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U.S. Army Corps of Engineers
2,4-D Site Report

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Prepared for: U.S. Army Corps of Engineers
Walla Walla District Corps of Engineers
Regional Airport, Building 614
Walla Walla, WA 99362

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DRAFT

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1.0 PROJECT BACKGROUND/OBJECTIVE

The 2,4-D Site is located in the Hanford North Slope Area (Figure 1) approximately 25 miles north of the city of Richland, Washington. The site is located approximately 0.5 miles east of the Columbia River within Section 35, Township 27 East, Range 14 North. The site consists of an area approximately 60 feet in width by 440 feet in length which runs parallel to the base of a semi-stabilized sand dune which is approximately 60 feet in height (Figure 2). The area had been used to dispose of approximately 50 cubic yards of soil which had been impacted by 2,4-D. The impacted soil had resulted from the release of approximately 900 gallons from storage tanks located in Eltopia, Washington. After disposal of the soils in a shallow trench constructed at the base of the sand dune, the tanks themselves were flattened and buried at the site.

2,4-D is a chlorinated herbicide which was used to control vegetation. The herbicide can be metabolized by bacteria and is generally not as persistent in the environment as are most other herbicides. Previously, eight soil samples were collected at the site using a rotary auger drilling rig and analyzed in the field using a field screening test. Only one sample indicated the presence of 2,4-D, however, laboratory analysis of this sample and other selected samples did not contain detectable levels of chlorinated herbicides.

The objective of the current project was to obtain samples of soil adjacent to and beneath the flattened, buried tanks to assess possible impacts to site soils or groundwater. The project consisted of drilling four inclined borings to approximately 20 feet and the collection of four soil samples from each boring.

There are no surficial signs of the excavation or the buried tanks. The site was previously backfilled and leveled using native materials and native vegetation entirely covers the site. The locations of the tanks were determined using geophysical techniques (see Geophysics Survey, 2,4-D Site, Hanford-North Slope dated April 1994 by Shannon & Wilson, Inc.). Figure 2 shows the boundaries of the tank burial area as determined by geophysical techniques. These boundaries are marked at the site using flagging and were used to determine the drilling points for the current project.

2.0 FIELD INVESTIGATION

On July 19, 1994, an Environmental Technician and a Registered Professional Geologist from Cascade Earth Sciences, Ltd. met with Randy Chong and several representatives of the U.S. Army Corps of Engineers (COE) at the North Slope Job Shack. Two representatives of Environmental West Exploration (the drilling contractor), Driller Bob Sheldon and assistant Wendell Hawley, were also in attendance.

All parties mobilized to the access road to the 2,4-D site where a "tailgate" safety meeting was held from 7:45 am to 8:00 am. Concerns of access to the site from the main road were expressed, especially for the drill rig which was not 4-wheel drive equipped. A discussion of possible health hazards at the site included heat exhaustion, possible chemical exposure, and interaction with area wildlife. After discussions on the level of personal protection equipment (PPE) required by the site, it was determined that a modified Level D (including chemical resistant gloves) would be adequate unless specific site conditions warranted upgrading to respirators and Tyvek.

The driller and a representative of the COE walked the path to the site (approximately one-half mile) to assess the probability of accessing the site. After attempting to access the site, the drill rig became stuck in the loose sand approximately 100 yards from the site. A representative of CES and the COE went to Othello, Washington to purchase plywood to aid in moving the drill rig to the site. From 10:00 a.m. to 10:30 a.m., the drill rig was freed and moved into position at the 2,4-D Site

After walking the site, it was determined (in conjunction with COE representatives) that all four site borings would have to be performed along the eastern edge of the excavation boundary: access to the opposite side could not be accomplished by the drill rig due to the proximity of the sand dune. The borings were to be started approximately 6 feet from the outer edge of the boundary determined by geophysical methods. Figure 2 shows the locations of the four site borings with the electro-magnetic anomaly outline as a reference. The figure also shows the orientation of the inclined borings and the approximate horizontal extent beneath the anomaly after correction for the inclination. Figure 3 presents a cross-section showing the inclined borings and the approximate dimensions of the excavation based on available site information.

Drilling of the first inclined boring (designated S1) was initiated at 10:30 a.m. The orientation of the boring was approximately 235 degrees azimuth and the drilling stems were inclined 30 degrees from the vertical plane. In conjunction with Richard Fink of the COE, it was determined that split-spoon samples would be collected from the 5 to 7 feet, 10 to 12 feet, 15 to 17 feet, and 20 to 22 feet intervals. The second boring (S2) was initiated at 1:45 p.m. Boring S3 was initiated at 4:00 p.m. and S4 was initiated at 6:30 p.m. There was no evidence that the tanks were struck or penetrated during the drilling process.

Samples were collected into laboratory-prepared 9-ounce jars with Teflon-lined lids. The samples were placed on ice in a cooler for transportation to the laboratory. All sampling equipment and the split-spoons were decontaminated using a three-stage process consisting of a tap water wash, an Alconox wash, and a deionized water rinse. The augers and lead bit were steam cleaned between each boring. All decontamination fluids were placed in lined and sealed 55-gallon drums for disposal after sample results were obtained.

Soils encountered consisted of gray, dry to damp, loose, fine to medium-grained sand. Sand consisted of well-sorted, angular to sub-rounded grains predominantly of quartz and lithic fragments with feldspar and lesser white mica. Some samples showed iron-stained bands. No odors or other discolorations were noted. Refer to Appendix A for copies of the boring logs for the four site borings.

3.0 ANALYTICAL RESULTS/CONCLUSIONS

Eighteen soil samples (the four soil samples from each boring and two duplicate soil samples designated S1-S25 and S3-S25) were submitted to Columbia Analytical Services, Inc. (CAS) in Kelso, Washington. Additionally, a sample split from the first boring was provided to representatives of the Washington Department of Ecology and selected quality assurance samples were provided to the COE for analysis at their Troutdale, Oregon laboratory.

