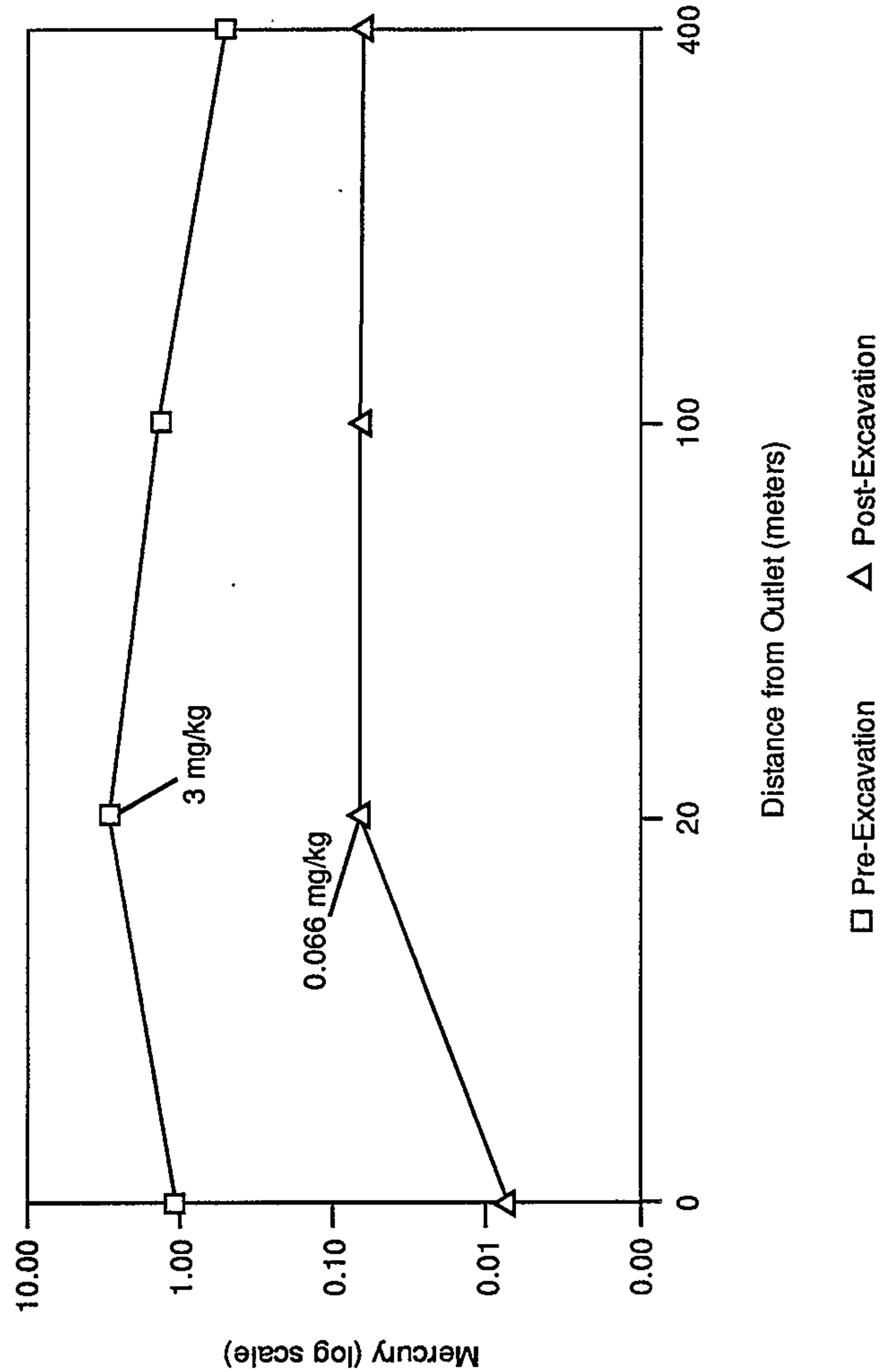
Figure C-13. Lead Concentrations from East Process Trench.

Figure C-14. Manganese Concentrations from East Process Trench.



