APPENDIX B

LABORATORY ANALYTICAL DATA SHEETS

Method 3-C
Analytical Results

prepared for

POST, BUCKLEY, SCHUH, & JERNIGAN

804 Moorefield Park Drive, #302
Richmond, VA 23236

by

Triangle Environmental Services, Inc.

Reviewed by:

Donna Nolen-Weathington
Method 25 Supervisor

Approved by:

Wayne A. Stollings
President

Approved by:

John Y. Morimoto, Ph.D.
QA Officer

Report
01198-25C

September 11, 2001

P.O. Box 13294 Research Triangle Park, NC 27709 (800) 367-4862

Triangle Environmental Services, Inc.
COMMENTS ON THE ANALYSES

Report #01198-25C for Post, Buckley, Schuh, & Jernigan
Project ID: 320086.02

Tanks Received: 8/2/01

Samples Analyzed: 8/7/01
Client Chain-of-Custody forms: 1 p

All samples:

- Where available, sample IDs were taken from the tank tags. Tank N81 -- no tag, assumed GP-7 by C-O-C order; tank N216 --loose tag, GP-3 assumed by C-O-C order.

- Laboratory preshipment and receipt pressure and temperature readings were used for the tank pre- and post-test tank data, respectively. However, client barometric pressure and temperature data were used to determine the water vapor fraction.

- The N_2 and O_2 concentrations as measured by Method 3-C exceeded the Method 25-C criteria of 20% for N_2 and 5% for O_2. The client was so notified and indicated that the samples should not be analyzed.

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C TABLE OF RESULTS

Name: PBS&J ID#01198-25C Analyzed: 8/7/01

Project ID: 320086.02

	Sample Description	Concentrations (ppm) O2	N2	CH4	CO2
1	GP-1	91037	786730	< 89	147902
2	GP-2	201141	804424	< 86	13433
3	GP-3	198012	805035	< 83	17595
4	GP-4	88337	830411	11848	87336
5	GP-5	101161	809515	147	106611
6	GP-6	78153	804390	< 89	130042
7	GP-7	52336	813338	29218	118737
8	GP-8	67106	854193	4115	91715

< # = Concentration Below Practical Quantitation Limit

Triangle Environmental Services, Inc.
METHOD 3-C PROCEDURES

CALIBRATION

Triplicate injections of a calibration gas mixture consisting of 2.39% oxygen, 9.95% nitrogen, 25.0% carbon dioxide, and 2.05% methane are made immediately before and after each batch of samples. Daily response factors are calculated from the pre-batch integrated responses (average area count / concentration in ppm) and must agree within 20% of the response factors of the initial calibrations. Further, the post-batch response factors must agree within 5% of the pre-batch response factors. Both criteria must be met before the analyses are considered valid.

ANALYSIS

All samples, which include the daily calibration gas mixture and sample tanks, are analyzed in triplicate using a computer-interfaced gas chromatograph equipped with an automated gas sampling system and a thermal conductivity detector (TCD). O_2, N_2, CO, CH_4, and CO_2 are eluted from the column and pass to the TCD.

CALCULATIONS

Calculations are done in accord with USEPA Method 3-C procedures. A sample calculation for one of the samples is provided in the report.

EQUIPMENT

Tanks are at a minimum twice evacuated and filled with ambient air filtered through charcoal and are then evacuated to below 10 mm Hg and monitored for at least an hour to check that the tanks do not leak more than 1 mm Hg/hour. They are then pressurized to greater than ambient pressure with helium, analyzed to ensure < 2 ppm CH_4 and < 20 ppm CO_2, and stored for later use.

Certifications:

South Coast Air Quality Management District: ID# 94 LA 0401
State of Louisiana DEP: Application submitted 6/99, Agency Interest ID #30939

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C SAMPLE CALCULATION

Note: All pressure values have been converted when necessary to mm Hg and all temperature values to Kelvin.

Name: PBS&J ID#01198-25C Analyzed: 8/7/01
Project ID: 320086.02

Sample # 1 GP-1

D A T A

Tank N450:
Volume (cu.m) = 0.004441

	Pressure (mm Hg)	Temp.(K)
Presampling	327.0	296.15
Postsampling	748.0	301.65
Final	1839.0	301.65
Barometric	762.8	
Water Vapor	22.9	

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.27	36.49	30.13	42.40

Areas:

O2	682,916	683,231	682,200
N2	6,284,162	6,282,140	6,282,040
CH4	0	0	0
CO2	1,372,743	1,370,991	1,373,571

C A L C U L A T I O N S

Measured Concentrations (ppmC):

Cm(O2) = Area(O2) / RF(O2)
= 682916 / 34.3 = 19927.5
= 683231 / 34.3 = 19936.7
= 682200 / 34.3 = 19906.6

Cm(N2) = Area(N2)/RF(N2)
= 6284162 / 36.5 = 172216.0
= 6282140 / 36.5 = 172160.6
= 6282040 / 36.5 = 172157.9

Cm(CH4) = Area(CH4)/RF(CH4)
= 0 / 30.1 = 0.0
= 0 / 30.1 = 0.0
= 0 / 30.1 = 0.0

Cm(CO2) = Area(CO2)/RF(CO2)
= 1372743 / 42.4 = 32376.0
= 1370991 / 42.4 = 32334.7
= 1373571 / 42.4 = 32395.5

Pressure-Temperature Ratio, Q(i) = P(i)/T(i):

postsampling tank: Q(1) = 748 / 301.65 = 2.479695
presampling tank: Q(2) = 327 / 296.15 = 1.10417
final tank: Q(3) = 1839 / 301.65 = 6.09647

Volume Sampled (dscm) = 0.3857 x Tank Volume x [Q(1)-Q(2)]
= 0.3857 x .004441 x [2.4797 - 1.1042]
= 0.002356

Averages and % Relative Standard Deviations (%RSD) of Cm's are calculated.
(%RSD of C = %RSD of Cm)

Moisture Correction Factor, MCF:

= 1 - Water Vapor Pressure/Barometric Pressure
= 1 - 22.9/ 762.8 = 0.9700

Calculated Concentrations (ppm):

C(O2) = Q(3)/[Q(1)-Q(2)] x Cm(O2)/MCF
= 6.0965/(2.4797 - 1.1042) x 19923.6/0.9700 = 91036.5

C(N2) = Q(3)/[Q(1)-Q(2)] x Cm(N2)/MCF
= 6.0965/(2.4797 - 1.1042) x 172178.1/0.9700 = 786729.8

C(CH4) = Q(3)/[Q(1)-Q(2)] x Cm(CH4)/MCF
= 6.0965/(2.4797 - 1.1042) x 0.0/0.9700 = 0.0 (<PQL of 89)

C(CO2) = Q(3)/[Q(1)-Q(2)] x Cm(CO2)/MCF
= 6.0965/(2.4797 - 1.1042) x 32368.7/0.9700 = 147901.8

<PQL of ### = Concentration Below Practical Quantitation Limit

Triangle Environmental Services, Inc.
METHOD 3-C SAMPLE QA/QC DATA

DAILY ANALYZER CHECKS

Daily Calibration

Response Factor Checks

Requirement: Daily RF = Initial RF ± 20%

	Initial RF 2/5/98
O_2	28.94
N_2	34.69
CH_4	28.91
CO_2	40.55

Triplicate injections of a mixture of O_2, N_2, CH_4, and CO_2 are made before and after each batch of samples.

Analyzer Linearity Check 2/5/98

	$100x(1-RF/RF_{average})$	Requirement:
max. dev. O_2:	- 3.4%	± 10%
max. dev. N_2:	+ 1.5%	± 10%
max. dev. CH_4:	- 1.7%	± 10%
max. dev. CO_2:	+ 2.4%	± 10%

EQUIPMENT CHECKS

Clean Sampling Equipment Check

Tank	< 2 ppm CH_4	@ 100%
	<20 ppm CO_2	@ 100%

Sample Tank Evacuation and Leak Check

Tank evacuated to ≤ 10 mm Hg absolute pressure, monitored for ≥ 1 hour, and passed for use if no pressure change (< 1 mm Hg/hr) is noted.

Sample Tank Volumes

Tank weighed empty, filled with deionized distilled water (temperature recorded), and weighed to the nearest 2 g. Volume calculated based on density of water at that temperature and results recorded in permanent file.

Triangle Environmental Services, Inc.
CALIBRATION DATA FOR THE ANALYSES

Client: Post, Buckley, Schuh, & Jernigan ID#01198-25C

Project ID: 320086.02

Method 3-C
7-AUG-1: Analyzer f
Preanalysis Calibration

Compound	Conc.	Area(1)	Area(2)	Area(3)	Average	%RSD	RF	IRF	%Diff.
O2	23900.0	819439	818826	818680	818982	0.0%	34.27	28.94	18.41%
N2	99500.0	3632246	3630001	3628893	3630380	0.0%	36.49	34.69	5.18%
CH4	20500.0	617594	617907	617623	617708	0.0%	30.13	28.91	4.23%
CO2	250000.0	10601860	10598750	10601450	10600690	0.0%	42.40	41.14	3.07%

Postanalysis Calibration

Compound	Conc.	Area(1)	Area(2)	Area(3)	Average	RF(post)	RF(pre)	%Diff
O2	23900	814401	816320	814671	815131	34.11	34.27	-0.5%
N2	99500	3609987	3615245	3611712	3612315	36.30	36.49	-0.5%
CH4	20500	611270	616788	614954	614337	29.97	30.13	-0.5%
CO2	250000	10526790	10560450	10550200	10545810	42.18	42.40	-0.5%

Sample # 1 N450
2 N44
3 N216
4 N101
5 N32
6 N102
7 N81
8 N405

Conc. = concentration in ppmC, %RSD = % relative standard deviation,
RF = response factor = Average Area/Conc., IRF = response factor from initial calibration,
%Diff. = %(RF-IRF)/IRF for preanalysis/= %(RF(post)-RF(pre)/RF(pre), C2+ = propane

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: PBS&J ID#01198-25C Analyzed: 8/7/01

Project ID: 320086.02

Sample # 1 GP-1

TANK N450:
Volume (cu.m) = 0.004441

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	327.0	296.15	1.104
Postsampling	748.0	301.65	2.480
Lab receipt	748.0	301.65	2.480
Final	1839.0	301.65	6.096
Barometric	762.8		
Water Vapor	22.9		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.002356

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.27	36.49	30.13	42.40
Practical Quantitation Limit (ppm)	89	89	89	89

Areas:

O2	682,916	683,231	682,200
N2	6,284,162	6,282,140	6,282,040
CH4	0	0	0
CO2	1,372,743	1,370,991	1,373,571

Concentrations:

	ppm Amount	± SD	%RSD
O2	91037	± 70	0.1
N2	786730	± 150	0.0
CH4	< 89		
CO2	147902	± 142	0.1

< # = Concentration Below Practical Quantitation Limit

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: PBS&J ID#01198-25C Analyzed: 8/7/01

Project ID: 320086.02

Sample # 2 GP-2

TANK N44:
Volume (cu.m) = 0.004555

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	327.0	296.15	1.104
Postsampling	761.0	301.65	2.523
Lab receipt	761.0	301.65	2.523
Final	1821.0	301.65	6.037
Barometric	762.8		
Water Vapor	22.9		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.002492

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.27	36.49	30.13	42.40
Practical Quantitation Limit (ppm)	86	86	86	86

Areas:

O2	1,571,481	1,571,107	1,571,060
N2	6,692,263	6,691,630	6,688,659
CH4	0	0	0
CO2	130,164	129,358	129,961

Concentrations:

	ppm Amount	± SD	%RSD
O2	201141	± 30	0.0
N2	804424	± 231	0.0
CH4	< 86		
CO2	13433	± 43	0.3

< # = Concentration Below Practical Quantitation Limit

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: PBS&J ID#01198-25C Analyzed: 8/7/01

Project ID: 320086.02

Sample # 3 GP-3

TANK N216:
Volume (cu.m) = 0.004459

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	325.0	296.15	1.097
Postsampling	772.0	301.65	2.559
Lab receipt	772.0	301.65	2.559
Final	1821.0	301.65	6.037
Barometric	762.8		
Water Vapor	22.9		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.002514

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.27	36.49	30.13	42.40
Practical Quantitation Limit (ppm)	83	83	83	83

Areas:

O2	1,594,672	1,593,834	1,593,193
N2	6,900,862	6,900,441	6,898,480
CH4	0	0	0
CO2	175,115	175,230	175,335

Concentrations:

	ppm Amount ± SD	%RSD
O2	198012 ± 92	0.0
N2	805035 ± 148	0.0
CH4	< 83	
CO2	17595 ± 11	0.1

< # = Concentration Below Practical Quantitation Limit

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: PBS&J ID#01198-25C Analyzed: 8/7/01

Project ID: 320086.02

Sample # 4 GP-4

TANK N101:
Volume (cu.m) = 0.004556

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	326.0	296.15	1.101
Postsampling	771.0	301.65	2.556
Lab receipt	771.0	301.65	2.556
Final	1830.0	301.65	6.067
Barometric	762.8		
Water Vapor	22.9		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.002557

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.27	36.49	30.13	42.40
Practical Quantitation Limit (ppm)	84	84	84	84

Areas:

O2	704,821	704,923	703,264
N2	7,053,243	7,052,523	7,044,215
CH4	82,730	83,592	82,837
CO2	862,173	861,797	860,677

Concentrations:

	ppm Amount	±	SD	%RSD
O2	88337	±	117	0.1
N2	830411	±	591	0.1
CH4	11848	±	67	0.6
CO2	87336	±	79	0.1

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: PBS&J ID#01198-25C Analyzed: 8/7/01

Project ID: 320086.02

Sample # 5 GP-5

TANK N32:
Volume (cu.m) = 0.004561

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	325.0	296.15	1.097
Postsampling	773.0	301.65	2.563
Lab receipt	773.0	301.65	2.563
Final	1827.0	301.65	6.057
Barometric	762.8		
Water Vapor	22.9		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.002577

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.27	36.49	30.13	42.40
Practical Quantitation Limit (ppm)	83	83	83	83

Areas:

O2	815,006	813,620	811,765
N2	6,939,371	6,929,844	6,924,436
CH4	1,074	1,007	1,032
CO2	1,061,080	1,060,511	1,060,396

Concentrations:

	ppm Amount	±	SD	%RSD
O2	101161	±	202	0.2
N2	809515	±	883	0.1
CH4	147	±	5	3.3
CO2	106611	±	37	0.0

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: PBS&J ID#01198-25C Analyzed: 8/7/01

Project ID: 320086.02

Sample # 6 GP-6

TANK N102:
Volume (cu.m) = 0.004555

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	326.0	296.15	1.101
Postsampling	748.0	301.65	2.480
Lab receipt	748.0	301.65	2.480
Final	1834.0	301.65	6.080
Barometric	762.8		
Water Vapor	22.9		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.002423

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.27	36.49	30.13	42.40
Practical Quantitation Limit (ppm)	89	89	89	89

Areas:

O2	589,829	588,982	588,781
N2	6,459,662	6,464,313	6,447,433
CH4	0	0	0
CO2	1,215,018	1,214,468	1,209,411

Concentrations:

	ppm Amount ± SD	%RSD
O2	78153 ± 74	0.1
N2	804390 ± 1086	0.1
CH4	< 89	
CO2	130042 ± 331	0.3

< # = Concentration Below Practical Quantitation Limit

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: PBS&J ID#01198-25C Analyzed: 8/7/01

Project ID: 320086.02

Sample # 7 GP-7

TANK N81:
Volume (cu.m) = 0.004544

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	326.0	296.15	1.101
Postsampling	739.0	301.65	2.450
Lab receipt	739.0	301.65	2.450
Final	1828.0	301.65	6.060
Barometric	762.8		
Water Vapor	22.9		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.002364

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.27	36.49	30.13	42.40
Practical Quantitation Limit (ppm)	90	90	90	90

Areas:

O2	386,628	387,643	387,597
N2	6,404,048	6,415,163	6,406,771
CH4	192,279	190,503	187,514
CO2	1,087,279	1,088,659	1,085,402