The eighteen soil samples collected from the site borings were analyzed for chlorinated herbicides including 2,4-D using EPA Method 8150A modified. No chlorinated herbicides were detected in these soil samples. The method detection limit for 2,4-D is 0.2 mg/Kg (ppm). Refer to the laboratory reports for the method detection limits for other chlorinated herbicides covered by EPA Method 8150A. The official Laboratory Reports and Chain-of-Custody documentation is presented in Appendix B.

Based on the soil samples collected adjacent to and beneath the 2,4-D Site (and submitted to CAS for analysis), the disposal of the tanks used to store 2,4-D have not significantly impacted the soils beneath the filled excavation. Accordingly, if samples analyzed by the COE Laboratory and the Department of Ecology display similar results, no further actions appear to be required to protect human health and the environment at this time. However, the investigation was not designed to discover all possible contaminants at the site. Future actions or changes in site conditions may warrant additional investigation and/or monitoring to protect the environment and/or limit exposure of site personnel.

B:\352059.RPT\COE24-D.RPT

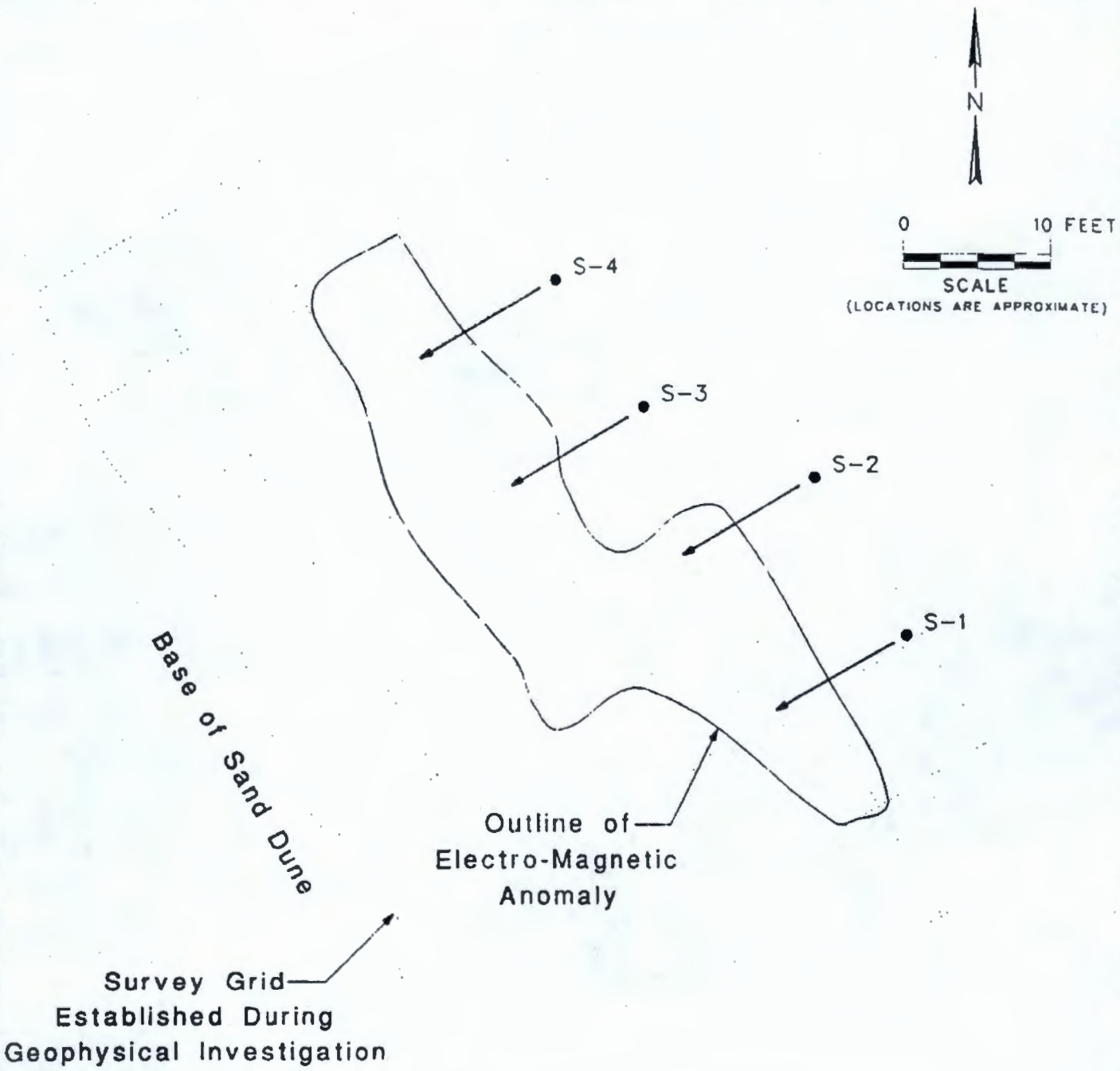
0 5 10

Scale in Miles
1:250,000

FIGURE 1 - Vicinity Map

CORPS OF ENGINEERS
HANFORD 2,4-D SITE

(USGS TOPOGRAPHIC MAP OF WALLA WALLA, WA. 1961)

