MEMO

TO: File

FROM: Fred Biebesheimer, Kami Baisch

DATE: 1128 hrs, 16 May 1995

SUBJECT: Sampling Methodology and Analytical Results for Pacific Recycling Site Hazard Assessment

Historical soil contamination occurred around the base of the AST (containing fuel) on the Pacific Recycling Site (site). Contamination was due to over-filling vehicle tanks and fuel handling techniques.

Methodology

Fred Biebesheimer of Science Applications International Corporation (SAIC) performed the sampling. The conservative approach was used to determine the most contaminated onsite sampling location. After identifying an obviously contaminated area of soil by discoloration and odor of petroleum hydrocarbons, the one sampling location was centered on the area of greatest contamination. The sampling location was 7 feet southeast of the above-ground storage tank secondary containment structure (see photos).

Samples were taken from the 0 to 0.5 foot interval, using the SAIC standard operating procedure (SOP) No. 550: *Sediment/Slurry Sampling* referenced in the project-specific Sampling and Analysis Plan (SAP). This procedure involved using a stainless steel spoon to excavate to a depth of 0.5', and depositing the soil in a stainless steel bowl. The soil was then composited, placed in jars, and packed in a cooler chilled to 4° C. A total of six aliquots of sample (PRS01 - PRS06) were taken from the single sampling location to accommodate analytical requirements. Note: Sample numbers PRS02 and PRS04 were sent to the lab for TPH analysis. These two samples were not analyzed because, upon arrival, it was discovered that these samples were unnecessary because TPH-G and TPH-D could be performed from a single sample.

A background metals sample (PRS07) was taken from a field ~300 yards east of the site, near the intersection of Yew Street and Chemical Drive. This sample was taken using SAIC SOP No. 550.

Field QA/QC

Field duplicates were taken at the onsite sampling location and analyzed for the same constituents as above. Observation of holding times, chain-of-custody, and proper sampling handling techniques as described by the SAP were used to maintain quality control.

Analytical Results and QA

Samples were analyzed for TPH-G and TPH-D (modified 8015 method) and metals (method 6010 and 7471).

The following table presents the results of the sampling effort. Only results above MTCA residential soil cleanup guidelines are presented.

Sample #	Analyses		
	TPH-Gas	TPH-D	Metals
PRS01	850 mg/kg	15000 mg/kg	—
PRS03	—	—	Cd 3.2 mg/kg Pb 390 mg/kg
PRS05 (FD)	680 mg/kg	19000 mg/kg	—
PRS06 (FD)	—	—	Cd 3.1 mg/kg Pb 400 mg/kg
PRS07 (BK)	—	—	—

The TPH-G and TPH-D analyses indicate that these constituents were greater than the MTCA Method A cleanup levels. The analytical results for TPH-G indicate that the patterns was not a result of TPH-G, but rather a response to diesel. Although this places the TPH-G results in question, the conservative approach was used, and this contaminant was used to score the site. The field duplicates indicate relatively good field replicability, varying 2 to 20%. The surrogate percent recovery for both TPH-G and TPH-D were not within the data quality objectives specified in the SAP. This is largely a function of dilution of the concentrated samples as evidenced by the fact that the surrogate recovery in the blanks were in control. The Percent recovery of the matrix spikes/matrix spike duplicates were also out of control. The relative percent difference for the MS/MSDs was within the precision objective established in the SAP.

The metals analysis indicated that lead and cadmium were detected above the MTCA Method A cleanup levels. These was good replicability between the duplicates for the lead and cadmium analyses varying only 3%. The metals in the background sample were substantially less than the metals in the site sample. No metals were detected in the laboratory blank. The percent recover and the relative percent difference were within the accuracy and precision ranges for the MS/MSDs specified in the SAP, except for antimony and chromium. Neither of these were detected above MTCA cleanup levels.