Concentrations:

	ppm Amount	±	SD	%RSD
O2	52336	±	77	0.1
N2	813338	±	735	0.1
CH4	29218	±	370	1.3
CO2	118737	±	179	0.2

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: PBS&J ID#01198-25C Analyzed: 8/7/01

Project ID: 320086.02

Sample # 8 GP-8

TANK N405:
Volume (cu.m) = 0.004491

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	326.0	296.15	1.101
Postsampling	738.0	301.65	2.447
Lab receipt	738.0	301.65	2.447
Final	1841.0	301.65	6.103
Barometric	762.8		
Water Vapor	22.9		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.002331

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.27	36.49	30.13	42.40
Practical Quantitation Limit (ppm)	91	91	91	91

Areas:

O2	491,337	492,189	492,086
N2	6,662,663	6,669,659	6,667,577
CH4	25,917	26,538	27,094
CO2	830,653	832,536	831,999

Concentrations:

	ppm Amount	±	SD	%RSD
O2	67106	±	63	0.1
N2	854193	±	460	0.1
CH4	4115	±	91	2.2
CO2	91715	±	107	0.1

Chain of Custody

Triangle Environmental Services, Inc.
LABORATORY SAMPLE INFORMATION AND CHAIN-OF-CUSTODY FORM

Company Name: PBS&J	Project ID: 3200 86.02	Date: 8/1/01
Contact Person: Chad Smith	Phone #: 804 560 7600	Process Type:
Latest Date Samples Expected at Lab: 8/03/01 (Normal Turnaround: 15 working days after last receipt of samples)	Results Due Date: standard	
	Report Package Due Date:	
Send Report to: (Street address required for UPS shipment of report)	*Person* Chad Smith	Send Invoice to: (if different from report address) *Person* Same
	Address 804 Moorefield Park Dr. #302	*Address*
	Richmond VA 23236	
Phone # 804 560 7600	*FAX #* 804 560 5729	

✓ all applicable boxes

Analysis

US EPA: ☐ Method 25 ☑ Method 3-C ☑ Method 25-C (NMOC as C [default]) ☐ Method 10-B			SCAQMD: ☐ Method 25.1 ☐ Method 25.2
# of Tank/Trap Pairs:	# of Tank-Only Samples:	# of Trap-Only Samples:	# of Bag Samples:
☐ Audit with Delay (*extra charge*)	☐ Rush Turnaround (*extra charge*)	☐ High Concentrations Possible ☐ Call if Concentrations High	☐ Dilute High Concentrations (*extra charge*)

Special Instructions:

Tanks (Bags) (List IDs): #N450 : N44 : N216 : N101 N32 : N102 : N81 : N405	Traps (List IDs):

☐ TES Equipment	☐ Client Equipment	☐ Client Equipment to be Reconditioned
Tanks, Unused for Reconditioning (List IDs):		Traps, Unused for Reconditioning (List IDs):

Relinquished by: CDC		Date: 8/1/01	Time: 1200 pm	To: (Carrier)			
Tanks received at TES by: [signature]	Condition: good	Date: 8/2/01	Time: 9:50	Traps received at TES by:	Condition:	Date:	Time:

Method 25-C
Analytical Results

prepared for

POST, BUCKLEY, SCHUH, & JERNIGAN

804 Moorefield Park Drive, #302
Richmond, VA 23236

by

Triangle Environmental Services, Inc.

Reviewed by:

Donna Nolen-Weathington
Method 25 Supervisor

Approved by:

Wayne A. Stollings
President

Approved by:

John Y. Morimoto, Ph.D.
QA Officer

Report
01279-25C

November 2, 2001

P.O. Box 13294 Research Triangle Park, NC 27709 (800) 367-4862

Triangle Environmental Services, Inc.
COMMENTS ON THE ANALYSES

Report #01279-25C for Post, Buckley, Schuh, & Jernigan
Project ID: 320086.02

Tanks Received: 10/22/01

Samples Analyzed: 10/25-29/01 (25-C on Analyzer B)
Client Chain-of-Custody forms: 1 p

All samples: Laboratory preshipment and receipt pressure and temperature readings were used for the tank pre- and post-test tank data, respectively. Also, laboratory barometric pressure and temperature data were used to determine the water vapor fraction.

Sample #1:

- The tank contents were diluted so as to bring the measured CO_2 concentrations within the Method 25 calibration range. The reported final tank pressure is the original final tank pressure multiplied by the dilution factor.

- The Method 25-C results for this sample were not adjusted to a nitrogen-free basis due to the N_2 level being above what the correction factor would accurately handle.

Samples #2-4: The N_2 and O_2 concentrations as measured by Method 3-C exceeded the Method 25-C criteria of 20% for N_2 and 5% for O_2. The client was so notified and indicated that the samples should not be analyzed.

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 25-C TABLE OF RESULTS

Name: Post, Buckley, Schuh, & Jernigan ID#01279-25C Analyzed: 10/25-29/01

Project ID: 320086.02

	Sample Description	Concentrations (ppm) — As Carbon				
		CO	CH4	CO2	NMOC (ppm)	Mass Conc. (mg/cu.m)
1	GP4B	< 14	153	145209	< 35	< 17

< # = Concentration Below Practical Quantitation Limit
Correction of concentrations for the presence of nitrogen was not made

* Please refer to the "Comments on the Analyses" page of the report for additional information.

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C TABLE OF RESULTS

Name: Post, Buckley, Schuh, & Jernigan ID#01279-25C Analyzed: 10/25/01

Project ID: 320086.02

	Sample Description	Concentrations (ppm) O2	N2		CH4	CO2
1	GP4B	24565	859709		149	142441
2	GP5B	134720	802261	<	82	92535
3	GP7B	219048	814982	<	89	491
4	GP8B	219584	816486	<	88	490

< # = Concentration Below Practical Quantitation Limit

Triangle Environmental Services, Inc.
CALIBRATION DATA FOR THE ANALYSES

Client: Post, Buckley, Schuh, & Jernigan ID#01279-25C

Project ID: 320086.02

Method 3-C

25-OCT-1: Analyzer f

Preanalysis Calibration

Compound	Conc.	Area(1)	Area(2)	Area(3)	Average	%RSD	RF	IRF	%Diff.
O2	23900.0	816328	816204	813798	815443	0.2%	34.12	28.94	17.90%
N2	99500.0	3617818	3617547	3605748	3613704	0.2%	36.32	34.69	4.69%
CH4	20500.0	615380	616426	612167	614658	0.4%	29.98	28.91	3.71%
CO2	250000.0	10480880	10523330	10449470	10484560	0.4%	41.94	41.14	1.94%

Postanalysis Calibration

Compound	Conc.	Area(1)	Area(2)	Area(3)	Average	RF(post)	RF(pre)	%Diff
O2	23900	820502	819754	820466	820241	34.32	34.12	0.6%
N2	99500	3632298	3634285	3632797	3633127	36.51	36.32	0.5%
CH4	20500	619208	619793	621226	620076	30.25	29.98	0.9%
CO2	250000	10559800	10569260	10571040	10566700	42.27	41.94	0.8%

Sample # 1 6159
2 6157
3 6141
4 6120

Method 25-C

29-OCT-1: Analyzer b

Preanalysis Calibration

Compound	Conc.	Area(1)	Area(2)	Area(3)	Average	%RSD	RF	IRF	%Diff.
CO	203.0	62407	62019	62122	62183	0.3%	306.3	311.2	-1.6%
CH4	50.5	16064	15940	15843	15949	0.7%	315.8	300.8	5.0%
CO2	10200.0	3216856	3188247	3197377	3200827	0.5%	313.8	304.2	3.2%
C2+	60.3	17685	17851	17779	17772	0.5%	294.7	304.1	-3.1%

Postanalysis Calibration

Compound	Conc.	Area(1)	Area(2)	Area(3)	Average	RF(post)	RF(pre)	%Diff
CO	203.0	64222	63514	62226	63321	311.9	306.3	1.8%
CH4	50.5	16473	16252	15876	16200	320.8	315.8	1.6%
CO2	10200.0	3299854	3268584	3194934	3254457	319.1	313.8	1.7%
C2+	60.3	18648	17698	17768	18038	299.1	294.7	1.5%

Sample # 1 6159

Conc. = concentration in ppmC, %RSD = % relative standard deviation,
RF = response factor = Average Area/Conc., IRF = response factor from initial calibration,
%Diff. = %(RF-IRF)/IRF for preanalysis/= %(RF(post)-RF(pre)/RF(pre), C2+ = propane

Triangle Environmental Services, Inc.
METHOD 25-C PROCEDURES

CALIBRATION

The calibrations satisfy the requirements for Methods 25, 25-C, and 10-B.

Triplicate injections of a calibration gas mixture consisting of 203 ppm carbon monoxide, 50.5 ppm methane, 10200 ppm carbon dioxide, and 20.1 ppm propane are made immediately before and after each batch of samples. Daily response factors are calculated from the pre-batch integrated responses (average area count / concentration in ppmC) and must agree within 10% of the response factors of the initial calibrations. Further, the post-batch response factors must agree within 2% of the pre-batch response factors. Both criteria must be met before the analyses are considered valid.

ANALYSIS

All samples, which include the daily calibration gas mixture and sample tanks, are analyzed in triplicate using a computer-interfaced gas chromatograph equipped with an automated gas sampling system and a flame ionization detector (FID). CO, CH_4, and CO_2 are eluted from the Unibead 1S-Carbosieve G column and pass through the analytical oxidation and reduction catalyst to the FID. The column is then backflushed to elute the nonmethane organic (NMO) fraction, which passes through the analytical oxidation and reduction catalysts to the FID.

CALCULATIONS

Calculations are done in accord with USEPA Method 25-C procedures. A sample calculation for one of the samples is provided in the report.

EQUIPMENT

Tanks are at a minimum twice evacuated and filled with ambient air filtered through charcoal and are then evacuated to below 10 mm Hg and monitored for at least an hour to check that the tanks do not leak more than 1 mm Hg/hour. They are then pressurized to greater than ambient pressure with helium, analyzed to ensure < 2 ppmC NMO, and stored for later use. Prior to shipping, tanks are evacuated to ≈325 mm Hg absolute. The tank absolute pressure and temperature and the barometric pressure are recorded on a data sheet enclosed with the shipment. The absolute pressure can be verified by measurement in the field.

Sampling units are reconditioned by checking that all sections operate properly. The unit is flushed with zero air for at least thirty minutes before an aliquot of this flow is injected into the analyzer. If the total carbon concentration is below 10 ppm, the unit is made ready for use and stored for shipment.

Certifications:

South Coast Air Quality Management District: ID# 94 LA 0401

State of Louisiana DEP: Application submitted 6/99, Agency Interest ID #30939

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 25-C SAMPLE CALCULATION

Note: All pressure values have been converted when necessary to mm Hg and all temperature values to Kelvin.

Name: Post, Buckley, Schuh, & Jernigan ID#01279-25C Analyzed: 10/25-29/01

Project ID: 320086.02

Sample # 1 GP4B

D A T A

Tank 6159:
Volume = 0.005786 cu.m

	Pressure (mm Hg)	Temp.(K)
Presampling	327.0	299.2
Postsampling	767.0	298.2
Final	7631.2	298.2
Barometric	750.0	
Water Vapor	23.8	

Water fraction = 0.0317

Calibration Data:

	CH4	CO2	NMOC
Response Factor (area units/ppmC)	315.8	313.8	294.7

Areas:

CO	157	156	156
CH4	2,686	2,715	2,694
CO2	2,549,387	2,555,747	2,545,512
NMOC	553	547	532

C A L C U L A T I O N S

Measured Concentrations (ppmC):

Cm(CO) = (Area(CO) - CO Blank) / RF(CO)
= (157 - 148) / 306.3 = 0.0
= (156 - 148) / 306.3 = 0.0
= (156 - 148) / 306.3 = 0.0

Cm(CH4) = Area(CH4)/RF(CH4)
= 2686 /315.8 = 8.5
= 2715 /315.8 = 8.6
= 2694 /315.8 = 8.5

Cm(CO2) = Area(CO2)/RF(CO2)
= 2549387 /313.8 = 8124.2
= 2555747 /313.8 = 8144.5
= 2545512 /313.8 = 8111.9

Cm(NMOC) = Area(NMOC)/RF(NMOC)
= 553 /294.7 = 1.9
= 547 /294.7 = 1.9
= 532 /294.7 = 1.8

Pressure-Temperature Ratio, Q(i) = P(i)/T(i):

postsampling tank: Q(1) = 767 / 298.15 = 2.572531
presampling tank: Q(2) = 327 / 299.15 = 1.093097
final tank: Q(3) = 7631.242 / 298.15 = 25.59531

Volume Sampled (dscm) = 0.3857 x Tank Volume x [Q(1)-Q(2)]
= 0.3857 x .005786 x [2.5725 - 1.0931]
= 0.003302

Averages and % Relative Standard Deviations (%RSD) of Cm's are calculated.
(%RSD of C = %RSD of Cm)

Moisture Correction Factor, CF:

CF = 1 - Water fraction (Nitrogen correction will not be made)
= 1 - 0.0317 = 0.9683

Calculated Concentrations (ppm):

C(CO) = Q(3)/[Q(1)-Q(2)] x Cm(CO)/CF
= 25.5953/(2.5725 - 1.0931) x 0.0/0.9683 = 0.5 (<PQL of 14)

C(CH4) = Q(3)/[Q(1)-Q(2)] x Cm(CH4)/CF
= 25.5953/(2.5725 - 1.0931) x 8.5/0.9683 = 152.7

C(CO2) = Q(3)/[Q(1)-Q(2)] x Cm(CO2)/CF
= 25.5953/(2.5725 - 1.0931) x 8126.9/0.9683 = 145209.1

C(NMOC as Carbon) = Q(3)/[Q(1)-Q(2)] x Cm(NMOC)/(CF x Carbon Number)
= 25.5953/(2.5725 - 1.0931) x 1.8/(0.9683 x 1)
= 33.0 (<PQL of 35)

Carbon Mass Concentration (mg/cu.m)
= (12.011 /24.056) x C(NMOC)
= 0.4993 x 33.0 = 16.5 (<PQL of 17)

<PQL of ### = Concentration Below Practical Quantitation Limit

Triangle Environmental Services, Inc.
METHOD 25-C SAMPLE QA/QC DATA

DAILY ANALYZER CHECKS

10.2* **Daily Calibration**

Response Factor Checks
Requirement: Daily RF = Initial RF ± 10%
See the individual sample data sheet for the daily response factor

	Initial RF for Analyzer A 5/16/01	Initial RF for Analyzer B 5/16/00
CO	207.69	311.18
CH_4	208.39	300.82
CO_2	210.35	304.18
NMO	219.42	304.12

Triplicate injections of a mixture of CO, CH_4, CO_2, and C_3H_8 are made before and after each batch of samples.

INITIAL NMO ANALYZER PERFORMANCE CHECKS

10.1.2.1* **Oxidation Catalyst Efficiency Check** Analyzer A, 4/8/98; Analyzer B, 4/21/98

FID response with reduction catalyst in bypass mode = 0, 0
Requirement: ≤1%

10.1.2.2* **Reduction Catalyst Efficiency Check** Analyzer A, 4/8/98; Analyzer B, 4/21/98

Response of CH_4 with oxidation and reduction catalysts in series mode and response with both catalysts in bypass mode to be within 5% of the average:
1.05 x Average Response > Response > 0.95 x Average Response
or Higher Response/Lower Response < 1.105263
100.0%, 100.0% Requirement: <110.5%

* USEPA Method 25 Protocol (2000) Reference Number

10.1.2.3* **Analyzer Linearity Check+NMO Calibration** Analyzer A, 11/3/99; Analyzer B, 5/16/00

	$100\times(1-RF/RF_{average})$	Requirement:
RF Value CO:	+2.07%, -1.79%	± 2.5%
RF Value CH_4:	-1.48%, +0.39%	± 2.5%
RF Value CO_2:	+2.50%, +1.15%	± 2.5%
RF Value NMO:	-0.60%, -1.17%	± 2.5%
% RSD Values:	1.02%, 1.49%	≤ 2%
$\frac{RF\ (NMO)}{RF\ (CO_2)}$ =	1.03, 1.00	1.0 ± 0.1

10.1.2.4* **System Performance Check** Analyzer A, 4/8/98; Analyzer B, 4/21/98, 5/1/98

	Measured Value, Expected Value		Requirement
	Analyzer A	Analyzer B	
Propane in Mix	19.6, 20.0	20.22, 20.0	± 5%
Hexane	50.6, 51.6	51.6, 51.6	± 5%
Toluene	20.3, 20.0	19.34, 20.0	± 5%
Methanol	104.5, 109.1	109.55, 109.0	± 5%

EQUIPMENT CHECKS

8.1.1* **Clean Sampling Equipment Check** (Method 25)

Sample Unit	<10 ppmC total C	@ 100%
Tank	< 2 ppmC NMO	@ 100%

8.1.2* **Sample Tank Evacuation and Leak Check** (Method 25)

Tank evacuated to ≤10 mm Hg absolute pressure, monitored for ≥1 hour, and passed for use if no pressure change (< 1 mm Hg/hr) is noted. (Method 25C: ± 2 mm Hg after 30 minutes)

10.3* **Sample Tank Volumes**

Tank weighed empty, filled with deionized distilled water (temperature recorded), and weighed to the nearest 2 g. Volume calculated based on density of water at that temperature and results recorded in permanent file.