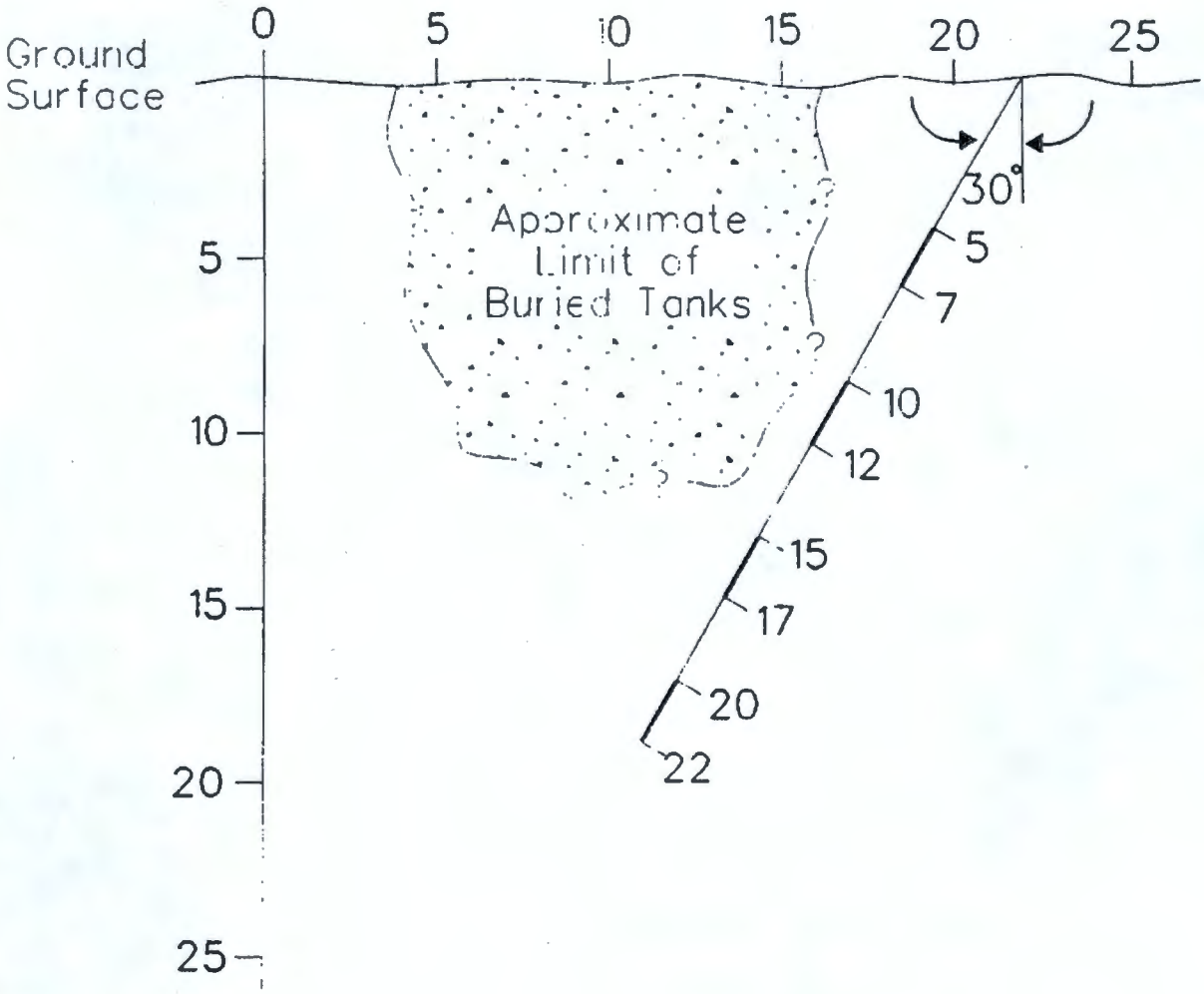


EXPLANATION

S-2 — Boring Location with Direction and Horizontal Extent of Inclined Boring

FIGURE 2 - Site Plan

PROJECT NUMBER 352059	CORPS OF ENGINEERS HANFORD 2,4-D SITE
DATE: 8/25/94	
DWG. NG / DWG NO. 352059F2	HANFORD, NORTH SLOPE
PROJECT MANAGER SWC	
REVISED	CASCADE EARTH SCIENCES, LTD Oregon – Washington – Idaho



EXPLANATION

20
22
Uncorrected sample depth interval

No vertical exaggeration

FIGURE 3 - Cross Section Showing Locations of Soil Sample Collection in Vertical Profile

PROJECT NUMBER 352059	CORPS OF ENGINEERS HANFORD 2,4-D SITE
DATE 8/24/94	
DWG NG / DWG NO 352059F3	HANFORD, NORTH SLOPE
PROJECT MANAGER SWC	
REVISED	CASCADE EARTH SCIENCES, LTD Oregon - Washington - Idaho

PROJECT: COE NORTH SLOPE [illegible]	CES	PROJECT NUMBER: [illegible]	MONITORING WELL LOG: S1
BORING LOCATION: S1 – SOUTHERN BURN SOUTH ANOMALY		[illegible]	
DRILLED BY: Bob Sheldon Environmental [illegible]		[illegible]	COMPLETION DATE: [illegible]
DRILLING EQUIPMENT: B-80 Air Rotary [illegible]		[illegible]	

* TOTAL DEPTH: 10'	* WELL DEPTH: [illegible]	[illegible]	WELLHEAD [illegible] (FT)
FILTER PACK INTERVAL (FT): [illegible]	SIZE: [illegible]	[illegible]	SIZE (IN): –
SEAL INTERVAL (FT): [illegible]	TYPE: Bentonite [illegible]	[illegible]	TYPE: –
GROUND SURFACE ELEV (FT MSL): [illegible]	TOP OF CASING ELEV (FT MSL): [illegible]	[illegible]	STATIC W.L. ELEV (FROM T/C): –