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Chemistry, Microbiology, and Technical Services

Certificate of Analysis

CLIENT: Science Appl Internat'l Corp
606 Columbia St. N.W.,
Suite 300
Olympia, WA 98501
ATTN : Nancy Winters

Work Order# : 95-04-812
DATE RECEIVED : 04/26/95
DATE OF REPORT: 05/11/95
CLIENT JOB ID : Shipmt. # 4535260656

Work ID : 01-1052-05-4729-700
Taken By : Client
Transported by: FedEx 4535260656
Type : Soil

SAMPLE IDENTIFICATION:

	Sample Description	Collection Date
01	PRS01	04/24/95 14:30
02	PRS02	04/24/95 14:30
03	PRS03	04/24/95 14:30
04	PRS04	04/24/95 14:30
05	PRS05	04/24/95 14:30
06	PRS06	04/24/95 14:30
07	PRS07	04/24/95 15:02

Per clients request sample 9504812-02 & 04 were held without analysis.

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Work Order# : 95-04-812

GENERAL COMMENTS ON MODIFIED 8015 TOTAL PETROLEUM HYDROCARBONS (TPH) ANALYSIS:

The method, commonly referred to as "Modified 8015", is employed to determine the concentrations of low, medium, and high boiling point hydrocarbons in soil and water samples. Because the hydrocarbon source in environmental samples is often unknown, Laucks employs an 8015 method modification that allows one screening analysis to examine this full range.

The sample is extracted using methylene chloride, then analyzed by gas chromatography using a flame ionization detector (GC/FID). One sample in every 10 analyses is selected for additional spiking and also for analysis as a duplicate.

The standard materials gasoline, diesel, and lube oil are analyzed to provide pattern recognition chromatograms. A multi-point calibration is performed using diesel fuel and diesel fuel is used as the continuing calibration standard.

Results are quantitated depending on client request. One method is to quantitate results as "total hydrocarbons," using the total response for the diesel fuel standard to compute the calibration factor. Total response is defined as the total integrated area from C7 (toluene) to n-C40. Alternatively, one or more hydrocarbon ranges can be quantitated using gasoline as a standard for the range toluene to n-C12, diesel as a standard for the range n-C12 to n-C24, and motor oil as a standard for the range n-C24 to n-C40.

In addition, a qualitative pattern match is made by visually examining the sample and standard chromatograms. If a match is detected between a common fuel and a sample, this fact is stated in our report in the sample comments section at the bottom of each analytical report. However, it is not unusual to be unable to state that a match exists.

COMMENTS ON MODIFIED 8015 HYDROCARBON ANALYSIS:

*MS/MSD Recoveries:

The MS/MSD recoveries could not be accurately quantitated due to the high dilution factors applied to the sample extracts and the high level of diesel range response which was detected in the native sample. Since the recovery of diesel calculated from the blank spike analysis was in control, no further action was taken.

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GENERAL COMMENTS ON ANTIMONY DETERMINATIONS:

The long-term trend at Laucks has consistently demonstrated antimony recoveries in soil matrix spikes and matrix spike duplicates hovering near 20%. Substantial efforts have been made to investigate the cause of these poor recoveries. We have concluded that laboratory performance is not the central issue, but that the lack of recovery is in fact inherent to the digestion method. As there are no other accepted methods for the preparation of soils for antimony, we are limited in what steps we can take to correct the situation.

When evaluating antimony data, please be aware that because antimony MS/MSD recoveries are consistently biased low in soils and sediments, it is likely that soil sample results are similarly biased.

COMMENTS ON MS/MSD & BLANK SPIKE RECOVERY REPORTS:

Chromium recoveries and/or RPD's exceeded the control limits.
Since the remaining recoveries and RPD's in the MS/MSD sample and all recoveries in the blank spike were in control, this was attributed to matrix interference and no further action was taken.

Initial and containing calibration standards for mercury are made from the same solution as the spiking material and were all within acceptance limits. Low and reproducible MS/MSD recovery is indicative of matrix interference in the sample selected for QC.