* USEPA Method 25 Protocol (2000) Reference Number

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 25-C DATA REPORT

Name: Post, Buckley, Schuh, & Jernigan ID#01279-25C Analyzed: 10/25-29/01

Project ID: 320086.02

Sample # 1 GP4B

TANK 6159:
Volume = 0.005786 cu.m

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	327.0	299.15	1.093
Postsampling	767.0	298.15	2.573
Lab receipt	767.0	298.15	2.573
Final	7631.2	298.15	25.595
Barometric	750.0		
Water Vapor	23.8		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled = 0.003302 dscm
Water fraction = 0.0317
Nitrogen correction will not be made

Calibration Data:

	CO	CH4	CO2	NMOC	
Response Factor (area units/ppmC)	306.3	315.8	313.8	294.7	
Practical Quantitation Limit (ppm)	14	14	14	35	(as Carbon)
CO Blank (area units)	148				

Areas:

CO	157	156	156
CH4	2,686	2,715	2,694
CO2	2,549,387	2,555,747	2,545,512
NMOC	553	547	532

Concentrations:

*Corrected for blank	ppm Amount	± SD	%RSD
CO*	< 14		
CH4	153	± 1	0.6
CO2	145209	± 294	0.2
NMOC as Carbon	< 35		
	(= < 17 mg Carbon/cu.m)		

< # = Concentration Below Practical Quantitation Limit

Triangle Environmental Services, Inc.
METHOD 3-C PROCEDURES

CALIBRATION

Triplicate injections of a calibration gas mixture consisting of 2.39% oxygen, 9.95% nitrogen, 25.0% carbon dioxide, and 2.05% methane are made immediately before and after each batch of samples. Daily response factors are calculated from the pre-batch integrated responses (average area count / concentration in ppm) and must agree within 20% of the response factors of the initial calibrations. Further, the post-batch response factors must agree within 5% of the pre-batch response factors. Both criteria must be met before the analyses are considered valid.

ANALYSIS

All samples, which include the daily calibration gas mixture and sample tanks, are analyzed in triplicate using a computer-interfaced gas chromatograph equipped with an automated gas sampling system and a thermal conductivity detector (TCD). O_2, N_2, CO, CH_4, and CO_2 are eluted from the column and pass to the TCD.

CALCULATIONS

Calculations are done in accord with USEPA Method 3-C procedures. A sample calculation for one of the samples is provided in the report.

EQUIPMENT

Tanks are at a minimum twice evacuated and filled with ambient air filtered through charcoal and are then evacuated to below 10 mm Hg and monitored for at least an hour to check that the tanks do not leak more than 1 mm Hg/hour. They are then pressurized to greater than ambient pressure with helium, analyzed to ensure < 2 ppm CH_4 and < 20 ppm CO_2, and stored for later use.

Certifications:

South Coast Air Quality Management District: ID# 94 LA 0401

State of Louisiana DEP: Application submitted 6/99, Agency Interest ID #30939

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C SAMPLE CALCULATION

Note: All pressure values have been converted when necessary to mm Hg and all temperature values to Kelvin.

Name: Post, Buckley, Schuh, & Jernigan ID#01279-25C Analyzed: 10/25/01
Project ID: 320086.02

Sample # 1 GP4B

D A T A

Tank 6159:
Volume (cu.m) = 0.005786

	Pressure (mm Hg)	Temp.(K)
Presampling	327.0	299.15
Postsampling	767.0	298.15
Final	1841.0	298.15
Barometric	750.0	
Water Vapor	23.8	

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.12	36.32	29.98	41.94

Areas:

O2	194,199	194,530	194,617
N2	7,251,010	7,242,457	7,238,040
CH4	1,032	1,016	1,066
CO2	1,389,593	1,383,684	1,384,438

C A L C U L A T I O N S

Measured Concentrations (ppmC):

Cm(O2) = Area(O2) / RF(O2)
= 194199 / 34.1 = 5691.6
= 194530 / 34.1 = 5701.3
= 194617 / 34.1 = 5703.9

Cm(N2) = Area(N2)/RF(N2)
= 7251010 / 36.3 = 199642.4
= 7242457 / 36.3 = 199406.9
= 7238040 / 36.3 = 199285.3

Cm(CH4) = Area(CH4)/RF(CH4)
= 1032 / 30.0 = 34.4
= 1016 / 30.0 = 33.9
= 1066 / 30.0 = 35.6

Cm(CO2) = Area(CO2)/RF(CO2)
= 1389593 / 41.9 = 33132.9
= 1383684 / 41.9 = 32992.0
= 1384438 / 41.9 = 33010.0

Pressure-Temperature Ratio, Q(i) = P(i)/T(i):

postsampling tank: Q(1) = 767 / 298.15 = 2.572531
presampling tank: Q(2) = 327 / 299.15 = 1.093097
final tank: Q(3) = 1841 / 298.15 = 6.174745

Volume Sampled (dscm) = 0.3857 x Tank Volume x [Q(1)-Q(2)]
= 0.3857 x .005786 x [2.5725 - 1.0931]
= 0.003302

Averages and % Relative Standard Deviations (%RSD) of Cm's are calculated.
(%RSD of C = %RSD of Cm)

Moisture Correction Factor, MCF:

= 1 - Water Vapor Pressure/Barometric Pressure
= 1 - 23.8/ 750.0 = 0.9683

Calculated Concentrations (ppm):

C(O2) = Q(3)/[Q(1)-Q(2)] x Cm(O2)/MCF
= 6.1747/(2.5725 - 1.0931) x 5699.0/0.9683 = 24565.4

C(N2) = Q(3)/[Q(1)-Q(2)] x Cm(N2)/MCF
= 6.1747/(2.5725 - 1.0931) x 199444.8/0.9683 = 859708.6

C(CH4) = Q(3)/[Q(1)-Q(2)] x Cm(CH4)/MCF
= 6.1747/(2.5725 - 1.0931) x 34.6/0.9683 = 149.2

C(CO2) = Q(3)/[Q(1)-Q(2)] x Cm(CO2)/MCF
= 6.1747/(2.5725 - 1.0931) x 33044.9/0.9683 = 142440.5

Triangle Environmental Services, Inc.
METHOD 3-C SAMPLE QA/QC DATA

DAILY ANALYZER CHECKS

Daily Calibration

Response Factor Checks

Requirement: Daily RF = Initial RF ± 20%

	Initial RF 2/5/98
O_2	28.94
N_2	34.69
CH_4	28.91
CO_2	41.14

Triplicate injections of a mixture of O_2, N_2, CH_4, and CO_2 are made before and after each batch of samples.

Analyzer Linearity Check 2/5/98

	$100x(1-RF/RF_{average})$	Requirement:
max. dev. O_2:	- 3.4%	± 10%
max. dev. N_2:	+ 1.5%	± 10%
max. dev. CH_4:	- 1.7%	± 10%
max. dev. CO_2:	+ 2.4%	± 10%

EQUIPMENT CHECKS

Clean Sampling Equipment Check

Tank	< 2 ppm CH_4	@ 100%
	<20 ppm CO_2	@ 100%

Sample Tank Evacuation and Leak Check

Tank evacuated to ≤ 10 mm Hg absolute pressure, monitored for ≥ 1 hour, and passed for use if no pressure change (< 1 mm Hg/hr) is noted.

Sample Tank Volumes

Tank weighed empty, filled with deionized distilled water (temperature recorded), and weighed to the nearest 2 g. Volume calculated based on density of water at that temperature and results recorded in permanent file.

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: Post, Buckley, Schuh, & Jernigan ID#01279-25C Analyzed: 10/25/01

Project ID: 320086.02

Sample # 1 GP4B

TANK 6159:
Volume (cu.m) = 0.005786

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	327.0	299.15	1.093
Postsampling	767.0	298.15	2.573
Lab receipt	767.0	298.15	2.573
Final	1841.0	298.15	6.175
Barometric	750.0		
Water Vapor	23.8		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.003302

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.12	36.32	29.98	41.94
Practical Quantitation Limit (ppm)	84	84	84	84

Areas:

O2	194,199	194,530	194,617
N2	7,251,010	7,242,457	7,238,040
CH4	1,032	1,016	1,066
CO2	1,389,593	1,383,684	1,384,438

Concentrations:

	ppm Amount	±	SD	%RSD
O2	24565	±	28	0.1
N2	859709	±	783	0.1
CH4	149	±	4	2.5
CO2	142441	±	331	0.2

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: Post, Buckley, Schuh, & Jernigan ID#01279-25C Analyzed: 10/25/01

Project ID: 320086.02

Sample # 2 GP5B

TANK 6157:
Volume (cu.m) = 0.005779

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	325.0	299.15	1.086
Postsampling	775.0	298.15	2.599
Lab receipt	775.0	298.15	2.599
Final	1842.0	298.15	6.178
Barometric	750.0		
Water Vapor	23.8		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.003372

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.12	36.32	29.98	41.94
Practical Quantitation Limit (ppm)	82	82	82	82

Areas:

O2	1,090,417	1,090,834	1,088,601
N2	6,917,891	6,907,206	6,902,454
CH4	0	0	0
CO2	922,804	918,476	919,427

Concentrations:

	ppm Amount ± SD	%RSD
O2	134720 ± 147	0.1
N2	802261 ± 918	0.1
CH4	< 82	
CO2	92535 ± 229	0.2

< # = Concentration Below Practical Quantitation Limit

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: Post, Buckley, Schuh, & Jernigan ID#01279-25C Analyzed: 10/25/01

Project ID: 320086.02

Sample # 3 GP7B

TANK 6141:
Volume (cu.m) = 0.005791

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	326.0	299.15	1.090
Postsampling	738.0	298.15	2.475
Lab receipt	738.0	298.15	2.475
Final	1836.0	298.15	6.158
Barometric	750.0		
Water Vapor	23.8		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.003095

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.12	36.32	29.98	41.94
Practical Quantitation Limit (ppm)	89	89	89	89

Areas:

O2	1,629,643	1,627,407	1,627,635
N2	6,452,652	6,445,338	6,447,599
CH4	0	0	0
CO2	4,221	4,518	4,716

Concentrations:

	ppm Amount ± SD	%RSD
O2	219048 ± 166	0.1
N2	814982 ± 473	0.1
CH4	< 89	
CO2	491 ± 27	5.6

< # = Concentration Below Practical Quantitation Limit

TRIANGLE ENVIRONMENTAL SERVICES, INC.

METHOD 3-C DATA REPORT

Name: Post, Buckley, Schuh, & Jernigan ID#01279-25C Analyzed: 10/25/01

Project ID: 320086.02

Sample # 4 GP8B

TANK 6120:
Volume (cu.m) = 0.005784

	Pressure (mm Hg)	Temperature (K)	P/T
Presampling	324.0	299.15	1.083
Postsampling	745.0	298.15	2.499
Lab receipt	745.0	298.15	2.499
Final	1850.0	298.15	6.205
Barometric	750.0		
Water Vapor	23.8		

Field and laboratory postsampling pressure-temperature comparison:

Laboratory receipt P/T / Field postsampling P/T = 1.000

Volume Sampled (dscm) = 0.003158

Calibration Data:

	O2	N2	CH4	CO2
Response Factor (area units/ppmC)	34.12	36.32	29.98	41.94
Practical Quantitation Limit (ppm)	88	88	88	88

Areas:

O2	1,654,427	1,654,107	1,656,848
N2	6,550,503	6,549,680	6,553,186
CH4	0	0	0
CO2	4,444	4,605	4,581

Concentrations:

	ppm Amount ± SD	%RSD
O2	219584 ± 199	0.1
N2	816486 ± 228	0.0
CH4	< 88	
CO2	490 ± 9	1.9

< # = Concentration Below Practical Quantitation Limit

Chain of Custody

Triangle Environmental Services, Inc.
LABORATORY SAMPLE INFORMATION AND CHAIN-OF-CUSTODY FORM

Company Name: PBS&J	Project ID: 320086.02	Date: 10/17/01
Contact Person: Chad Smith	Phone #: 804-560-7600	Process Type:
Latest Date Samples Expected at Lab: 10/23/01 (Normal Turnaround: 15 working days after last receipt of samples)		Results Due Date:
		Report Package Due Date:
Send Report to: (Street address required for UPS shipment of report)	Person Chad Smith Address 804 Moorefield Park Dr. #302 Richmond, VA 23236	Send Invoice to: (if different from report address) Person / Address
Phone # 804-560-7600	FAX # 804-560-5129	

✓ all applicable boxes

Analysis

US EPA: ☐ Method 25 ☒ Method 3-C ☒ Method 25-C (NMOC as C [default]) ☐ Method 10-B			SCAQMD: ☐ Method 25.1 ☐ Method 25.2
# of Tank/Trap Pairs:	# of Tank-Only Samples: 4	# of Trap-Only Samples:	# of Bag Samples:
☐ Audit with Delay (*extra charge*)	☐ Rush Turnaround (*extra charge*)	☐ High Concentrations Possible ☐ Call if Concentrations High	☐ Dilute High Concentrations (*extra charge*)

Special Instructions: Also analyze for Hydrogen Sulfide and Carbon Monoxide

Tanks (Bags) (List IDs): 6159, 6157, 6141, 6120	Traps (List IDs):

☒ TES Equipment	☐ Client Equipment	☐ Client Equipment to be Reconditioned
Tanks, Unused for Reconditioning (List IDs):		Traps, Unused for Reconditioning (List IDs):

Relinquished by:		Date: 10/18/01	Time: 1000am	To: (Carrier)			
Tanks received at TES by:	Condition: good	Date: 10/22/01	Time: 10:45	Traps received at TES by:	Condition:	Date:	Time:

Triangle Environmental Services

6661 South Alston Avenue
Durham, NC 27713

01279-25C

Analytical Report
(1101-04)

EPA Method 16

Hydrogen sulfide

Summary of Results

Company	Triangle Env. Services
Analyst Initials	JRC
Parameters	Hydrogen sulfide
# Samples	1 Cannister

Client #	320086.02
Job #	1101-04
PO #	01279-25C
Report Date	11/9/2001

Compound	Sample ID / Sample Conc (ppm)
	GP-4B
Hydrogen sulfide	3.46 ND

Results

Company	Triangle Env. Services
Analyst Initials	JRC
Parameters	Hydrogen sulfide
# Samples	1 Cannister

Client #	320086.02
Job #	1101-04
PO #	01279-25C
Report Date	11/9/2001

MDL 0.200 (ppm)
LOQ 1.00 (ppm)
Compound Hydrogen sulfide

Lower Curve Limit 2.53 (ppm)
Upper Curve Limit 9.00 (ppm)

Sample ID	Lab ID # 1	Lab ID # 2	Analysis Method	Ret Time # 1	Ret Time # 2	% Diff Ret	Conc # 1	Conc # 2	% Diff Conc	Avg Conc (ppm)	DF	Tank Dilution	Sample Conc (ppm)	Qual
GP-4B	007B0701.D	007B0702.D	1101-18A.	NA	NA	NA	0.200	0.200	NA	0.200	1	17.3	3.46	ND

Narrative Summary

Analysis

The tank sample was analyzed for hydrogen sulfide using EPA Method 16 analytical procedures. Triangle Environmental Services, Inc provided a dilution ratio for the canister.