GROUP SYMBOL	DESCRIPTION OF MATERIALS: INTERVAL (FT)	WELL GRAPHIC	SAMPLE: RECOVERY	SAMPLE: TYPE	SAMPLE: NUMBER	REMARKS (DRILLING CONDITIONS, PID READINGS, ETC.)
	SURFACE – Loose fine-grained [illegible] vegetation [illegible] skeleton weed					Ground surface
						5.0–7.0 at 11:00 Easy Drilling
	5.0–7.0 SAND light gray (10YR [illegible]) [illegible] fine-grained with minor medium-[illegible] fragments, much mica [illegible] most fragments are [illegible] All angular-subrounded					
	10.0–11.5 SAND light gray (10YR [illegible]) loose, medium grained [illegible] looser at depth. Abundant [illegible] and dark lithic fragments at [illegible] angular subrounded				S1–S10	10.0–12.0 at 11:10 Easy Drilling
	15.0–17.0 SAND Gray (10YR 6/1) loose [illegible] medium coarse grained [illegible] occassional larger lithic [illegible] All angular-subrounded				S1–S15	15.0–17.0 at 11:30 Easy Drilling
	20.0–22.0 SAND [illegible] medium coarse grained [illegible] no larger [illegible] fragments [illegible] subrounded				[illegible]	20.0–22.0 at 11:45 Easy Drilling Terminate drilling at 20.0' Set up for decon at 12:00 to 12:15. 12:15 to 12:30 fill hole with bentonite grout 235 degrees A, 30 degrees off vertical approx. 6 feet from flags at USTs eastern edge
	Total depth [illegible]					

THIS SUMMARY APPLIES ONLY AT THE LOCATION [illegible] SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT [illegible] THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

* DEPTHS IN FEET BELOW GROUND SURFACE

Best Available Copy

PROJECT	COE NORTH SLOPE [illegible]	PROJECT NUMBER	[illegible]
BORING LOCATION	S1 NORTH BORING SOUTHERN ANOMALY	LOCATED BY	[illegible]
DRILLED BY	Bob Sh[illegible] Environmental [illegible]	START DATE	[illegible]
DRILLING EQUIPMENT	B-8[illegible] Air rotary [illegible]	SAMPLING EQUIPMENT	[illegible] Split spoon

MONITORING WELL [illegible]: S2

*TOTAL DEPTH	20'	*WELL DEPTH	[illegible]
FILTER PACK INTERVAL (FT)	[illegible]		[illegible]
SEAL INTERVAL (FT)	[illegible]		[illegible]
GROUND SURFACE ELEV (FT MSL)	[illegible]		STATIC W.L. ELEV (FROM T/C)

GROUP SYMBOL	INTERVAL (FT)	DESCRIPTION OF [illegible]	SAMPLE TYPE	SAMPLE NUMBER	REMARKS (DRILLING CONDITIONS, PID READINGS, ETC)
		SURFACE [illegible] fine-grained [illegible] Dry vegetation			Ground surface
					[illegible] at 14:00
	5.0-7.0	SAND Light gray [illegible] loose, fine-grained, wit[illegible] subangular-subrounded [illegible] fragments and quartz [illegible]			
	10.0-11.5	SAND Light gray [illegible] loose, medium-coarse grained [illegible] some iron-stained bands [illegible] bands, brownish yellow [illegible] grains subangular subrounded		S2-S10	10.0-12.0 at 14:10
	15.0-17.0	SAND Gray [illegible] medium to coarse grained [illegible] lithic fragments and some [illegible] granule-sized lithic clasts [illegible] stained		S2-15	15.0-17.0 at 14:30
	20.0-22.0	SAND Light gray [illegible] medium coarse grained Abundant [illegible] fragments and quartz some large [illegible] clasts As above [illegible] fragments approx [illegible] approx 70% feldspar [illegible] approx 10%		S2-S20	20.0-22.0 at 14:45 Terminate drilling at 20.0' 35 degrees A, 30 degrees from vertical approx [illegible] from flaging
		[illegible] Depth [illegible] ft			

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF [illegible] AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT [illegible] TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

* DEPTHS IN FEET BELOW GROUND SURFACE

Best Available Copy

PAGE [illegible]

PROJECT: COE NORTH SLOPE [illegible]	CES	PROJECT NUMBER: [illegible]	MONITORING WELL [illegible] S3
BORING LOCATION: S3 [illegible] SOUTH [illegible] NORTH ANOMAL		[illegible]	
DRILLED BY: Bob Sheldon [illegible]		[illegible]	[illegible]
DRILLING EQUIPMENT: [illegible] 80 Air [illegible]		[illegible]	

* TOTAL DEPTH: 20'	* WELL DEPTH: [illegible]	[illegible]	WELLHEAD [illegible]
FILTER PACK INTERVAL (FT): [illegible]		[illegible]	
SEAL INTERVAL (FT): [illegible] 20 [illegible]		[illegible]	TYPE: [illegible]
GROUND SURFACE ELEV. (FT MSL):	TOP OF [illegible] ELEV. [illegible]	[illegible]	STAT. ELEV. [illegible] W.L. FROM T.O.C.

GROUP SYMBOL	DESCRIPTION OF [illegible] INTERVAL (FT)	DEPTH [illegible]	W.L. [illegible]	SAMPLE RECOVERY	SAMPLE TYPE	SAMPLE NUMBER	REMARKS DRILLING CONDITION, PID READINGS, ETC.
	[illegible] AGE Loose fine-grained [illegible] Dry vegetation						Ground surface
							15.0-17.0 at 16:20
	5.0-[illegible] SAND Light gray [illegible] loose, fine-grained [illegible] Grains are subangular [illegible]						
	10.0-11.5 SAND light gray [illegible] damp, loose, medium [illegible] with occasional larger (pebble [illegible]) fragments of volcanic [illegible] stained band approx [illegible]						10.0-12.0 at 16:30
	15.0-17.0 SAND Gray (10YR [illegible]) loose, damp, coarse grained with abundant lithic clasts (dark, 1 mm to 2 mm approx 40%). Occasional large [illegible] volcanic lithic clasts [illegible] smaller silt clasts						15.0-17.0 at 16:40
	20.0-22.0 SAND Light gray [illegible] medium coarse grained with [illegible] coarser sand clasts to [illegible] Quartz approx 35%, feldspar [illegible] 25%, lithic fragments approx [illegible] and etc. approx 10%. All su[illegible] surrounded						20.0-22.0 at 16:50 Terminate drilling at 20.0 [illegible]35 degrees A, 30 degrees from vertical approx 6 feet from flaging
	Total Depth= 20 ft						

THIS SUMMARY APPLIES ONLY AT THE [illegible] THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MA[illegible] THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS [illegible]

* DEPTHS IN FEET BELOW GROUND SURFACE.