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Work Order# : 95-04-812

FLAGGING:

The flag "U" indicates the analyte of interest was not detected, to the limit of detection indicated.

The flag "D" indicates the value reported derives from analysis of a diluted sample or sample extract.

ATTACHMENTS:

Following presentation of sample results, the following appendices are attached to this report:

Appendix A: Method Blanks & Surrogate Recoveries Reports
Appendix B: MS/MSD & Duplicate Reports
Appendix C: Blank Spike Recovery Report
Appendix D: Chain-of-Custody

Unless otherwise instructed all samples will be discarded on 06/19/95

Respectfully submitted,
Laucks Testing Laboratories, Inc.

J. M. Owens

J. M. Owens

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Work Order # 95-04-812

TESTS PERFORMED AND RESULTS:

Analyte	Units	01	03	05	06
Antimony (Method 6010)	mg/kg DB		5.0 U		4.9 U
Arsenic (Method 6010)	mg/kg DB		17. U		16. U
Beryllium (Method 6010)	mg/kg DB		0.41 U		0.41 U
Cadmium (Method 6010)	mg/kg DB		3.2		3.1
Chromium (Method 6010)	mg/kg DB		10.		20.
Copper (Method 6010)	mg/kg DB		250.		93.
Lead (Method 6010)	mg/kg DB		390.		400.
Mercury (Method 7471)	mg/kg DB		0.1		0.1
Nickel (Method 6010)	mg/kg DB		16.		16.
Selenium (Method 6010)	mg/kg DB		17. U		16. U
Silver (Method 6010)	mg/kg DB		0.83 U		0.82 U
Thallium (Method 6010)	mg/kg DB		21. U		21. U
Total Solids	%	93.2	95.4	88.2	92.2
Zinc (Method 6010)	mg/kg DB		380.		400.

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Work Order # 95-04-812

TESTS PERFORMED AND RESULTS:

Analyte	Units	07
Antimony (Method 6010)	mg/kg DB	5.8 U
Arsenic (Method 6010)	mg/kg DB	19. U
Beryllium (Method 6010)	mg/kg DB	0.48 U
Cadmium (Method 6010)	mg/kg DB	1.1
Chromium (Method 6010)	mg/kg DB	4.2
Copper (Method 6010)	mg/kg DB	7.4
Lead (Method 6010)	mg/kg DB	13.
Mercury (Method 7471)	mg/kg DB	0.1 U
Nickel (Method 6010)	mg/kg DB	12.
Selenium (Method 6010)	mg/kg DB	19. U
Silver (Method 6010)	mg/kg DB	0.96 U
Thallium (Method 6010)	mg/kg DB	24. U
Total Solids	%	91.3
Zinc (Method 6010)	mg/kg DB	49.

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REPORT ON SAMPLE: 9504812-01A
Client Sample ID: PRS01

Collection Date	: 04/24/95	Test Code	: M8015S
Date Received	: 04/26/95	Test Method	: MOD_8015
Date Extracted	: 04/27/95	Extraction Method	: SW 3550
Date Analyzed	: 05/04/95		

Analyte	Result (mg/kg DB)		PQL (mg/kg DB)
Gasoline range, as gasoline	850	D	210
Diesel range, as diesel	15000	D	2700

Surrogate recovery report for sample 9504812-01A

Surrogate	Percent Recovery		Limits: Min.	Max.
2-Fluorobiphenyl	0	*	50	150
p-Terphenyl	0	*	50	150

* = Indicates that recovery is outside control limits

Comments: There is no apparent gasoline pattern. The majority of the response in the gas range is a result of diesel range hydrocarbons. A diesel pattern is present. Surrogates are diluted out.