The tank was analyzed for hydrogen sulfide using a Hewlett Packard 5890 Series II gas chromatograph equipped with a flame photometric detector. Samples and calibration standards were injected into the GC using a VICI six port valve with a gas sample loop. Hydrogen sulfide was referenced to a certified permeation device.

Separation

The sample and standards were separated using a Restek 60 m x 0.53 mm ID Rtx-1 capillary column. Hydrogen was used as the carrier gas. Hydrogen sulfide eluted at approximately 2.6 minutes, separated well, and was easily identified.

Chromatographic Conditions

Initial temperature:	48°C, hold for 2.2 minutes
Ramp:	25°C per minute to 185°C
Net Run Time:	7.7 minutes
Pressure Constant:	4.2 psi at 48°C
Detector temperature:	200°C

Reproducibility

All standards were within 10% of their tag value.

Reporting Notes

The symbols *MDL* and *LOQ* represent the Minimum Detection Limit and the Limit of Quantification.

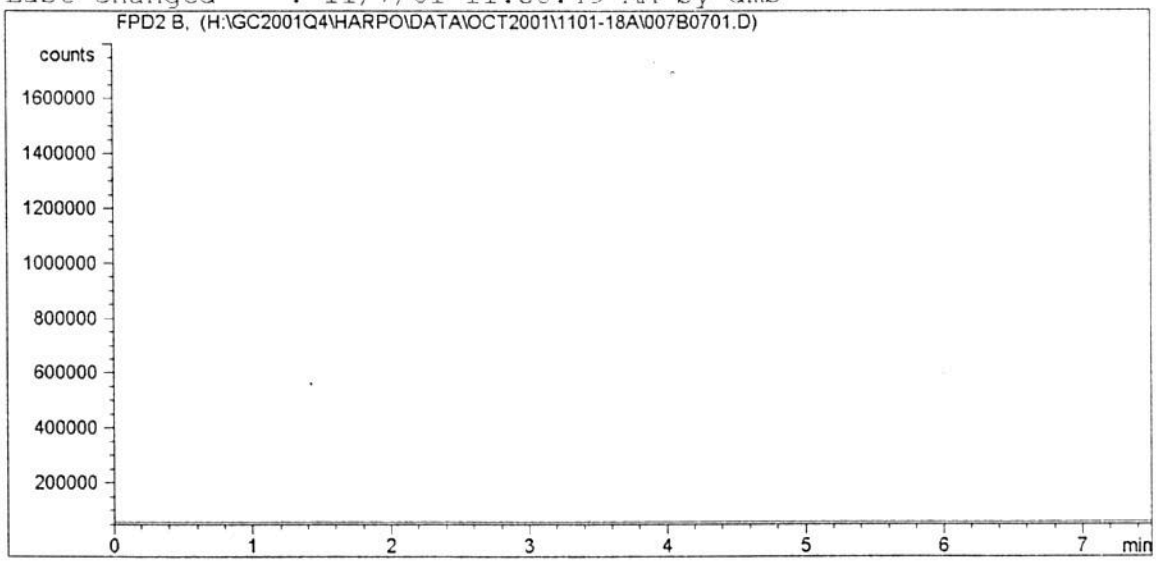
The symbols *ND* following a value indicate a non-detect or analytical result below the MDL.

The symbol *J* following a value indicates an analytical result between the MDL and the LOQ.

The symbol *E* following a value indicates an analytical result exceeding 125% of the highest calibration point.

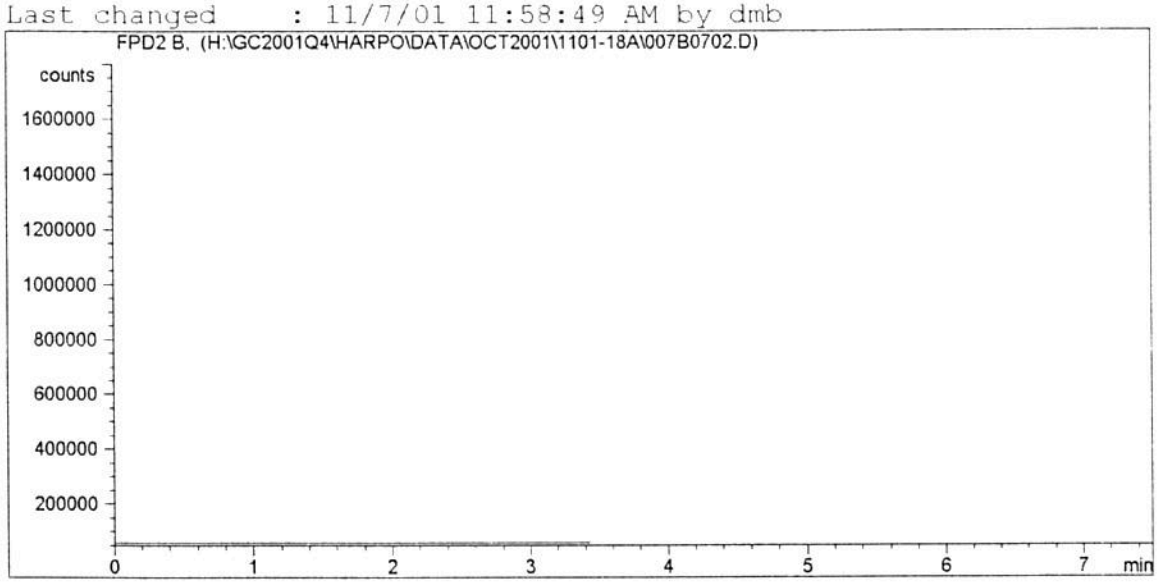
Sample Chromatograms

```
==========================================================================
Injection Date  : 11/7/01 12:41:04 PM                Seq. Line :   7
Sample Name     : GP-4B                                   Vial :   7
Acq. Operator   : jrc                                      Inj :   1
Acq. Instrument : Harpo                             Inj Volume : External
Acq. Method     : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed    : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed    : 11/7/01 11:58:49 AM by dmb
```




```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Wednesday, November 07, 2001 11:58:45 AM
Multiplier             :      1.0000
Dilution               :      1.0000

Signal 1: FPD2 B,

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          counts*s                [ppmv]
-------|------|----------|----------|----------|--|------------------
  2.565           -          -          -          Hydrogen sulfide
  3.519           -          -          -          Methyl mercaptan
  4.638           -          -          -          Dimethyl sulfide
  7.177           -          -          -          Dimethyl disulfide

Totals :                                 0.00000

 Results obtained with enhanced integrator!
1 Warnings or Errors :

Warning : Calibrated compound(s) not found

==========================================================================
```

```
==========================================================================
Injection Date  : 11/7/01 12:52:51 PM            Seq. Line :   7
Sample Name     : GP-4B                               Vial :   7
Acq. Operator   : jrc                                  Inj :   2
Acq. Instrument : Harpo                          Inj Volume : External
Acq. Method     : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed    : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed    : 11/7/01 11:58:49 AM by dmb
```




```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Wednesday, November 07, 2001 11:58:45 AM
Multiplier             :      1.0000
Dilution               :      1.0000

Signal 1: FPD2 B,

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          counts*s                [ppmv]
-------|------|----------|----------|----------|--|------------------
  2.565           -          -          -          Hydrogen sulfide
  3.519           -          -          -          Methyl mercaptan
  4.638           -          -          -          Dimethyl sulfide
  7.177           -          -          -          Dimethyl disulfide

Totals :                                 0.00000

 Results obtained with enhanced integrator!
1 Warnings or Errors :

Warning : Calibrated compound(s) not found

==========================================================================
```

Curve(s)/QA Point(s) Chromatograms

Calibration Table

Calib. Data Modified : Wednesday, November 07, 2001 11:58:45 AM

Calculate : External Standard
Based on : Peak Area

Rel. Reference Window : 5.000 %
Abs. Reference Window : 0.000 min
Rel. Non-ref. Window : 5.000 %
Abs. Non-ref. Window : 0.000 min
Uncalibrated Peaks : not reported
Partial Calibration : Yes, identified peaks are recalibrated
Correct All Ret. Times: No, only for identified peaks

Curve Type : Power
Origin : Ignored
Weight : Equal

Recalibration Settings:
Average Response : Average all calibrations
Average Retention Time: Floating Average New 75%

Calibration Report Options :
Printout of recalibrations within a sequence:
Calibration Table after Recalibration
Normal Report after Recalibration
If the sequence is done with bracketing:
Results of first cycle (ending previous bracket)

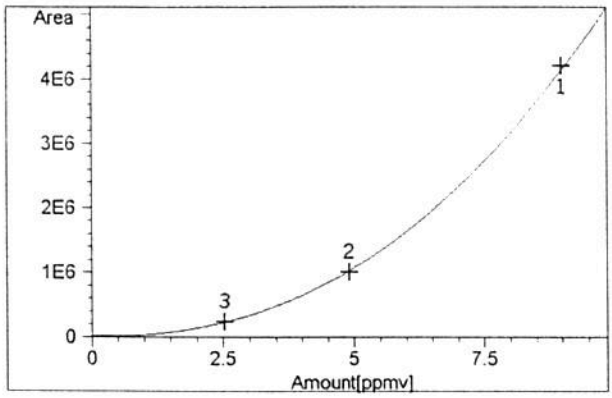
Signal 1: FPD2 B,

RetTime [min]	Sig	Lvl	Amount [ppmv]	Area	Amt/Area	Ref	Grp	Name
2.565	1	3	2.53000	2.26435e5	1.11732e-5			Hydrogen sulfide
		2	4.90000	9.97998e5	4.90983e-6			
		1	9.00000	4.20066e6	2.14252e-6			
3.519	1	3	1.37000	6329.10433	2.16460e-4			Methyl mercaptan
		2	2.65000	2.12339e4	1.24800e-4			
		1	4.90000	7.69686e4	6.36624e-5			
4.638	1	3	1.01000	1.53995e4	6.55867e-5			Dimethyl sulfide
		2	1.95000	5.16836e4	3.77296e-5			
		1	3.60000	1.83577e5	1.96103e-5			
7.177	1	3	2.71000e-1	5776.15853	4.69170e-5			Dimethyl disulfide
		2	5.26000e-1	1.67847e4	3.13381e-5			
		1	9.60000e-1	5.86183e4	1.63771e-5			

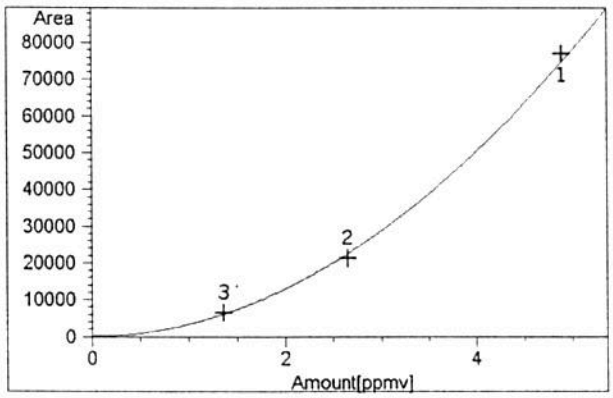
Peak Sum Table

No Entries in table

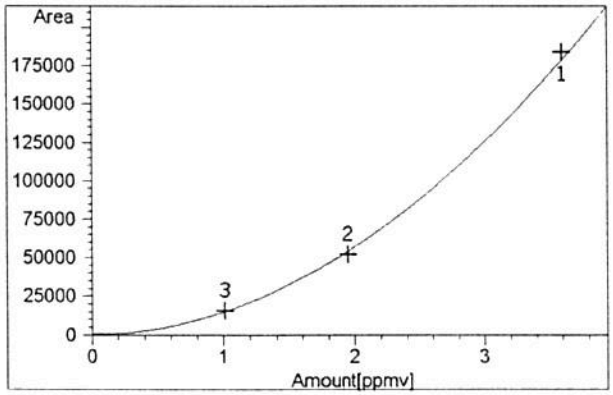
Calibration Curves



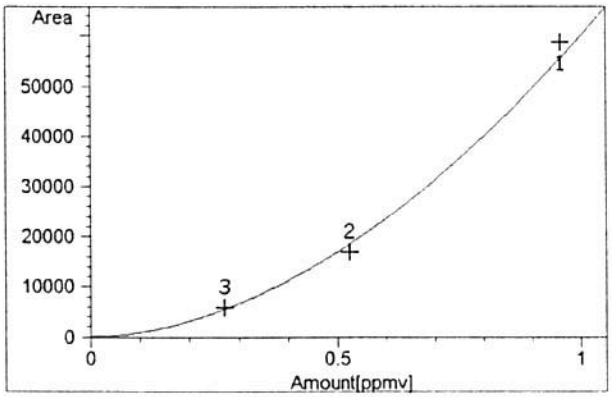
Hydrogen sulfide at exp. RT: 2.565
FPD2 B,
Correlation: 0.99995
Residual Std. Dev.: 60747.77236
Formula: y = b * x^m
m: 2.30060
b: 26439.64065
x: Amount[ppmv]
y: Area



Methyl mercaptan at exp. RT: 3.519
FPD2 B,
Correlation: 0.99962
Residual Std. Dev.: 2486.89039
Formula: y = b * x^m
m: 1.95876
b: 3326.40116
x: Amount[ppmv]
y: Area



Dimethyl sulfide at exp. RT: 4.638
FPD2 B,
Correlation: 0.99971
Residual Std. Dev.: 5181.81368
Formula: y = b * x^m
m: 1.94858
b: 14758.22014
x: Amount[ppmv]
y: Area

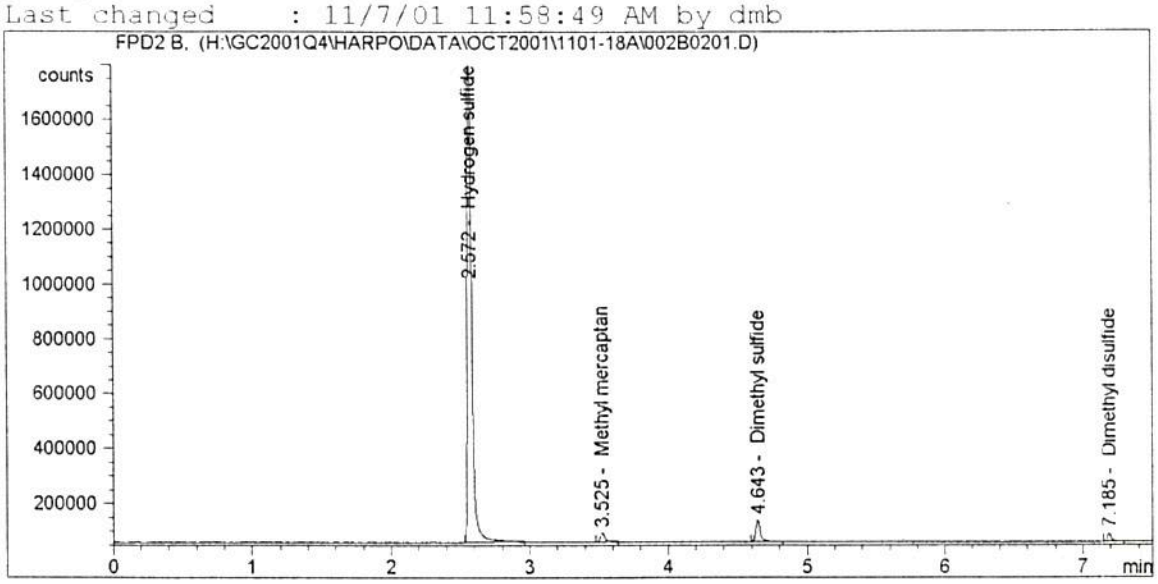


Dimethyl disulfide at exp. RT: 7.177
FPD2 B,
Correlation: 0.99854
Residual Std. Dev.: 3444.56808
Formula: y = b * x^m
m: 1.82833
b: 59972.21742
x: Amount[ppmv]
y: Area

338 cc/min 49.9C

==========

Injection Date : 11/7/01 10:08:41 AM Seq. Line : 2
Sample Name : high2 std Vial : 2
Acq. Operator : jrc Inj : 1
Acq. Instrument : Harpo Inj Volume : External
Acq. Method : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed : 11/7/01 11:58:49 AM by dmb



==========

External Standard Report

==========

Sorted By : Signal
Calib. Data Modified : Wednesday, November 07, 2001 11:58:45 AM
Multiplier : 1.0000
Dilution : 1.0000

Signal 1: FPD2 B,

RetTime [min]	Type	Area counts*s	Amt/Area	Amount [ppmv]	Grp	Name
2.572	PB	4.26305e6	2.13695e-6	9.10993		Hydrogen sulfide
3.525	PB	7.71156e4	6.45379e-5	4.97687		Methyl mercaptan
4.643	PB	1.89224e5	1.95710e-5	3.70331		Dimethyl sulfide
7.185	PB	5.84383e4	1.68713e-5	9.85928e-1		Dimethyl disulfide

Totals : 18.77604

Results obtained with enhanced integrator!