Best Available Copy

PROJECT: [illegible] NORTH [illegible]	CES	PROJECT NUMBER: [illegible]	MONITORING WELL LOG: S4
BORING LOCATION: S4 - NORTH [illegible] NORTH ANDOVER			
DRILLED BY: Hot Shelter, Environmental [illegible]		START DATE: [illegible]	COMPLETION DATE: [illegible]
DRILLING EQUIPMENT: [illegible]-80 Air Rotary Auger		SAMPLING EQUIPMENT: [illegible]	

*TOTAL DEPTH: [illegible]	*WELL DEPTH: [illegible]	[illegible]	WELLHEAD [illegible]
FILTER PACK INTERVAL (FT): [illegible]		[illegible]	[illegible]
SEAL INTERVAL (FT): [illegible] 20 [illegible]		[illegible]	TYPE: [illegible]
GROUND SURFACE ELEV. (FT MSL): [illegible]	TOP OF CASING ELEV. (FT MSL): [illegible]	[illegible]	STATIC W.L. ELEV. (FROM T/C): [illegible]

GROUP SYMBOL	INTERVAL (FT)	DESCRIPTION OF [illegible]	[illegible]	[illegible]	SAMPLE RECOVER	SAMPLE TYPE	SAMPLE NUMBER	REMARKS (DRILLING CONDITIONS, PID READINGS, ETC.)
		SURFACE - Loose fine-grained [illegible] Dry vegetation						Ground surface
								[illegible] at 18:4[illegible]
	5.0-[illegible]	SAND: Light [illegible] loose, fine grained, well [illegible] fines. Mica, quartz [illegible] feldspar						
	10.0-[illegible]	SAND: light gray (10YR [illegible]) loose, medium grained with [illegible] downward to fine grained [illegible] iron stained zones approx. [illegible] lithology same as above						10.0-12.0 at 19:00
	15.0-17.0	SAND: Gray (10YR [illegible]) loose, damp, medium grained with [illegible] graded sand clasts. Lithology same as above. All subangular to [illegible]			2	2.0	4 [illegible]	15.0-17.0 at 19:15
	20.0-[illegible]	SAND: Light gray [illegible] loose, medium grained [illegible]						20.0-22.0 at 19:40
		Total Depth [illegible]						Terminate drilling at [illegible] [illegible] degrees [illegible] 30 degrees from vertical approx. 6 feet from tagging

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF [illegible] DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT [illegible] TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

* DEPTHS IN FEET BELOW GROUND SURFACE

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Columbia Analytical Services inc.

August 12, 1994

Service Request No.: K944396

Stuart Childs
Cascade Earth Sciences, Ltd.
7515 N.E. Ambassador Place
Portland, OR 97220

Re: **2,4-D Hanford North Slope/Project #94-458**

Dear Stuart:

Enclosed are the results of the sample(s) submitted to our laboratory on July 21, 1994. For your reference, these analyses have been assigned our service request number K944396.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 208.

Respectfully submitted,

Columbia Analytical Services, Inc.

Kevin DeWhitt
Quality Assurance Coordinator

KD/td

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	U. S. Army Corps of Engineers	**Date Received:**	07/21/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Analyzed:**	07/28/94
Sample Matrix:	Soil	**Work Order No.:**	K944396

Solids, Total
EPA Method Modified 160.3
Percent (%)

Sample Name	Lab Code	Result
94-24D-S3-S5	K944396-001	76.7
94-24D-S3-S10	K944396-002	97.8
94-24D-S3-S15	K944396-003	81.5
94-24D-S3-S20	K944396-004	93.7
94-24D-S3-S25	K944396-005	98.1
94-24D-S4-S5	K944396-006	97.8
94-24D-S4-S10	K944396-007	77.6
94-24D-S4-S15	K944396-008	97.8
94-24D-S4-S20	K944396-009	96.8
94-2,4D,S1-S5	K944396-010	92.6

Approved by _____ Date 8-12

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	U. S. Army Corps of Engineers	**Date Received:**	07/21/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Analyzed:**	07/28/94
Sample Matrix:	Soil	**Work Order No.:**	K944396

Solids, Total
EPA Method Modified 160.3
Percent (%)

Sample Name	Lab Code	Result
94-2,4D,S1-S10	K944396-011	91.1
94-2,4D-S1-S15	K944396-012	79.3
94-24D-S1-S20	K944396-013	96.8
94-24D-S1-S25	K944396-014	92.9
94-24D-S2-S5	K944396-015	92.0
94-24D-S2-S10	K944396-016	97.7
94-24D-S2-S15	K944396-017	91.4
94-24D-S2-S20	K944396-018	97.5

Approved by [signature] Date 8.12

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	US Army Corps of Engineers	Date Collected:	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	Date Received:	7/21/94
Sample Matrix:	Soil	Date Extracted:	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units mg/Kg (ppm)
Dry Weight Basis

Sample Name:		94-24D-S3-S5	94-24D-S3-S10	94-24D-S3-S15
Lab Code:		K4396-001	K4396-002	K4396-003
Date Analyzed:		8/3/94	8/3/94	8/3/94
Analyte	**MRL**			
Dalapon	1	ND	ND	ND
MCPP	20	ND	ND	ND
Dicamba	0.1	ND	ND	ND
MCPA	20	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND
2,4-D	0.2	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND
Dinoseb	0.5	ND	ND	ND
2,4-DB	0.5	ND	ND	ND