9 2 1 2 6 4 8 1 5 5 4

Figure C-15. Mercury Concentrations from East Process Trench.



9 2 1 2 6 1 3 1 5 6 6

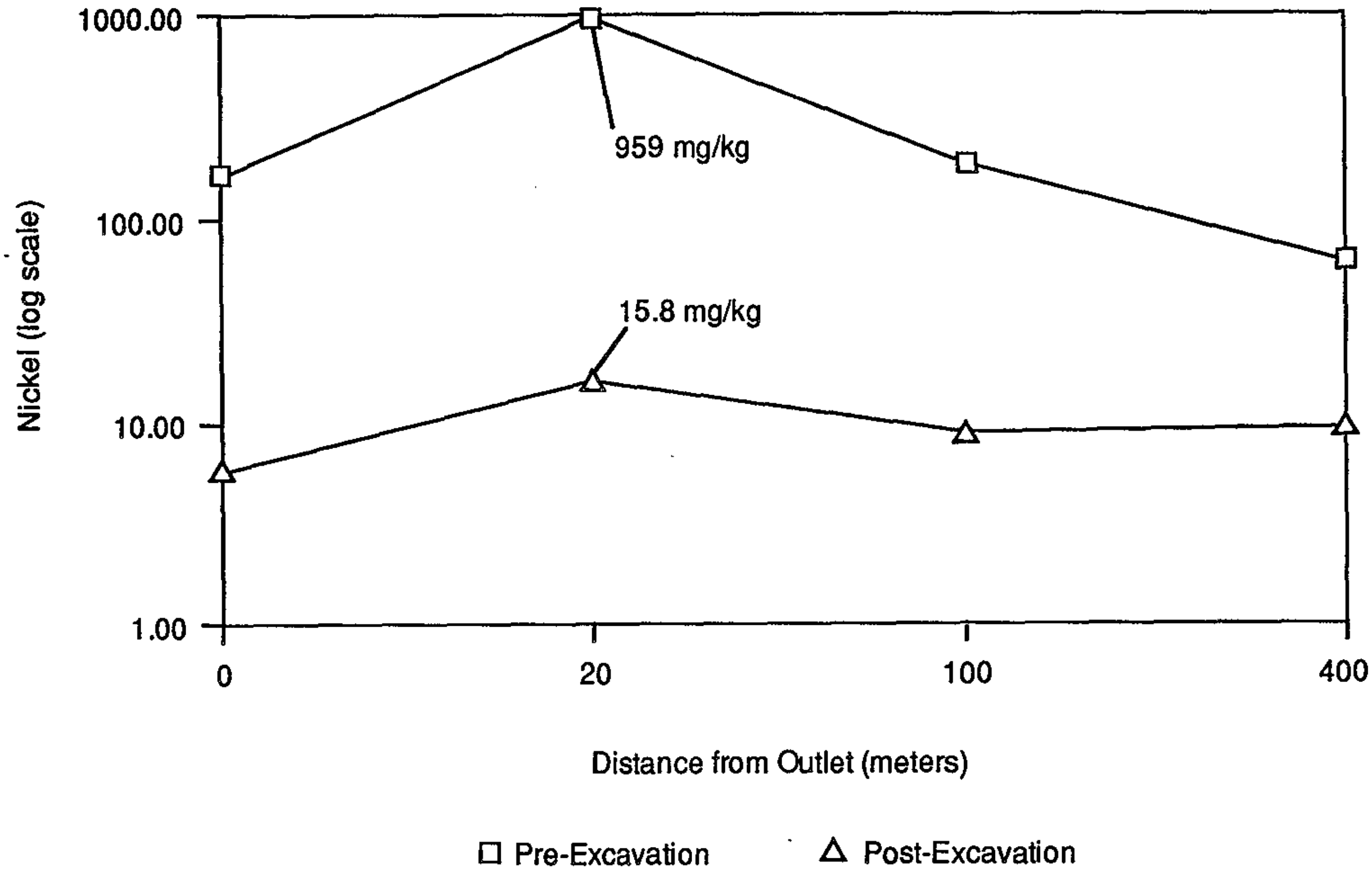


Figure C-16. Nickel Concentrations from East Process Trench.