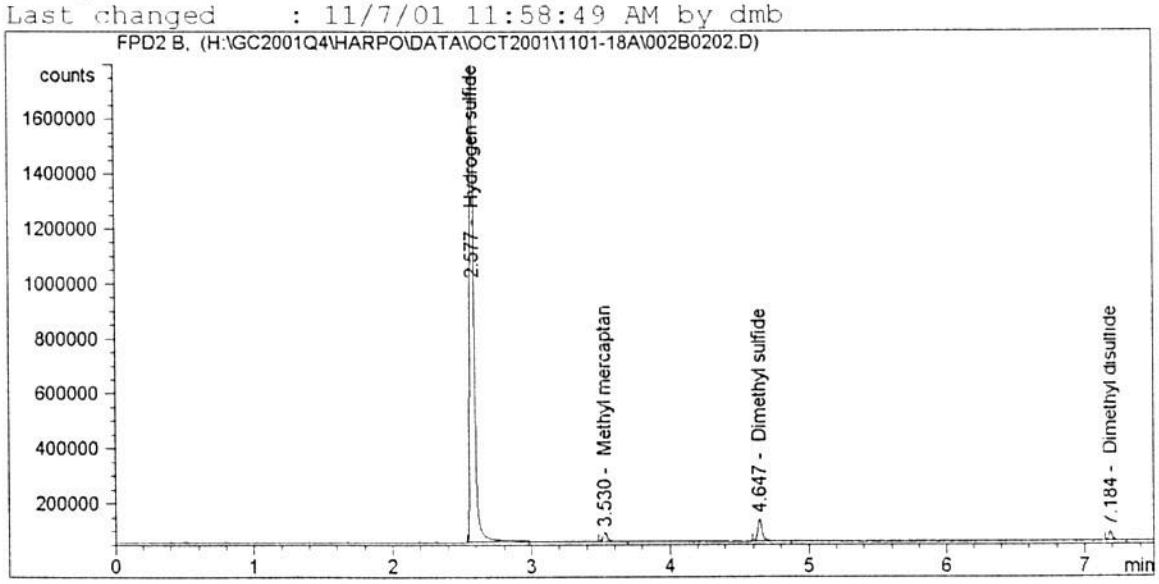
==========

*** End of Report ***

338 cc/min 49.9C

==========

Injection Date : 11/7/01 10:19:43 AM Seq. Line : 2
Sample Name : high2 std Vial : 2
Acq. Operator : jrc Inj : 2
Acq. Instrument : Harpo Inj Volume : External
Acq. Method : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed : 11/7/01 11:58:49 AM by dmb



==========

External Standard Report

==========

Sorted By : Signal
Calib. Data Modified : Wednesday, November 07, 2001 11:58:45 AM
Multiplier : 1.0000
Dilution : 1.0000

Signal 1: FPD2 B,

RetTime [min]	Type	Area counts*s	Amt/Area	Amount [ppmv]	Grp	Name
2.577	PB	4.22078e6	2.14902e-6	9.07055		Hydrogen sulfide
3.530	BB	7.88713e4	6.38306e-5	5.03440		Methyl mercaptan
4.647	BB	1.87692e5	1.96486e-5	3.68789		Dimethyl sulfide
7.184	PB	6.50474e4	1.60719e-5	1.04543		Dimethyl disulfide

Totals : 18.83828

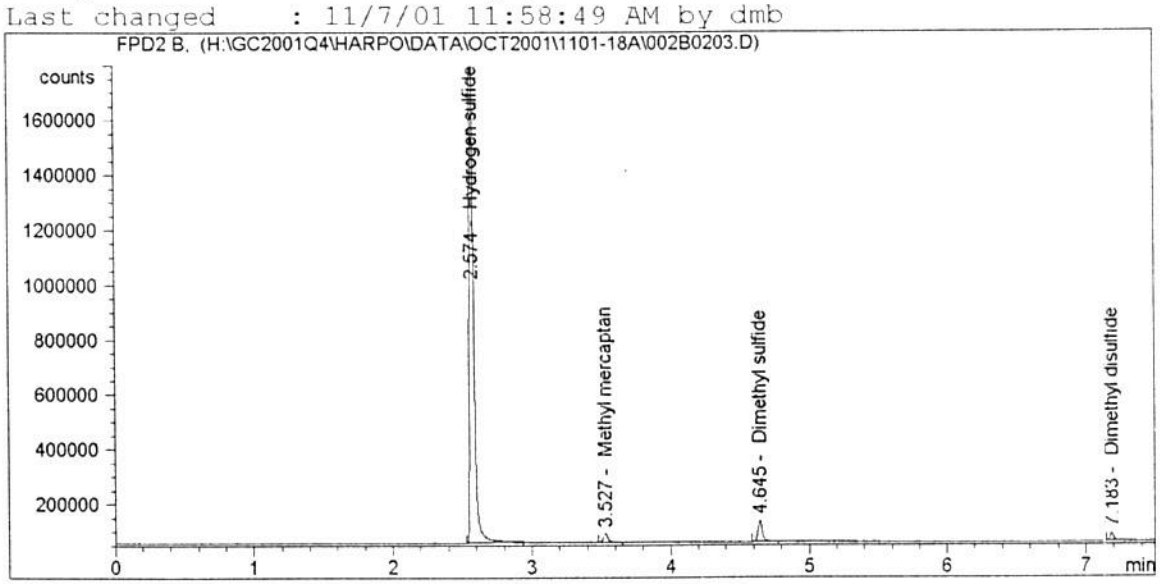
Results obtained with enhanced integrator!

==========

*** End of Report ***

338 cc/min 49.9C

```
==========================================================================
Injection Date  : 11/7/01 10:31:03 AM          Seq. Line :   2
Sample Name     : high2 std                         Vial :   2
Acq. Operator   : jrc                                Inj :   3
Acq. Instrument : Harpo                       Inj Volume : External
Acq. Method     : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed    : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed    : 11/7/01 11:58:49 AM by dmb
```




```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Wednesday, November 07, 2001 11:58:45 AM
Multiplier             :      1.0000
Dilution               :      1.0000

Signal 1: FPD2 B,
```

RetTime [min]	Type	Area counts*s	Amt/Area	Amount [ppmv]	Grp	Name
2.574	BB	4.11815e6	2.17914e-6	8.97402		Hydrogen sulfide
3.527	PB	7.49188e4	6.54573e-5	4.90398		Methyl mercaptan
4.645	PB	1.73815e5	2.03973e-5	3.54534		Dimethyl sulfide
7.183	PB	5.23692e4	1.77306e-5	9.28537e-1		Dimethyl disulfide

Totals : 18.35188

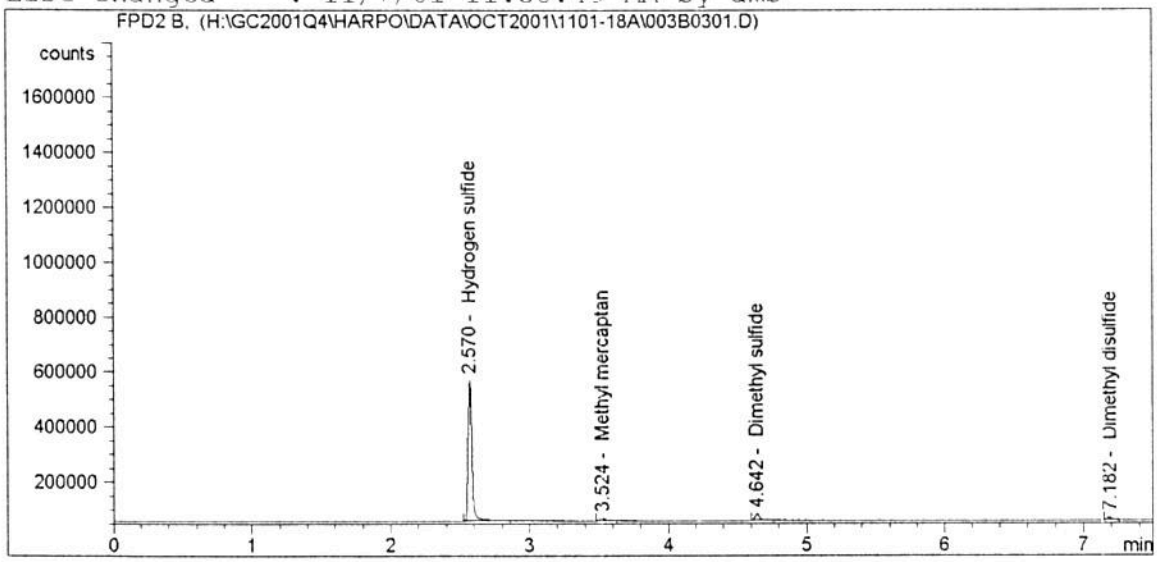
Results obtained with enhanced integrator!

==========

*** End of Report ***

620 cc/min 49.9C

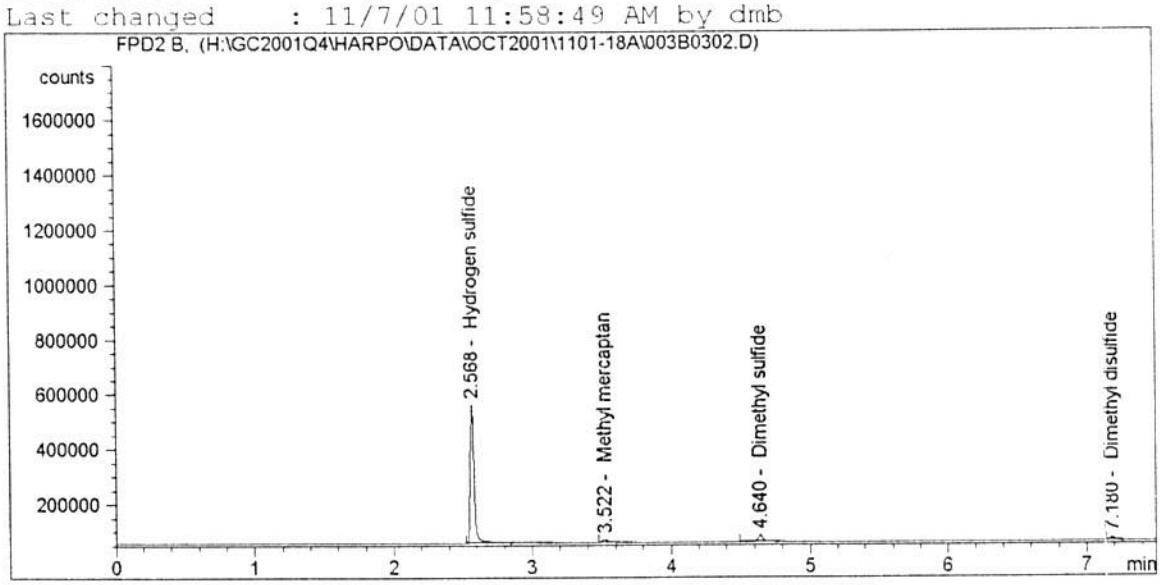
```
==========================================================================
Injection Date  : 11/7/01 10:42:51 AM            Seq. Line :   3
Sample Name     : mid std                             Vial :   3
Acq. Operator   : jrc                                  Inj :   1
Acq. Instrument : Harpo                         Inj Volume : External
Acq. Method     : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed    : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed    : 11/7/01 11:58:49 AM by dmb
```




```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Wednesday, November 07, 2001 11:58:45 AM
Multiplier             :      1.0000
Dilution               :      1.0000

Signal 1: FPD2 B,

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          counts*s                [ppmv]
-------|------|----------|----------|----------|--|-----------------
  2.570 PB     1.04367e6  4.73479e-6    4.94157    Hydrogen sulfide
  3.524 BB     2.19338e4  1.19421e-4    2.61935    Methyl mercaptan
  4.642 BB     5.34258e4  3.62226e-5    1.93522    Dimethyl sulfide
  7.182 PB     1.74254e4  2.91900e-5 5.08648e-1    Dimethyl disulfide

Totals :                                10.00479

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

620 cc/min 49.9C

```
==========================================================================
Injection Date  : 11/7/01 10:54:29 AM            Seq. Line :   3
Sample Name     : mid std                             Vial :   3
Acq. Operator   : jrc                                  Inj :   2
Acq. Instrument : Harpo                         Inj Volume : External
Acq. Method     : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed    : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed    : 11/7/01 11:58:49 AM by dmb
```



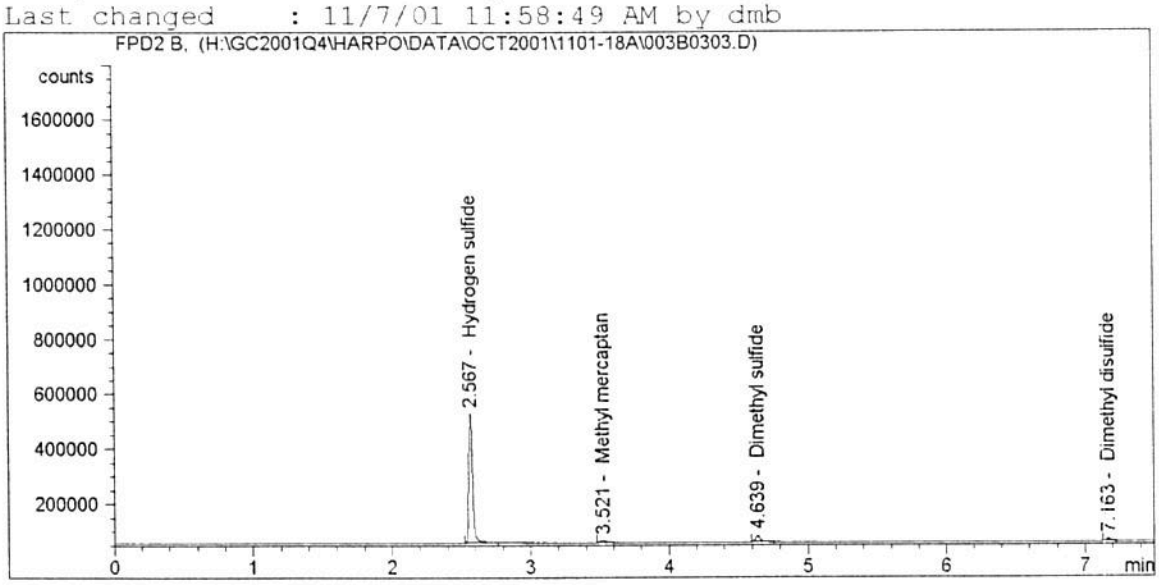

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Wednesday, November 07, 2001 11:58:45 AM
Multiplier             :      1.0000
Dilution               :      1.0000

Signal 1: FPD2 B,
```