Approved By [signature] Date 8-12

K4396HRA.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC

Analytical Report

Client:	US Army Corps of Engineers	Date Collected:	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	Date Received:	7/21/94
Sample Matrix:	Soil	Date Extracted:	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name:		94-24D-S3-S20	94-24D-S3-S25	94-24D-S4-S5
Lab Code:		K4396-004	K4396-005	K4396-006
Date Analyzed:		8/3/94	8/3/94	8/3/94
Analyte	**MRL**			
Dalapon	1	ND	ND	ND
MCPP	20	ND	ND	ND
Dicamba	0.1	ND	ND	ND
MCPA	20	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND
2,4-D	0.2	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND
Dinoseb	0.5	ND	ND	ND
2,4-DB	0.5	ND	ND	ND

Approved By [signature] Date 8-12

S4396HRA.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	US Army Corps of Engineers	Date Collected:	7/19/94
Project:	2,4-D Hanford North Slope#94-458	Date Received:	7/21/94
Sample Matrix:	Soil	Date Extracted:	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name:		94-24D-S4-S10	94-24D-S4-S15	94-24D-S4-S20
Lab Code:		K4396-007	K4396-008	K4396-009
Date Analyzed:		8/3/94	8/3/94	8/3/94
Analyte	**MRL**			
Dalapon	1	ND	ND	ND
MCPP	20	ND	ND	ND
Dicamba	0.1	ND	ND	ND
MCPA	20	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND
4-D	0.2	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND
Dinoseb	0.5	ND	ND	ND
2,4-DB	0.5	ND	ND	ND

Approved By [signature] Date 8-12

S4396HRA.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ıent:	US Army Corps of Engineers	Date Collected:	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	Date Received:	7/21/94
Sample Matrix:	Soil	Date Extracted:	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name:		94-2,4D,S1-S5	94-2,4D,S1-S10	94-2,4D-S1-S15
Lab Code:		K4396-010	K4396-011	K4396-012
Date Analyzed:		8/3/94	8/3/94	8/3/94
Analyte	**MRL**			
Dalapon	1	ND	ND	ND
MCPP	20	ND	ND	ND
Dicamba	0.1	ND	ND	ND
MCPA	20	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND
-D	0.2	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND
Dinoseb	0.5	ND	ND	ND
2,4-DB	0.5	ND	ND	ND

Approved By _____ Date 8-12

K4396HRA.XLS/8/12/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	US Army Corps of Engineers	Date Collected:	7/19/94
Project:	2,4-D Hanford North Slope #94-458	Date Received:	7/21/94
Sample Matrix:	Soil	Date Extracted:	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units mg/Kg (ppm)
Dry Weight Basis

Sample Name:		94-24D-S1-S20	94-24D-S1-S25	94-24D-S2-S5
Lab Code:		K4396-013	K4396-014	K4396-015
Date Analyzed:		8/3/94	8/3/94	8/3/94
Analyte	**MRL**			
Dalapon	1	ND	ND	ND
MCPP	20	ND	ND	ND
Dicamba	0.1	ND	ND	ND
MCPA	20	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND
-D	0.2	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND
Dinoseb	0.5	ND	ND	ND
2,4-DB	0.5	ND	ND	ND

Approved By [signature] Date 8-12

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	US Army Corps of Engineers	**Date Collected:**	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	7/21/94
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units mg/Kg (ppm)
Dry Weight Basis

	Sample Name:	94-24D-S2-S10	94-24D-S2-S15	94-24D-S2-S20
	Lab Code:	K4396-016	K4396-017	K4396-018
	Date Analyzed:	8/3/94	8/3/94	8/3/94
Analyte	**MRL**			
Dalapon	1	ND	ND	ND
MCPP	20	ND	ND	ND
Dicamba	0.1	ND	ND	ND
MCPA	20	ND	ND	ND
Dichloroprop	0.1	ND	ND	ND
4-D	0.2	ND	ND	ND
2,4,5-TP (Silvex)	0.05	ND	ND	ND
2,4,5-T	0.05	ND	ND	ND
Dinoseb	0.5	ND	ND	ND
2,4-DB	0.5	ND	ND	ND

Approved By _____ Date 8-12

S4396HRA.XLS/8/9/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ient:	US Army Corps of Engineers	**Date Collected:**	NA
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	NA
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Service Request:	K944396

Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name:	Method Blank
Lab Code:	K4396-MB
Date Analyzed:	8/3/94

Analyte	**MRL**	
Dalapon	1	ND
MCPP	20	ND
Dicamba	0.1	ND
MCPA	20	ND
Dichloroprop	0.1	ND
4-D	0.2	ND
2,4,5-TP (Silvex)	0.05	ND
2,4,5-T	0.05	ND
Dinoseb	0.5	ND
2,4-DB	0.5	ND

Approved By _____ Date 8-12

APPENDIX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

.ent:	US Army Corps of Engineers	**Date Collected:**	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	**Date Received:**	7/21/94
Sample Matrix:	Soil	**Date Extracted:**	7/28/94
		Date Analyzed:	8/3/94
		Service Request:	K944396

Surrogate Recovery Summary
Chlorinated Herbicides
EPA Method Modified 8150A

Sample Name	**Lab Code**	**Percent Recovery** 2,4-Dichlorophenylacetic Acid
94-24D-S3-S5	K4396-001	61
94-24D-S3-S10	K4396-002	72
94-24D-S3-S15	K4396-003	66
94-24D-S3-S20	K4396-004	75
94-24D-S3-S25	K4396-005	70
24D-S4-S5	K4396-006	76
94-24D-S4-S10	K4396-007	60
94-24D-S4-S15	K4396-008	50
94-24D-S4-S20	K4396-009	64
94-2,4D,S1-S5	K4396-010	70
94-2,4D,S1-S10	K4396-011	73
94-2,4D-S1-S15	K4396-012	75
94-24D-S1-S20	K4396-013	66
94-24D-S1-S25	K4396-014	70
94-24D-S2-S5	K4396-015	69
94-24D-S2-S10	K4396-016	64
94-24D-S2-S15	K4396-017	60
94-24D-S2-S20	K4396-018	71
94-24D-S3-S20	K4396-004MS	69
94-24D-S3-S20	K4396-004DMS	71
Lab Control Sample	K4396-LCS	74
Method Blank	K4396-MB	67