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REPORT ON SAMPLE: 9504812-05A
Client Sample ID: PRS05

Collection Date	: 04/24/95	Test Code	: M8015S
Date Received	: 04/26/95	Test Method	: MOD_8015
Date Extracted	: 04/27/95	Extraction Method	: SW 3550
Date Analyzed	: 05/04/95		

Analyte	Result (mg/kg DB)		PQL (mg/kg DB)
Gasoline range, as gasoline	680	D	230
Diesel range, as diesel	19000	D	2800

Surrogate recovery report for sample 9504812-05A

Surrogate	Percent Recovery	Limits: Min.	Max.
2-Fluorobiphenyl	0 *	50	150
p-Terphenyl	0 *	50	150

* = Indicates that recovery is outside control limits

Comments: There is no apparent gasoline pattern. The majority of the response in the gas range is a result of diesel range hydrocarbons. A diesel pattern is present. Surrogates are diluted out.

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APPENDIX A

Method Blanks & Surrogate Recoveries Reports

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Quality Control Report
Method Blanks for Work Order 9504812

Blank Name	Samples Verified	Test Description	Result	Units	Control Limit
B042895_HG_S01	3,6,7	Mercury by Cold Vapor	0.10 U	mg/kg DB	0.20
B050195_ICP_S01	3,6,7	Silver by ICP	1.0 U	mg/kg DB	2.0
		Arsenic by ICP	20 U		40
		Beryllium by ICP	0.50 U		1.0
		Chromium by ICP	1.0 U		2.0
		Lead by ICP	10 U		20
		Copper by ICP	1.0 U		2.0
		Nickel by ICP	2.0 U		4.0
		Antimony by ICP	6.0 U		12
		Selenium by ICP	20 U		40
		Thallium by ICP	25 U		50
		Zinc by ICP	1.0 U		5.0
		Molybdenum by ICP	1.0 U		2.0
		Cadmium by ICP	1.0 U		2.0
B042795_GSV_S01	1,5	Gasoline range, as gasoline	20 U	mg/kg	20
		Diesel range, as diesel	25 U		25
		Oil range, as oil	100 U		100

A method blank can validate more than one analyte on more than one work order. The method blanks in this report may validate analytes not determined on this work order, but nonetheless determined in the associated blank.

Because they validate more than one work order, method blank results are not always reported in the same concentration units or to the same detection limits that are used for sample results.

* = blank exceeds control limit

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Quality Control Report
Multi-Component Method Blanks
Surrogate Recoveries for Work Order 9504812

Blank Name	Test Description	Surrogate Compound	Recov	LCL	UCL
B042795_GSV_S01	Modified 8015	2-Fluorobiphenyl	115	50	150
		p-Terphenyl	96	50	150

* = Recovery exceeds control limit

Recov = Percent recovery of surrogate compound
LCL = Lower Control Limit
UCL = Upper Control Limit

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APPENDIX B

MS/MSD & Duplicate Reports

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Quality Control Report
MS/MSD Report for Work Order 9504812

MS/MSD Name	Sample Fractions Verified	MS/MSD Sample	Analyte	Percent Recovery MS	MSD	RPD	Cont. Limits LCL	UCL	RPD
K042795_GSVS01	1,5	9504812-01	Diesel range, as diesel	999*	999 *	27	20	160	50
K042895_HGS01	3,6,7	9504812-03	Mercury	64*	61 *	5	65	130	30
K050195_ICPS01	3,6,7	9504812-07	Silver	83	80	3	58	132	30
			Arsenic	99	98	1	70	127	30
			Beryllium	95	94	1	84	122	10
			Cadmium	90	91	1	60	138	21
			Chromium	38*	38 *	1	60	134	30
			Copper	96	96	0	50	150	30
			Nickel	94	93	1	69	124	21
			Lead	95	93	2	50	148	30
			Antimony	23*	333 *	174*	30	94	30
			Selenium	85	84	1	67	129	10
			Thallium	80	76	5	68	116	10
			Zinc	90	91	1	50	150	30
			Molybdenum	94	94	0	50	150	30

* = Value Exceeds Control Limit
RPD = Relative Percent Difference
LCL = Lower Control Limit
UCL = Upper Control Limit
-1 for recovery value indicates that recovery could not be calculated

An MS/MSD pair can validate the results for more than one work order. For this reason, results for analytes not requested on this work order may appear in this MS/MSD report.