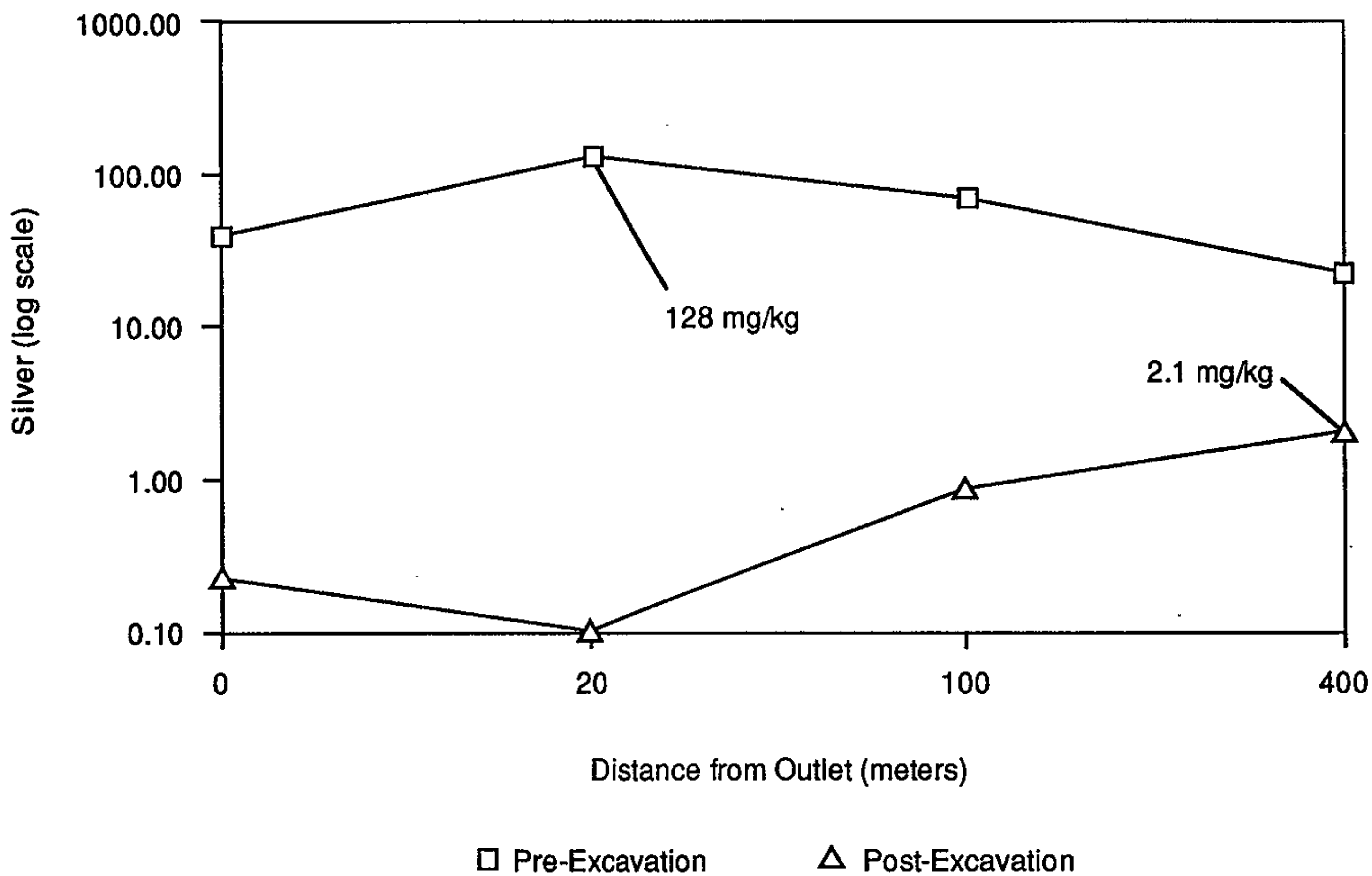


Figure C-17. Silver Concentrations from East Process Trench.