RetTime [min]	Type	Area counts*s	Amt/Area	Amount [ppmv]	Grp	Name
2.568	PB	1.01894e6	4.79942e-6	4.89032		Hydrogen sulfide
3.522	PB	2.23502e4	1.18326e-4	2.64462		Methyl mercaptan
4.640	PB	5.23833e4	3.65717e-5	1.91575		Dimethyl sulfide
7.180	PB	1.73059e4	2.92811e-5	5.06737e-1		Dimethyl disulfide
Totals :				9.95743		

```
 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

620 cc/min 49.9C

```
==========================================================================
Injection Date  : 11/7/01 11:06:22 AM            Seq. Line :   3
Sample Name     : mid std                             Vial :   3
Acq. Operator   : jrc                                  Inj :   3
Acq. Instrument : Harpo                         Inj Volume : External
Acq. Method     : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed    : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed    : 11/7/01 11:58:49 AM by dmb
```




```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Wednesday, November 07, 2001 11:58:45 AM
Multiplier             :      1.0000
Dilution               :      1.0000

Signal 1: FPD2 B,
```

RetTime [min]	Type	Area counts*s	Amt/Area	Amount [ppmv]	Grp	Name
2.567	PB	9.31384e5	5.04950e-6	4.70302		Hydrogen sulfide
3.521	PB	1.94178e4	1.26759e-4	2.46138		Methyl mercaptan
4.639	BB	4.92417e4	3.76896e-5	1.85590		Dimethyl sulfide
7.163	BB	1.56227e4	3.06705e-5	4.79156e-1		Dimethyl disulfide

Totals : 9.49946

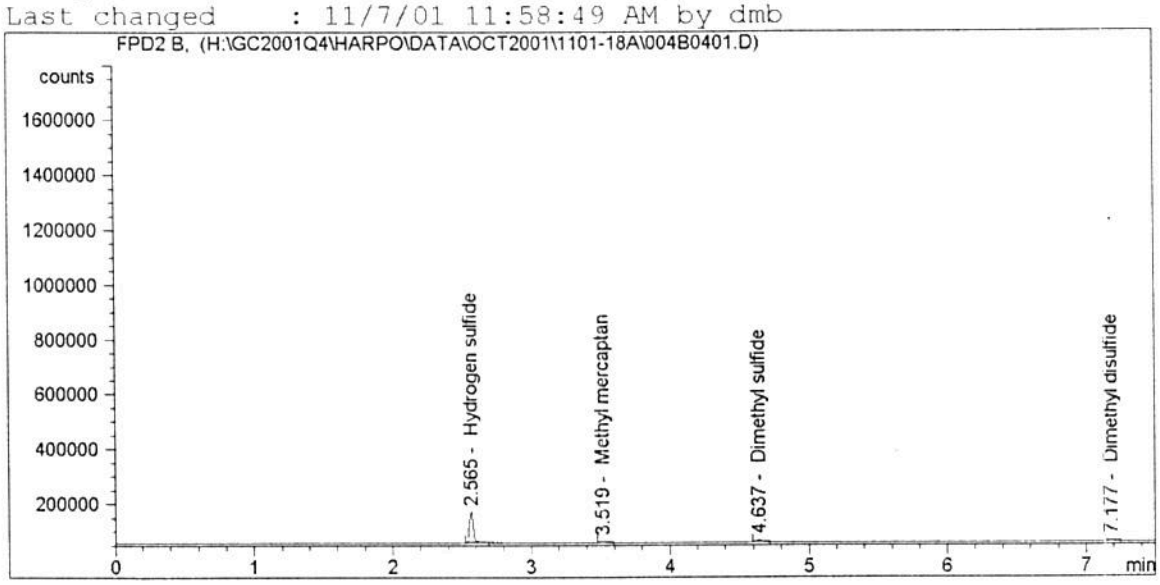
Results obtained with enhanced integrator!

==========

*** End of Report ***

1201 cc/min 49.9C

```
==========================================================================
Injection Date  : 11/7/01 11:18:16 AM          Seq. Line :   4
Sample Name     : low std                           Vial :   4
Acq. Operator   : jrc                                Inj :   1
Acq. Instrument : Harpo                        Inj Volume : External
Acq. Method     : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed    : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed    : 11/7/01 11:58:49 AM by dmb
```




```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Wednesday, November 07, 2001 11:58:45 AM
Multiplier             :      1.0000
Dilution               :      1.0000

Signal 1: FPD2 B,
```

RetTime [min]	Type	Area counts*s	Amt/Area	Amount [ppmv]	Grp	Name
2.565	PB	2.20191e5	1.14112e-5	2.51265		Hydrogen sulfide
3.519	PB	6211.32129	2.21450e-4	1.37550		Methyl mercaptan
4.637	BB	1.47217e4	6.78407e-5	9.98729e-1		Dimethyl sulfide
7.177	PB	5582.40332	4.88884e-5	2.72915e-1		Dimethyl disulfide

Totals : 5.15979

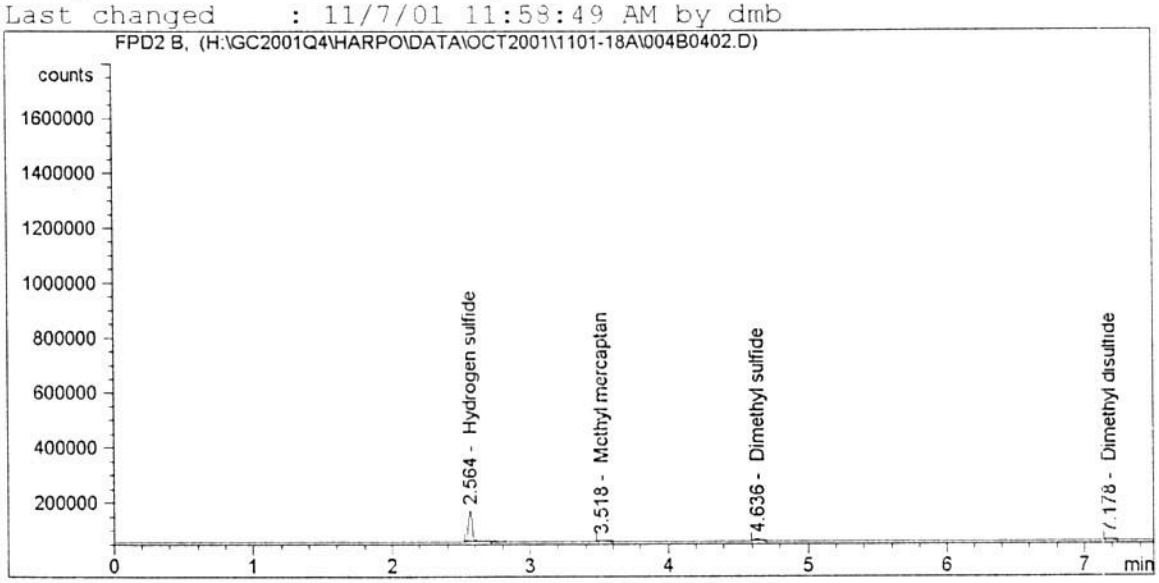
Results obtained with enhanced integrator!

==========

*** End of Report ***

1201 cc/min 49.9C

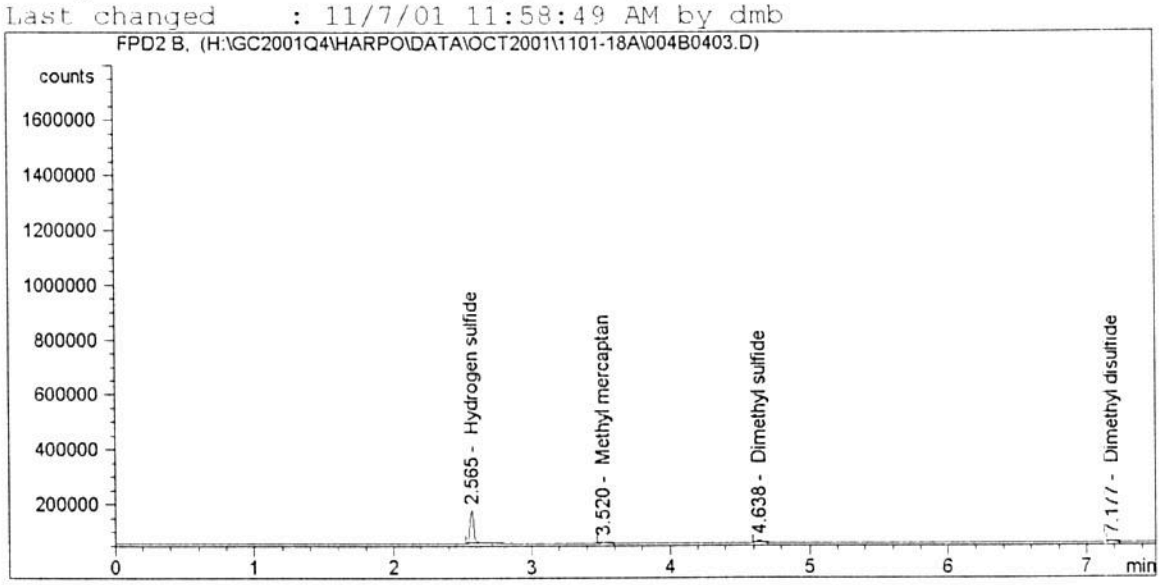
```
==========================================================================
Injection Date  : 11/7/01 11:29:59 AM            Seq. Line :   4
Sample Name     : low std                             Vial :   4
Acq. Operator   : jrc                                  Inj :   2
Acq. Instrument : Harpo                         Inj Volume : External
Acq. Method     : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed    : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed    : 11/7/01 11:58:49 AM by dmb
```




```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Wednesday, November 07, 2001 11:58:45 AM
Multiplier             :      1.0000
Dilution               :      1.0000

Signal 1: FPD2 B,

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          counts*s                [ppmv]
-------|------|----------|----------|----------|--|------------------
  2.564 PB     2.24659e5  1.12823e-5    2.53468    Hydrogen sulfide
  3.518 PB     6360.47705 2.18893e-4    1.39226    Methyl mercaptan
  4.636 BB     1.54044e4  6.63600e-5    1.02223    Dimethyl sulfide
  7.178 BB     5726.73340 4.83263e-5 2.76752e-1    Dimethyl disulfide

Totals :                                5.22593

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

1201 cc/min 49.9C

```
==========================================================================
Injection Date  : 11/7/01 11:41:48 AM            Seq. Line :   4
Sample Name     : low std                             Vial :   4
Acq. Operator   : jrc                                  Inj :   3
Acq. Instrument : Harpo                         Inj Volume : External
Acq. Method     : F:\GC2001Q3\HARPO\METHODS\1001-18.M
Last changed    : 11/7/01 10:06:51 AM by jrc
Analysis Method : H:\GC2001Q4\HARPO\METHODS\1101-18A.M
Last changed    : 11/7/01 11:58:49 AM by dmb
```




```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Wednesday, November 07, 2001 11:58:45 AM
Multiplier             :      1.0000
Dilution               :      1.0000

Signal 1: FPD2 B,
```

RetTime [min]	Type	Area counts*s	Amt/Area	Amount [ppmv]	Grp	Name
2.565	PB	2.34455e5	1.10134e-5	2.58214		Hydrogen sulfide
3.520	PB	6415.51465	2.17972e-4	1.39840		Methyl mercaptan
4.638	PB	1.60724e4	6.50028e-5	1.04475		Dimethyl sulfide
7.177	BB	6019.33887	4.72475e-5	2.84399e-1		Dimethyl disulfide

Totals : 5.30969

Results obtained with enhanced integrator!

==========

*** End of Report ***

AIR WATER & SOIL Laboratories, Inc.

2119A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804)358-8295 Fax: (804)358-8297

Certificate of Analysis

Client Name:	Post, Buckley, Schuh, & Jernigan	Date Received:	July 20, 2001
Client Project I.D.:	Cape Charles	Date Issued:	August 06, 2001
Submitted to:	Dennis Papa		

Reference Method: SW846 method 8260B

Three soil samples were analyzed for the following TCL Volatile Organic Compounds.

Parameter	SED-1 (mg/kg)	SED-2 (mg/kg)	SED-3 (mg/kg)	Detection Limit (mg/kg)
Acetone	0.1	BDL	BDL	0.1
Benzene	BDL	BDL	BDL	0.1
Bromochloromethane	BDL	BDL	BDL	0.1
Bromodichloromethane	BDL	BDL	BDL	0.1
Bromoform	BDL	BDL	BDL	0.1
Bromomethane/Methyl bromide	BDL	BDL	BDL	0.1
2-Butanone/MEK	BDL	BDL	BDL	0.1
Carbon disulfide	BDL	BDL	BDL	0.1
Carbon tetrachloride	BDL	BDL	BDL	0.1
Chlorobenzene	BDL	BDL	BDL	0.1
Chloroethane	BDL	BDL	BDL	0.1
Chloroform	BDL	BDL	BDL	0.1
Chloromethane/Methyl chloride	BDL	BDL	BDL	0.1
Dibromochloromethane	BDL	BDL	BDL	0.1
1,2-dibromo-3-chloropropane	BDL	BDL	BDL	0.1
1,2-Dibromoethane	BDL	BDL	BDL	0.1
1,2-Dichlorobenzene	BDL	BDL	BDL	0.1
1,3-Dichlorobenzene	BDL	BDL	BDL	0.1
1,4-Dichlorobenzene	BDL	BDL	BDL	0.1
1,1-Dichloroethane	BDL	BDL	BDL	0.1
1,2-Dichloroethane	BDL	BDL	BDL	0.1
1,1-Dichloroethene	BDL	BDL	BDL	0.1
cis-1,2-Dichloroethene	BDL	BDL	BDL	0.1
trans-1,2-Dichloroethene	BDL	BDL	BDL	0.1
1,2-Dichloropropane	BDL	BDL	BDL	0.1
cis-1,3-Dichloropropene	BDL	BDL	BDL	0.1
trans-1,3-Dichloropropene	BDL	BDL	BDL	0.1
Ethylbenzene	BDL	BDL	BDL	0.1
2-Hexanone	BDL	BDL	BDL	0.1
Methylene chloride	BDL	BDL	BDL	0.1
4-Methyl-2-Pentanone/MIBK	BDL	BDL	BDL	0.1
Styrene	BDL	BDL	BDL	0.1
1,1,2,2-Tetrachloroethane	BDL	BDL	BDL	0.1
Tetrachloroethene	BDL	BDL	BDL	0.1
Toluene	BDL	BDL	BDL	0.1
1,1,1-Trichloroethane	BDL	BDL	BDL	0.1
1,1,2-Trichloroethane	BDL	BDL	BDL	0.1
Trichloroethene	BDL	BDL	BDL	0.1
Vinyl chloride	BDL	BDL	BDL	0.1
Xylenes	BDL	BDL	BDL	0.1

BDL = Below Detection Limit

Timothy G. Ungerleider
QA Officer

AIR WATER & SOIL Laboratories, Inc.

2119A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804)358-8295 Fax: (804)358-8297

Certificate of Analysis

Client Name: Post, Buckley, Schuh, & Jernigan
Client Project I.D.: Cape Charles
Submitted to: Dennis Papa

Date Received: July 20, 2001
Date Issued: August 06, 2001

Reference Method: SW846 method 8270C

Three soil samples were analyzed for the following TCL Semi-volatile Organic Compounds.