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Quality Control Report
Duplicate Report for Work Order 9504812

Duplicate Name	Sample Fractions Verified	Sample	Analyte	RPD	Limit
D042795_TSS01	3,6,7	9504182-03	Total Solids	1.7	30

* = Value Exceeds Control Limit
RPD = Relative Percent Difference
L = RPD control limit for this analyte is 5x the detection limit. The value appearing in the RPD column is the absolute difference of the duplicates.
-1 for recovery value indicates that recovery could not be calculated

A duplicate pair can validate the results for more than one work order. For this reason, results for analytes not requested on this work order may appear in this duplicate report.

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APPENDIX C

Blank Spike Recovery Report

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Quality Control Report
Blank Spike Report for Work Order 9504812

Blank Spike Names						
Database	Lab Assigned	Fractions Verified	Analyte Name	Recov	LCL	UCL
S042795_GSVS01	S0427GSVSLM	1,5	Diesel range, as diesel	97	20	160
S050195_ICPS01	BS050195ICP1	3,6,7	Antimony	92	50	150
			Arsenic	97	70	127
			Beryllium	94	84	122
			Cadmium	94	60	138
			Chromium	99	60	134
			Copper	98	50	150
			Lead	94	50	148
			Molybdenum	96	50	150
			Nickel	95	69	124
			Selenium	90	67	129
			Silver	90	58	132
			Thallium	98	68	116
			Zinc	93	50	150

* = Value Exceeds Control Limit
LCL = Lower Control Limit
UCL = Upper Control Limit

A blank spike can validate the results for more than one work order. For this reason, results for analytes not requested on this work order may appear in this blank spike report.

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APPENDIX D

Chain-of-Custody

9504812

606 Columbia Street N.W., Suite 300
Olympia, Washington 98501
206/754-7077 • FAX: 206/943-1331

MASTER SAMPLE LOG AND CHAIN OF CUSTODY RECORD

Project No.: 01-1052-05-4729-700 Project Mgr.: NANCY WINTERS
Project Name: WDOE SITE HAZARD ASSESSMENTS
Project Location: PACIFIC RECYCLING (PR)
Client Name: WDOE

Sampling Location	Sample Number	Sample Depth	Sample Matrix	Sampling Date	Sampling Time	Sample Collector(s)	TPH - GAS (8015) 4/24/95 BG	TPH - DIESEL (8015) 4/24/95 BG	METALS - PP Metals 4/24/95 BG	Sample Containers/ Preservatives: NO PRESERVATION	Comments
PR-A	PRS01	0-.5'	SOIL	4/24/95	1430H	FHB	1				
	PRS02	0-.5'	SOIL	4/24/95	1430H	FHB	1				
	PRS03	0-.5'	SOIL	"	1430H	FHB		1			
	PRS04	0-.5'	SOIL	"	1430H	FHB	1				FIELD DUPE.
	PRS05	0-.5'	SOIL	"	1430H	FHB		1			FIELD DUP.
	PRS06	0-.5'	SOIL	"	1430H	FHB		1			FIELD DUP.
	PRS07	0-.5'	SOIL	"	1502H	FHB		1			BACKGROUND

FHB 4/24/95

Shipment No. 453526065b
Shipping Container No.:
Custody Seal No.: #01
Date Shipped: 4/24/95
Carrier: FED EX
Shipper:
Shipper Bill No.:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: /FHB	Signature:	Signature:	Signature:
Date/Time: 4/24/95 1000H	Date/Time: 4/26/95 9:00	Date/Time:	Date/Time:
Affiliation: SAIC	Affiliation:	Affiliation:	Affiliation:

• White: Lab Returns to Originator Upon Receipt of Samples; • Canary: Lab Retains; • Pink: Lab Returns to Project Manager with Final Report; • Goldenrod: Retained by Sampler