CAS Acceptance Limits: 36-116

Approved By [signature] Date 8-12

S4396HRA.XLS/8/12/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	US Army Corps of Engineers	Date Collected:	7/19/94
Project:	2,4-D Hanford North Slope/#94-458	Date Received:	7/21/94
Sample Matrix:	Soil	Date Extracted:	7/28/94
		Date Analyzed:	8/3/94
		Service Request:	K944396

Matrix Spike/Duplicate Matrix Spike Summary
Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name 94-24D-S3-S20
Lab Code: K4396-004

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference
2,4-D	0.24	0.25	ND	0.23	0.22	96	88	35-125	9
2,4,5-TP (Silvex)	0.08	0.08	ND	0.06	0.06	75	75	33-108	<1
2,4,5-T	0.08	0.08	ND	0.06	0.06	75	75	32-108	<1

Approved By [signature] Date 8-12

S4396HRS XLS/8/4/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	US Army Corps of Engineers	**Date Collected:**	NA
Project:	2,4-D Hanford North Slope #94-458	**Date Received:**	NA
LCS Matrix:	Soil	**Date Extracted:**	7/28/94
		Date Analyzed:	8/3/94
		Service Request:	K944396

Laboratory Control Sample Summary
Chlorinated Herbicides
EPA Method Modified 8150A
Units: mg/Kg (ppm)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
2,4-D	0.23	0.21	91	49-115
2,4,5-TP (Silvex)	0.08	0.06	75	40-96
2,4,5-T	0.08	0.06	75	43-105

Approved By [signature] Date 8-12

S4396HRL.XLS/8/9/94

APPENDIX B

CHAIN OF CUSTODY INFORMATION

CHAIN OF CUSTODY RECORD

.UE EARTH SCIENCES, Ltd.

Shipped From:

( ) Albany	3425 Spicer Dr., OR 97	(503) 926-7737	( ) Medford	1133 S Riverside #22	
( ) Bend	354 N.E. Greenwood Ave., OR 97701	(503) 385-5068	( ) Pocatello	PO Box 2379, ID 83206	(208) 237-7041
( ) LaGrande	PO Box 2737, OR 97850	(503) 963-7758	(X) Portland	7515 N.E. Ambassador Pl., OR 972	(503) 282-7502
			( ) Spokane	PO Box 14725, WA 99214	(509) 921-0290

Hanford North Slope PN: 352059
Normal Sampling Date: 7-19-94
Se ort To: Stuart Child's Location: Portland
QA/QC Requirements: YES
Provide Preliminary Results: Verbal / Fax (circle) Fax Number:
Laboratory Name: CAS
Address 1317 S. 13th AVE Kelso WA
Contact: Kevin D Phone # 577-7222

SAMPLE I.D	DATE	TIME	LAB I.D.	PRESERV-ATIVE	SAMPLE MATRIX	ORGANIC ANALYSIS: Volatile Organic GC/MS 624/8240	Semi-Volatile Organic GC/MS 625/8270	Halogenated Volatiles 601/8010	Aromatic Volatiles 602/8020 BTEX	Total Petroleum Hydrocarbons HCID G D (circle)	Total Petroleum Hydrocarbons EPA 418.1 418.1 MOD (circle)	Total Organic Carbon (TOC) 415/9060	Polyaromatic Hydrocarbons (PAH) 8310 8100 8270 (circle)			INORGANIC ANALYSIS: TCLP Metals As,Ba,Cd,Cr,Pb,Hg,Se,Ag	Metals (total or dissolved) List	Extractable Bases (circle) Ca,Na,Mg,K	Ph,Cond,Cl,SO_4,PO_4,F,Br NO_2,NO_3 (circle)	NH_3N,COD,Total-P,TKN (circle)	OTHER			NUMBER OF CONTAINERS
94-24D-S3-S5	7-19	16:20		NONE	SOIL					8150		Herbicides												1
94-24D-S3-S10		16:30																						1
94-24D-S3-S15		16:40																						
94-24D-S3-S20		17:10																						
94-24D-S3-S25		17:10																						
94-24D-S4-S5		18:45																						
94-24D-S4-S10		19:00																						
94-24D-S4-S15		19:20																						
94-24D-S4-S20		19:40																						
9.																								
10.																								
11.																								
12.																								

COMMENTS:

INVOICE INFORMATION
P.O. No.:
Bill To:

SHIPMENT INFORMATION
Shipped via: Sample Receipt:
Seals Intact: Condition:
Temp When Rcd.: °C Seal No.:
Samples Collected By: D. Mascarenas

Relinquished By:	Company:	Date/Time:	Received By:	Company:
D. Mascarenas	Cascade Earth Sci	7-21-94 1300	D. Stoms	CAS 7/22/94
Relinquished By:	Company:	Date/Time:	Received By:	Company:
Relinquished By:	Company:	Date/Time:	Received By:	Company:

Laboratory:
Please Return Original (White) with Results

White - CES Yellow - Laboratory Pink - Sender

CHAIN OF CUSTODY RECORD/LABORATORY ANALYSIS REQUEST FORM

CASCADE EARTH SCIENCES, Ltd.