Parameter	SED-1 (mg/kg)	SED-2 (mg/kg)	SED-3 (mg/kg)	Detection Limit (mg/kg)
Acenaphthene	BDL	BDL	BDL	0.5
Acenaphthylene	BDL	BDL	BDL	0.5
Anthracene	BDL	BDL	BDL	0.5
Benzo(a)anthracene	BDL	BDL	BDL	0.5
Benzo(b)fluoranthene	BDL	BDL	BDL	0.5
Benzo(k)fluoranthene	BDL	BDL	BDL	0.5
Benzo(ghi)perylene	BDL	BDL	BDL	0.5
Benzo(a)pyrene	BDL	BDL	BDL	0.5
bis(2-Chloroethoxy)methane	BDL	BDL	BDL	0.5
bis(2-Chloroethyl)ether	BDL	BDL	BDL	0.5
bis(2-Ethylhexyl)phthalate	BDL	BDL	BDL	0.5
4-Bromophenyl phenyl ether	BDL	BDL	BDL	0.5
Butyl benzyl phthalate	BDL	BDL	BDL	0.5
p-Chloroaniline	BDL	BDL	BDL	0.5
p-Chloro-m-cresol	BDL	BDL	BDL	0.5
2-Chloronaphthalene	BDL	BDL	BDL	0.5
2-Chlorophenol	BDL	BDL	BDL	0.5
4-Chlorophenyl phenyl ether	BDL	BDL	BDL	0.5
Chrysene	BDL	BDL	BDL	0.5
o-Cresol/2-Methylphenol	BDL	BDL	BDL	0.5
o-Cresol/4-Methylphenol	BDL	BDL	BDL	0.5
Di-n-butyl phthalate	BDL	BDL	BDL	0.5
Dibenz(a,h)anthracene	BDL	BDL	BDL	0.5
Dibenzofuran	BDL	BDL	BDL	0.5
3,3-Dichlorobenzidine	BDL	BDL	BDL	0.5
2,4-Dichlorophenol	BDL	BDL	BDL	0.5
Diethyl phthalate	BDL	BDL	BDL	0.5
2,4-Dimethylphenol	BDL	BDL	BDL	0.5
Dimethyl phthalate	BDL	BDL	BDL	0.5
4,6-Dinitro-o-cresol	BDL	BDL	BDL	0.5

BDL = Below Detection Limit

Timothy G. Ungerleider
QA Officer

AIR WATER & SOIL Laboratories, Inc.

2119A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804)358-8295 Fax: (804)358-8297

Certificate of Analysis

Client Name: Post, Buckley, Schuh, & Jernigan
Client Project I.D.: Cape Charles
Submitted to: Dennis Papa

Date Received: July 20, 2001
Date Issued: August 06, 2001

Reference Method: SW846 method 8270C continued

TCL Semi-volatile Organic Compounds continued:

Parameter	SED-1 (mg/kg)	SED-2 (mg/kg)	SED-3 (mg/kg)	Detection Limit (mg/kg)
2,4-Dinitrophenol	BDL	BDL	BDL	0.5
2,4-Dinitrotoluene	BDL	BDL	BDL	0.5
2,6-Dinitrotoluene	BDL	BDL	BDL	0.5
Di-n-octyl phthalate	BDL	BDL	BDL	0.5
Fluoranthene	BDL	BDL	BDL	0.5
Fluorene	BDL	BDL	BDL	0.5
Hexachlorobenzene	BDL	BDL	BDL	0.5
Hexachlorocyclopentadiene	BDL	BDL	BDL	0.5
Hexachlorethane	BDL	BDL	BDL	0.5
Hexachlorobutadiene	BDL	BDL	BDL	0.5
Indeno(1,2,3-cd)pyrene	BDL	BDL	BDL	0.5
Isophorone	BDL	BDL	BDL	0.5
2-Methylnaphthalene	BDL	BDL	BDL	0.5
Naphthalene	BDL	BDL	BDL	0.5
o-Nitroaniline	BDL	BDL	BDL	0.5
m-Nitroaniline	BDL	BDL	BDL	0.5
p-Nitroaniline	BDL	BDL	BDL	0.5
Nitrobenzene	BDL	BDL	BDL	0.5
o-Nitrophenol	BDL	BDL	BDL	0.5
p-Nitrophenol	BDL	BDL	BDL	0.5
n-Nitrosodiphenylamine	BDL	BDL	BDL	0.5
n-Nitrosodi-n-propylamine	BDL	BDL	BDL	0.5
2,2'-Oxybis(1-chloropropane)	BDL	BDL	BDL	0.5
Pentachlorophenol	BDL	BDL	BDL	0.5
Phenanthrene	BDL	BDL	BDL	0.5
Phenol	BDL	BDL	BDL	0.5
Pyrene	BDL	BDL	BDL	0.5
1,2,4-Trichlorobenzene	BDL	BDL	BDL	0.5
2,4,5-Trichlorophenol	BDL	BDL	BDL	0.5
2,4,6-Trichlorophenol	BDL	BDL	BDL	0.5

BDL = Below Detection Limit

Timothy G. Ungerleider
QA Officer

AIR WATER & SOIL Laboratories, Inc.

2119A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804)358-8295 Fax: (804)358-8297

Certificate of Analysis

Client Name: Post, Buckley, Schuh, & Jernigan
Client Project I.D.: Cape Charles
Submitted to: Dennis Papa

Date Received: July 20, 2001
Date Issued: August 06, 2001

Reference Method: SW-846 method 8081A

Three soil samples were analyzed for Pesticides.

Parameter	SED-1 (mg/kg)	SED-2 (mg/kg)	SED-3 (mg/kg)	Detection Limit (mg/kg)
alpha BHC	BDL	BDL	BDL	0.02
gamma BHC (Lindane)	BDL	BDL	BDL	0.02
beta BHC	BDL	BDL	BDL	0.02
Heptachlor	BDL	BDL	BDL	0.02
delta BHC	BDL	BDL	BDL	0.04
Aldrin	BDL	0.04	BDL	0.02
Heptachlor epoxide	BDL	BDL	BDL	0.40
Endosulfan I	BDL	BDL	BDL	0.04
4,4 DDE	BDL	0.09	0.05	0.04
Dieldren	BDL	0.05	0.07	0.04
Endrin	BDL	BDL	BDL	0.04
4,4 DDD	BDL	0.15	BDL	0.06
Endosulfan II	BDL	BDL	BDL	0.06
4,4 DDT	BDL	BDL	BDL	0.04
Endrin aldehyde	BDL	BDL	BDL	0.08
Endosulfan Sulfate	BDL	BDL	BDL	0.02
Methoxychlor	BDL	BDL	BDL	0.40
Toxaphene	BDL	BDL	BDL	0.40
Chlordane	BDL	BDL	BDL	0.40

Reference Method: SW-846 method 8082

Three soil samples were analyzed for PCBs.

Parameter	SED-1 (mg/kg)	SED-2 (mg/kg)	SED-3 (mg/kg)	Detection Limit (mg/kg)
Aroclor 1016	BDL	BDL	BDL	1.0
Aroclor 1221	BDL	BDL	BDL	1.0
Aroclor 1232	BDL	BDL	BDL	1.0
Aroclor 1242	BDL	BDL	BDL	1.0
Aroclor 1248	BDL	BDL	BDL	1.0
Aroclor 1254	BDL	BDL	BDL	1.0
Aroclor 1260	BDL	BDL	BDL	1.0

BDL = Below Detection Limit

Note: Detection Limits on Pesticides and PCBs were raised due to dilution factor

Timothy G. Ungerleider
QA Officer

AIR WATER & SOIL Laboratories, Inc.

2119A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804)358-8295 Fax: (804)358-8297

Certificate of Analysis

Client Name: Post, Buckley, Schuh, & Jernigan
Client Project I.D.: Cape Charles
Submitted to: Dennis Papa

Date Received: July 20, 2001
Date Issued: August 06, 2001

Reference Method: EPA/SW-846

Three soil samples were analyzed for the following Target Analyte Metals.

Parameter	SED-1 (mg/kg)	SED-2 (mg/kg)	SED-3 (mg/kg)	Detection Limit (mg/kg)	Spike Recovery	Method
Aluminum	5230	5230	1490	100.0	95%	6010B
Antimony	BDL	BDL	BDL	2.5	99%	7041
Arsenic	7.1	17.1	5.9	1.0	99%	6010B
Barium	146	298	148	1.0	103%	6010B
Beryllium	2.4	5.2	2.8	1.0	96%	6010B
Cadmium	2.3	3.9	3.4	1.0	98%	6010B
Calcium	2950	3710	4790	10.0	95%	6010B
Chromium	9.6	9.9	3.0	1.0	101%	6010B
Cobalt	2.5	3.3	4.1	1.0	100%	6010B
Copper	46.7	94.3	43.4	1.0	108%	6010B
Iron	12,400	24,800	15,100	100	98%	6010B
Lead	111	260	68.2	1.0	98%	6010B
Magnesium	856	494	374	10.0	106%	6010B
Manganese	53.4	141	170	1.0	104%	6010B
Mercury	0.083	0.165	0.046	0.008	117%	7471
Nickel	8.7	8.3	6.6	1.0	105%	6010B
Potassium	645	447	357	40.0	102%	7610
Selenium	BDL	BDL	BDL	1.0	89%	6010B
Silver	BDL	BDL	BDL	1.0	102%	6010B
Sodium	53.7	55.2	50.2	20.0	97%	7770
Thallium	BDL	BDL	BDL	1.0	102%	6010B
Vanadium	11.6	7.4	3.6	1.0	103%	6010B
Zinc	129	238	152	1.0	104%	6010B

BDL = Below Detection Limit

Timothy G. Ungerleider
QA Officer

AIR WATER & SOIL Laboratories, Inc.

2119-A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804) 358-8297 FAX

CHAIN OF CUSTODY

CLIENT NAME: PBS&J

CLIENT PROJECT NAME: Cape Charles

CLIENT CONTACT: Dennis Papa

CLIENT ADDRESS: 804 Moorefield #302 Richmond

CLIENT PHONE/FAX No. 560-7600/560-5129

CLIENT P.O. No. 320086

Sampler(s) I.D. (print/signature): Dennis Papa / [signature]

ANALYSIS

COMMENTS: 10-day T.A.T.

(Please Note Sample Preservative)

CLIENT SAMPLE I.D.	DATE	TIME	# CONT	MATRIX	GRAB	COMP	Target Compound List	8260/8270/8081/8082	Target Analyte List metals							
1. SED-1	7/19/01	1100	3	S	X		✓		✓							
2. SED-2	↓	1110	3	S	X		✓		✓							
3. SED-3	↓	1115	3	S	X		✓		✓							
4.																
5.																
6.																
7.																
8.																
9.																
10.																

RELINQUISHED: [signature]	RECEIVED: [signature]	DATE: 7/20/01	
		TIME: 9:30 AM	
RELINQUISHED: [signature]	RECEIVED: Mary Hansen	DATE: 7/20/01	
		TIME: 3:30	
RELINQUISHED:	RECEIVED:	DATE:	
		TIME:	

LAB USE ONLY

Preservative(s):

Temperature (°C):

Lab I.D. No.: 01071668

ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

7469 WHITE PINE ROAD - RICHMOND, VA 23237
804-275-4788 FAX 804-275-4907

BULK ASBESTOS SAMPLE ANALYSIS SUMMARY

CLIENT: PBS & J
Moorefield III
804 Moorefield Park Drive, Suite 302
Richmond, VA 23236

DATE OF RECEIPT: 19 OCT 2001
DATE OF ANALYSIS: 19 OCT 2001
DATE OF REPORT: 20 OCT 2001

CLIENT NUMBER: 48-3650 A
EHS PROJECT #: 10-01-2439
PROJECT: 320086.02

EHS SAMPLE #	CLIENT SAMPLE #/ LABORATORY GROSS DESCRIPTION	% ASBESTOS	OTHER MATERIALS
01	AB-1/ Dk. Brown Gran.; Misc. Debris	Trace, <1% Chrysotile <1% Total Asbestos	3% Cellulose 97% Non-Fibrous
02	AB-2/ Dk. Brown Gran.; Misc. Debris	Trace, <1% Chrysotile <1% Total Asbestos	2% Cellulose 98% Non-Fibrous
03	AB-3/ Dk. Brown Gran.; Misc. Debris	Trace, <1% Chrysotile <1% Total Asbestos	2% Cellulose 98% Non-Fibrous
04	AB-4/ Dk. Brown Gran.; Misc. Debris	Trace, <1% Chrysotile <1% Total Asbestos	3% Cellulose 97% Non-Fibrous

QC SAMPLE: M2-1998-2

QC BLANK: SRM 1866 Fiberglass

REPORTING LIMIT: 1% Asbestos

METHOD: Polarized Light Microscopy, EPA Method 600/R-93/116 *

ANALYST: Mark Case

Reviewed By Authorized Signatory:

Howard Varner, Laboratory Director
Irma Faszewski, Quality Assurance Coordinator
David Xu, MS, Senior Chemist
Feng Jiang, MS, Senior Geologist
Michael A. Mueller, Quality Assurance Manager

ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

CLIENT NUMBER: 48-3650 A
EHS PROJECT #: 10-01-2439
PROJECT: 320086.02

Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of Environmental Hazards Services, L.L.C. California Certification #2319. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy ((TEM), for enhanced detection capabilities) for materials regulated by the EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND NAD = no asbestos detected
SCF = suspected ceramic fibers

plm1.dot/19APR2001/ mb

4-PLM

EHS 10-01-2439

ENVIRONMENTAL HAZARDS SERVICES, L.L.C.

7469 Whitepine Road Richmond, Virginia 23237 Phone (804) 275-4788 Fax (804) 275-4907

CHAIN OF CUSTODY FORM

Company Name: PBS&J

Address: 804 Moorefield Park Drive #B02

City, State, Zip: Richmond VA 23236

EHS Client Account #:

Phone#: 804/560 7600 **Fax#:** 804/560 5129

Date: 10/18/01

Contact Name: Chris Smith

Sampler Name: Chris Smith

Project #: 320086.02

P.O. #:

Sample Number	Sample Date & Time	Asbestos: Bulk ID by PLM	Asbestos: Asbestos Wipe	Asbestos: Fiber Count (PCM)	Asbestos: TEM Air	Asbestos: TEM Chatfield (Bulk)	Lead: Air	Lead: Paint	Lead: Soil	Lead: Wipe	Lead: TCLP (Pb)	Lead: Waste Water	Other Metals (Specify metals below): TCLP RCRA 8					Air Volume (L) OR Wipe Area (ft^2) OR Scrape Area(cm^2)	Comments
AB-1	10/17/01	X																	
AB-2	↓	X																	
AB-3	↓	X																	
AB-4	↓	X																	

Released by: [illegible]	Signature:	Date/Time:
Received by:	Signature:	Date/Time:
Released by:	Signature:	Date/Time:
Received by: [illegible]	Signature: [illegible]	Date/Time: 10/19/01 [illegible]

APPENDIX C

ATSDR HEALTH CONSULTATION MEMO, JANUARY 26, 2000

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

MEMORANDUM

Date: January 27, 2000

From: Senior Regional Representative
ATSDR Region III

Subject: Health Consultation
Heizer Creek

To: Robert Guarni
EPA Brownfields Technical Coordinator (3HS31)

Attached is a copy of the health consultation for the "Town Parcel" at the Port of Cape Charles, Cape Charles, North Hampton County, Virginia, dated January 26, 1999. This health consultation is in response to the U.S. Environmental Protection Agency Region III's request for the Agency for Toxic Substances and Disease Registry (ATSDR) to review the data from the Phase II Environmental Site Assessment for the "Town Parcel" at the Port of Cape Charles (Cape Charles, Virginia), and to assess the potential for public health effects that may result from a proposed development at the site.

The primary intent of this health consultation is to inform you of any actions ATSDR has recommended in order to prevent or mitigate exposures to the contaminants of concern at the site. Please inform us if you discover significant errors or omissions in the document which could change its conclusions and recommendations. I can be reached at telephone number (215) 814-3139 or for written responses at the address listed below.

Charles J. Walters, Jr.
ATSDR
c/o US EPA Region III
Hazardous Site Cleanup
Division (3HS00)
1650 Arch Street
Philadelphia PA 19103

Attachment

cc: Monty Howie, Jr., ATSDR/DHAC/PERIS
Dr. Khizar Wasti, VA Department of Health w/attachment
Patricia McMurray, VADEQ w/attachment

Health Consultation

Contaminants Discovered by the Phase II
Environmental Site Assessment at the Port of Cape Charles

"TOWN PARCEL" AT PORT OF CAPE CHARLES

CAPE CHARLES, NORTH HAMPTON COUNTY, VIRGINIA

JANUARY 26, 2000

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR
or
Visit our Home Page at: http://atsdr1.atsdr.cdc.gov:8080/

HEALTH CONSULTATION

Contaminants Discovered by the Phase II
Environmental Site Assessment at the Port of Cape Charles

"TOWN PARCEL" AT PORT OF CAPE CHARLES

CAPE CHARLES, NORTH HAMPTON COUNTY, VIRGINIA

Prepared by:

Exposure Investigation and Consultation Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Background and Statement of Issue

The United States Environmental Protection Agency (EPA) requested the Agency for Toxic Substances and Disease Registry (ATSDR) review the data from the Phase II Environmental Site Assessment for the "Town Parcel" at the Port of Cape Charles (Cape Charles, Virginia), and assess the potential for public health effects that may result from a proposed development at the site.