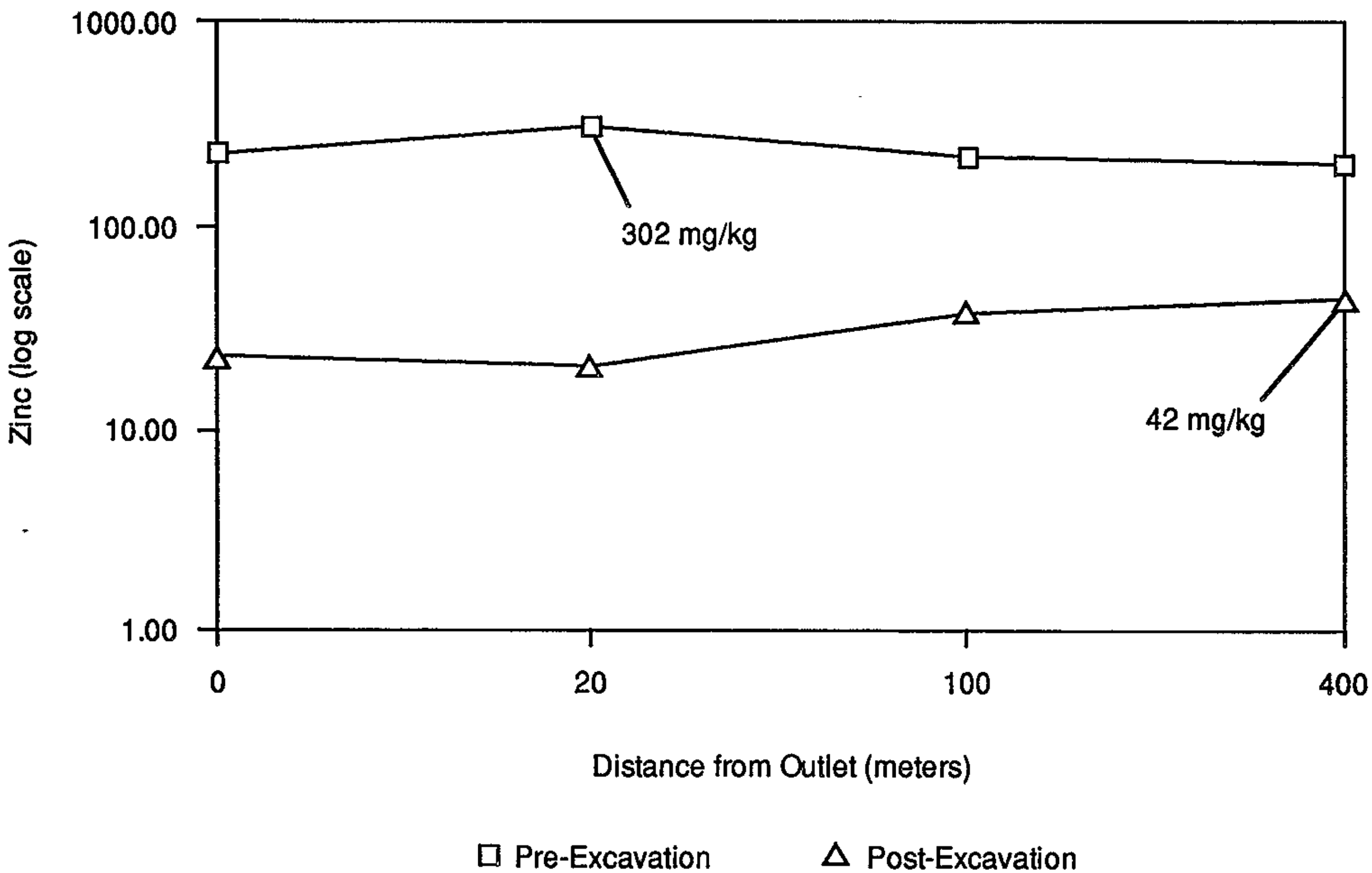


Figure C-18. Zinc Concentrations from East Process Trench.

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