Shipped From:
( ) Albany 3425 Spicer Dr., OR 97321 (503) 926-7737
( ) Bend 354 N.E. Greenwood Ave., OR 97701 (503) 385-5068
( ) LaGrande PO Box 2737, OR 97850 (503) 963-7758
( ) Medford 1133 S Riverside #22, OR 97501 (503) 779-2280
( ) Pocatello PO Box 2379, ID 83206 (208) 237-7041
(X) Portland 7515 N.E. Ambassador Pl., OR 97220 (503) 282-7502
( ) Spokane PO Box 14725, WA 99214 (509) 921-0290

Project: 2,4-D Hanford North Slope PN: 352059
Turn Around: normal Sampling Date: 7-19-94
Send Report To: Stuart Childs Location: PORTLAND
QA/QC Requirements: YES
Provide Preliminary Results: ___ Verbal / Fax (circle) Fax Number: ___
Laboratory Name: CAS
Address 1317 S. 13th AVE Kelso, WA 98626
Contact KEVIN D Phone # 206 577-7222

SAMPLE I.D	DATE	TIME	LAB I.D.	PRESERV-ATIVE	SAMPLE MATRIX	ORGANIC ANALYSIS: Volatile Organic GC/MS 624/8240	Semi-Volatile Organic GC/MS 625/8270	Halogenated Volatiles 601/8010	Aromatic Volatiles 602/8020 BTEX	Total Petroleum Hydrocarbons HCID G D (circle)	Total Petroleum Hydrocarbons EPA 418.1 418.1 MOD (circle)	Total Organic Carbon (TOC) 415/9060	Polyaromatic Hydrocarbons (PAH) 8310 8100 8270 (circle)			INORGANIC ANALYSIS: TCLP Metals As,Ba,Cd,Cr,Pb,Hg,Se,Ag	Metals (total or dissolved) List	Extractable Bases Ca,Na,Mg,K (circle)	Ph,Cond,Cl,SO_4,PO_4,F,Br NO_2,NO_3 (circle)	NH_3,N,COD,Total-P,TKN (circle)	OTHER			NUMBER OF CONTAINERS
1 94-2,4D, S1-S5	7-19	11:00		NONE	SOIL				EPA			8150	Herbicides											
2 94-2,4D,- S1-S10	7-19	11:50		NONE	SOIL																			
3 94-2,4D- S1-S15	7-19	12:40		NONE	SOIL																			
4 94-2,4D- S1-S20	7-19	13:10		NONE	SOIL																			
5 94-2,4D S1-S25	7-19	13:10		NONE	SOIL																			
6 94-2,4D S2-S5	7-19	14:00																						
7 94-2,4D S2-S10	7-19	14:20																						
8 94-2,4D S2-S15	7-19	14:30																						
9 94-2,4D S2-S20	7-19	14:45																						
10																								
11																								
12																								

COMMENTS

INVOICE INFORMATION
P.O. No.: ___
Bill To: ___

SHIPMENT INFORMATION
Shipped via: ___ Sample Receipt: ___
Seals Intact: ___ Condition: ___
Temp When Rcd.: ___ °C Seal No.: ___
Samples Collected By: D. Mascarenas

Relinquished By:	Company:	Date/Time:	Received By:	Company:
D. Mascarenas	Cascade Earth Sc	7/21/94 1500	D. Storms	CAS 7/22/94 0800
Relinquished By:	Company:	Date/Time:	Received By:	Company:
Relinquished By:	Company:	Date/Time:	Received By:	Company:

Laboratory:
Please Return Original (White) with Results

White - CES Yellow - Laboratory Pink - Sender

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client CES Work Order K94 4396

Cooler received on 7/22 and opened on 7/22 by RH

1. Were custody seals on outside of cooler? YES NO
   If yes, how many and where? 2-Front
   Were signature and date correct? YES NO
2. Were custody papers properly filled out (ink, signed, etc)? YES NO
3. Did all bottles arrive in good condition (unbroken)? YES NO
4. Were all bottle labels complete (i.e. analysis, preservation, etc)? YES NO
5. Did all bottle labels and tags agree with custody papers? YES NO
6. Were correct bottles used for the tests indicated? YES NO
7. Were VOA vials checked for absence of air bubbles, and noted if so? ~~YES NO~~ NA
8. Temperature of cooler upon receipt 6.1

Explain any discrepancies

		YES	NO
pH	Reagent		
12	NaOH		
2	HNO_3		
2	H_2SO_4		

YES = All samples OK
NO = Samples were preserved at lab as listed

VOC Vial pH Verification (Tested after Analysis) ☐ All Samples pH ≤ 2 ☐ Following Samples Exhibited pH > 2		

Sample I.D.	Reagent	Vol. Added

Comments:

APPENDIX C

RAW DATA

SAMPLE DESCRIPTION

SERVICE REQUEST #: K944396

ANALYST: Kristine Craven DATE: 7/28/94

LAB ID	SAMPLE ID	DESCRIPTION
K4396-001	94-24D-S3-S5	sand with water on top
-002	94-24D-S3-S10	dry sand
-003	94-24D-S3-S15	sand, rocks, water
-004	94-24D-S3-S20	sand
-005	94-24D-S3-S25	dry sand
-006	94-24D-S4-S5	dry, sand & soil
-007	94-24D-S4-S10	sand, water, rocks
-008	94-24D-S4-S15	Sand
-009	94-24D-S4-S20	Sand
-~~00~~ KC 7/28/94 010	94-2,4D,S1-S5	wet sand
-011	94-2,4D,S1-S10	wet sand
-012	94-2,4D-S1-S15	water, rocks, sand
-013	94-2 4D-S1-S20	dry sand
-014	94-24D-S1-S25	wet sand
-015	94-24D-S2-S5	Wet sand
-016	94-24D-S2-S10	dry ~~wet~~ KC 7/28/94 sand
-017	94-24D-S2-S15	Wet sand
-018	94-24D-S2-S20	Sand

REVIEWED BY: Karen Pearson DATE: 07/29/94