The Cape Charles Harbor, located approximately 20 miles north of Virginia Beach, VA, has been active since the late 1800s. In addition to the dock and harbor areas, portions of the general area were previously used for a municipal landfill and for a bulk oil storage facility. Petroleum releases have occurred in the past, however, problems associated with the spilled petroleum have been remediated (1). Presently the general area includes: a U. S. Coast Guard Station, the Town of Cape Charles waste water treatment plant, a rail yard, industrial facilities, and the remains of abandoned industrial and commercial operations (1).

The municipal landfill began operations prior to 1949, and stopped accepting wastes in 1995 (1). The "Town Parcel" is under consideration for development, as a "Brownfields Project", and this property includes the area over the closed landfill. (Appendix A includes definitions , including one for "brownfields" as well as a description of the ATSDR investigation process.) This health consultation evaluates the public health hazard associated with the contaminants found in the landfill, as described by the Phase II Environmental Site Assessment (1).

The area under consideration for development is bordered to the east by State Route 642 and an industrial facility known as the"Robberecht Property". The former landfill comprised approximately five acres of the parcel of land considered for development. Portions of the property have been cleared, including areas over the landfill, however other areas are covered by heavy brush and tree growth (1). Several wetland areas are in the parcel, and a small, unnamed creek traverses the property. The water treatment facility is located immediately west of the parcel, and the Chesapeake Bay is located several hundred yards to the west. General groundwater and surface water flow is to the west, toward the harbor and the Chesapeake Bay. Groundwater in the area exists at approximately 2-6 feet below ground surface (1).

A Phase I Environmental Site Assessment was completed in January of 1997. Noted in the Phase I Assessment were areas that were targeted for investigation in the Phase II work. Those areas included specific sites where landfill debris was visible at the ground surface, as well as the locations where used tires and abandoned appliances and automobiles were visible. The Phase II work documented the presence of brick, PVC pipe, glass, metal, and plastic debris scattered on the surface (1).

Work for the Phase II Site Investigation began in November of 1997, and included 28 soil borings and screening of the material collected in the bore holes, using a photoionization detector (PID), 17 near-surface and subsurface soil samples, two surface water samples, instillation and

monitoring of five groundwater wells (screened at approximately 2-12 ft), and exploration of 21 excavated pits/trenches. Explorations at the pits included visual inspections, soil and water analyses, analyses of waste materials using the Toxicity Characteristic Leaching Procedure (TCLP), and analyses of potential asbestos-containing materials (1).

Surface soil samples, soil samples from boreholes, and soil from excavation pits were analyzed for pesticides, polychlorinated biphenyls (PCBs), volatile organic chemicals (VOCs), semivolatile organic chemicals (SVOCs), cyanide, and metals (analyzed for both target list metals and by TCLP testing). No PCBs, VOCs, or cyanide were found above method detection limits. With the exception of one sample (SS-1), no SVOCs were detected in any of the soil samples. The only SVOCs found were polyaromatic hydrocarbons (PAHs) in surface soil sample SS-1. PAHs were detected in SS-1 (surface soil) at a range of 0.7-5.4 ppm. Most PAHs, for instance chrysene, fluoranthene, and benzo(k)fluoranthene, were found at concentrations that were below both the EPA Preliminary Remedial Guideline (PRG) and the EPA Soil Screening Level (SSL) values. The exceptions were benzo(a)pyrene, at 3.6 ppm, which exceedes the PRG (0.056 mg/kg), but is less than the SSL (8 mg/kg), and benzo(a)anthracene, at 3.2 mg/kg, which exceeds both the PRG (0.56 mg/kg) and the SSL (2 mg/kg).

Several pesticides were detected in three different soil samples (SS-1(surface soil), P-9 (soil at 8-10 feet below ground surface), and P-9A (the duplicate for P-9)). The pesticides found include dichlorodiphenyltrichloroethane (DDT), dieldrin, endosulfan, endrin, and aldrin. With the exception of dieldrin (110 ug/kg), which exceeded the SSL by approximately a factor of three, the levels of all pesticides were below the SSL. No leachable pesticides were detected in any of the seven landfill debris samples tested by TCLP.

A variety of metals were detected at levels within the background range for the United States (2). However, the data for total metals showed several metals, notably arsenic (highest level = 15.3 ppm in surface soil sample SS-1) and lead (highest level =1,900 ppm in subsurface soil sample P-9A), exceeded the EPA SSL. Total lead was also above the average United States background in the "background sample" collected at the edge of the parcel. Levels of leachable metal, determined by TCLP, were all below the regulatory guidelines.

The water samples were analyzed for pesticides, PCBs, VOCs, SVOCs, cyanide and target analyte list metals. No levels of pesticides, PCBs, VOCs, SVOCs, or cyanide were detected above the method detection limits in any of the groundwater or surface water samples. Concentrations of certain "total metals" exceeded groundwater standards established by the state of Virginia, however, the "dissolved metals" did not exceed federal drinking water standards (based on maximum contaminant levels (MCL)). (Particulates in the groundwater apparently account for most of the total metals (1).) Total lead in a surface water sample collected in the vicinity of SS-1 (0.33 ppm), contained lead that exceeded the Virginia surface water standard of 0.015 ppm.

Analysis of buried shingle materials, discovered in a pit excavation, showed that the shingles contained 30 % chrysolite asbestos.

Discussion

Environmental Exposure Pathways

The most likely exposure pathways at the site include incidental ingestion of soil, dermal contact with soil, and water, and inhalation of landfill gas that migrates into ambient air. These exposure pathways involve past and present exposures. Because of the planned development of the area, exposures that are possible in the future are also important considerations. Three important factors influence the likelihood of past and present exposures at the site. These are; 1) the presence of contaminants in surface soil versus contaminants that are found well below the ground surface, 2) the partially brushy, and wooded, as well as marshy nature of the site, which suggests that human contacts with the on-site contaminants are infrequent, and 3) the surface and groundwater are not used for drinking water. From discussions with an EPA representative, it was learned that there is no indication of recreational or vagrant usage of the property. Of the contaminants found at the site, only those in the surface soil and landfill gas are considered important. Both of these pathways are discussed with respect to likely past, present, and future exposure scenarios.

Exposures to Soil Contaminants

Of the contaminants found in surface soil sample SS-1, those that exceed appropriate comparison values are PAHs, lead, and dieldrin. The levels of benzo(a)pyrene exceeded the PRG by a factor of approximately 50 whereas the lead and dieldrin levels exceeded the SSLs by factors of approximately 3-4. Based on the isolated nature of the sample location and the unlikely possibility of human contact with the sample location, ATSDR concludes that the surface soil contaminants at this location do not represent a past or present health hazard. However, because the planned development will involve landscaping and construction, ATSDR concludes that this sample site location represents a public health hazard for future exposures.

Because the asbestos-containing shingles were buried in the past, and were re-buried after examination of the excavated pits, the possibility for human contact with the asbestos has been, and is presently, limited. Due to the limited possibility of human exposure, ATSDR concludes that infrequent contact with the asbestos-containing shingles does not pose a public health hazard. However, because the planned development will involve landscaping and construction, ATSDR concludes that the asbestos containing shingles represent a health hazard for future exposures.

Exposure Pathway for Exposure to Landfill Gas

The presence and characterization of subsurface and above surface landfill gases and exposure assessments to landfill gases are well documented in scientific literature (see reference 3 for a review). An exposure scenario considered for this Health Consultation was inhalation of landfill gas by workers and future residents or occupants of buildings at the site.

Microbial degradation of materials buried in landfills is a primary contributor to the production of landfill gas. Among the more common landfill gases are methane and carbon dioxide, which can make up almost all of the total gas volume (3). Methane does not represent a toxicity hazard, however, a build-up of methane in structures near or over a landfill is possible, and such a buildup can present an explosion hazard. Landfill gas can also contain non-methane gases. These non-methane gases include a variety of VOCs, that can occur inside buildings or homes, and they may represent toxic exposures to occupants.

The age of the landfill on the "Town Parcel" and the materials in the landfill suggest that the landfill could be a source of toxic landfill gas. Readings from screening the soil boring samples with a PID (all values between non-detect and 10 ppm) also suggest that landfill gas may be present at the site. However, no analyses of landfill gas were reported in the Phase II Environmental Site Assessment. Therefore, this data gap precludes further analysis of the hazards that may be associated with landfill gas. Because of this data gap, potential exposure to landfill gas is considered an indeterminate public health hazard.

It should be noted that while this Health Consultation was in the final stages of preparation, EPA informed ATSDR of plans for an investigation of the landfill gas at site.

Additional Considerations Related to Future development at the site

The data available in the Phase II Site Investigation report show a number of contaminant detections. The distribution of detected contaminants appears to be consistent with a landfilling facility. That is, the waste materials and contaminants appear to be located in areas that are consistent with an indiscriminate dumping pattern. For an example of that dumping pattern, consider that the asbestos-containing shingles were only found in one location, and all the PAHs detected were found in only one surface soil location.

The apparent indiscriminate dumping suggests that planned landscaping and construction activities may uncover additional, not yet discovered, hazardous wastes. In addition, construction generated dusts must be considered as a site-related hazard. The planned construction activities will require a "Health and Safety Plan", and the possibility that construction workers may encounter presently buried wastes or contaminated dusts needs to be addressed in that "Health and Safety Plan".

Conclusions

1. Site contaminants described by the Phase II Environmental Site Assessment, other than the contaminants reported at sample location SS-1 and the asbestos-containing shingles, are no apparent health hazard.

2. As regards future exposures, the surface soil near the sample location SS-1 and the asbestos-containing shingles represent public health hazards.

3. Potential health hazards associated with surface soil location SS-1 and the asbestos containing shingles could be eliminated by remediation of the wastes at those specific areas.

4. The presence or absence of landfill gases at the parcel have not been determined. Therefore the landfill gas is an indeterminate health hazard.

5. Adherence to a strict "Health and Safety Plan" during development of the site should be required for all workers at the site.

Recommendations

1. Prior to beginning construction or landscaping activities, remediate the areas containing the asbestos containing shingles and the soil near sample location SS-1.

2. Prior to construction, determine the presence or absence of subsurface and above surface landfill gas. If found, characterize the components of the landfill gas, and assess any public health hazard associated with the landfill gas.

3. Develop contingency procedures for handling any wastes that may be encountered during the planned development activities.

Preparers of Report:

Clement J. Welsh, Ph D, MPH
Environmental Health Scientist
ATSDR/DHAC/EICB

Reviewers of Report:

Susan Moore
Section Chief
ATSDR/DHAC/EICB

John E. Abraham, PhD
Branch Chief
ATSDR/DHAC/EICB

References

1. Phase II Environmental Site Assessment: "Town Parcel" Port Charles Sustainable Technologies Industrial Park, Cape Charles, Virginia. Prepared for; U. S. Environmental Protection Agency, Prepared by: PBS&J, Newport News, VA. March 31, 1999.

2. Buonicore, A. J. 1995. Clean Up Criteria for Soil and Groundwater. ATSM Data Series DS-64, American Society for Testing and Materials, Philadelphia, PA.

3. Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines. U. S. Environmental Protection Agency (EPA-450/3-90-011a). March 1991.

Appendix A

ATSDR Procedures and Definitions

Evaluation Strategy

ATSDR evaluates hazards associated with environmental contaminants in two phases. The first phase is a screening phase that may consist of several steps, and the second phase is based on professional judgment. In the first step of the screening phase, ATSDR compares health comparison values with concentrations of contaminants to which the community could be exposed. Exposures at levels less than or equal to these comparison values are not expected to make people sick and are thus considered to be safe levels, even under the conditions of maximum exposure. For example, comparison values for chronic-duration (long-term) exposures are based on lifelong, continuous exposure. While it is unlikely that anyone would be exposed this frequently or for this duration, it represents a worst-case condition. If a contaminant concentration does not exceed a comparison value, ATSDR does not need to evaluate the contaminant any further because, even under the maximum conditions of exposure, an individual would not be expected to get sick.

If a contaminant concentration exceeds a comparison value, but is below levels where adverse health effects have been reported, ATSDR performs a more in-depth evaluation using realistic exposure scenarios. This is a way to describe the exposure, relative to other exposures. It does not predict whether an individual will get sick. For example, if an individual were exposed to a contaminant half as much as another individual, his risk would be half as great. This risk does not mean that the individual would get sick. ATSDR does not know if either individual would get sick, but ATSDR uses this way of describing an individual's risk of getting sick from a specific exposure.

Comparison Values

ATSDR comparison values are media-specific concentrations that are considered to be safe under default conditions of exposure. They are used as screening values in the preliminary identification of site-specific contaminants of concern. The latter term should not be misinterpreted as an implication of hazards. As ATSDR uses the phrase, a contaminant of concern is merely a chemical substance detected at the site in question and selected by the health assessor for further evaluation of potential health effects. Generally, a chemical is selected as a contaminant of concern because its maximum concentration in air, water, or soil at the site exceeds one of ATSDR's comparison values.

It must be emphasized that comparison values are not thresholds of toxicity. While concentrations at or below the relevant comparison value may reasonably be considered safe, it does not automatically follow that any contaminant concentration that exceeds a comparison value would be expected to produce adverse health effects. The whole purpose behind highly conservative, health-based standards and guidelines is to enable health professionals to recognize and resolve potential public health hazards before they can become actual public health consequences. Thus, comparison values are designed to be preventive, rather than predictive, of adverse health effects. The probability that such effects will actually occur depends, not on environmental concentrations

alone, but on a unique combination of site-specific conditions and individual lifestyle and genetic factors that affect the route, magnitude, and duration of actual exposure.

Listed and described below are some of the various comparison values that ATSDR uses to select chemicals for further evaluation, as well as other non-ATSDR values that are sometimes used to put environmental concentrations into a meaningful frame of reference.

MRL	=	Minimal Risk Level
EMEG	=	Environmental Media Evaluation Guide
RBC	=	Risk-Based Concentration
MCL	=	Maximum Contaminant Level
SSL	=	Soil Screening Levels

Minimal Risk Levels (MRL) are estimates of daily human exposure to a chemical (doses expressed in mg/kg/day) that are unlikely to be associated with any appreciable risk of deleterious noncancer effects over a specified duration of exposure. In other words, MRLs are considered to be safe levels of exposure. They are developed using conservative exposure assumptions and uncertainty factors and are generally much lower than exposure concentrations noted to cause harmful health effects.

Environmental Media Evaluation Guides (EMEGs) are concentrations that are calculated from ATSDR minimal risk levels by factoring in default body weights and ingestion rates.

Risk-Based Concentrations (RBC) are media-specific concentrations derived by the Environmental Protection Agency Region III from RfDs, RfC's, or EPA's cancer slope factors. They represent concentrations of a contaminant in tap water, ambient air, fish, or soil (industrial or residential) that are considered unlikely to cause adverse health effects over a lifetime of chronic exposure. RBCs are based either on cancer ("c") or noncancer ("n") effects.

Maximum Contaminant Levels (MCL) represent contaminant concentrations in drinking water that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an exposure rate of 2 liters of water per day per person.

Soil Screening Values (SSL) are concentrations derived by the Environmental Protection Agency for protection of groundwater. While the SSL are not intended to be used as clean-up levels or standards, in general, if an SSL is not exceeded for the migration to groundwater pathway, the pathway can be eliminated from further consideration.

Additional Definition

Brownfields Project An abandoned, idled, or underused industrial or commercial facility or site where expansion or redevelopment is complicated by real or perceived environmental contamination. They can be urban, suburban, or rural areas. EPA's Brownfields initiative helps communities mitigate potential health risks and restore the economic viability of such areas or properties.