Appendix C.3. Tedlar Bag Analyses

Energy and
Environmental
Research Corporation

FIELD SAMPLE TRACKING REPORT

PROJECT NO. 6373-020 PAGE 1

PLANT/PROJECT _____

UNIT # _____

SAMPLE NO.	RUN NO.	PROCESS STREAM LOCATION	SAMPLE DATA				SENT TO:	
			DESCRIPTION	DATE	TIME	SAMPLER	LABORATORY	DATE
154580	1	Stack	Diluted	10-20-93	17:10 / 17:40	R. Campbell		
154581	1	Stack	Undiluted	10-20-93	17:10 / 17:40	R. Campbell		
154582	1	Stack	Condensate	10-20-93	17:10 / 17:40	R. Campbell		
154583	2	Stack	Diluted	10-20-93	17:48 / 18:18	R. Campbell		
154584	2	Stack	Undiluted	10-20-93	17:48 / 18:18	R. Campbell		
154585	2	Stack	Condensate	10-20-93	17:48 / 18:18	R. Campbell		
154586	3	Stack	Diluted	10-20-93	18:20 / 18:50	R. Campbell		
154587	3	Stack	Undiluted	10-20-93	18:20 / 18:50	R. Campbell		
154588	3	Stack	Condensate	10-20-93	18:20 / 18:50	R. Campbell		
154589	4	through system & lines	Blank/N_2	10-20-93	/	R. Campbell		

Applied P & Ch Laboratory
4006 E. Mission Blvd., Pomona, CA 91766
Tel: (909) 622-5148 Fax: (909) 622-3190

APCL Analytical Report

Submitted to:
Energy and Environmental Research Corporation
Attention: Dave Hansell
8001 Irvine Blvd.
Santa Ana, CA 92706
Tel: (714)552-1803 Fax: (714)857-1943

Service ID #: 801-934506A
Collected by: R. Campbell
Collected on: 10/20/93
Sample description:
Air Bag Samples from

Received : 10/23/93
Tested : 10/23-24/93
Reported : 11/15/93

Analysis of VOCs in Air

801-934506A Page 1 of 3

Component Analyzed	Method	Unit	PQL	Concentration 154580 Diluted 93-4506-01	154581 Undiluted 93-4506-02	154583 Diluted 93-4506-03	154584 Undiluted 93-4506-04	154586 Diluted 93-4506-05	154587 Undiluted 93-4506-06	154589 Blank 93-4506-07
Chlorinated Hydrocarbons										
Chloromethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Bromomethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Methylene Chloride	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-1,2-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chloroform	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,1-Trichloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Carbon Tetrachloride	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2-Dichloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Trichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2-Dichloropropane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-1,3-Dichloropropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-1,3-Dichloropropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,2-Trichloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Tetrachloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethylene Dibromide	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethylene Dichloride	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,2,2-Tetrachloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3-Dichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,4-Dichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chlorotoluene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2-Dichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2,4-Trichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Hexachlorobutadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-1,2-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,1,2-Tetrachloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Carbon Disulfide	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.

CADHS ELAP CERTIFICATION NUMBER 1431

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APCL Analytical Report

Analysis of VOCs in Air

Component Analyzed	Method	Unit	PQL	Concentration 154580 Diluted 93-4506-01	154581 Undiluted 93-4506-02	154583 Diluted 93-4506-03	154584 Undiluted 93-4506-04	154586 Diluted 93-4506-05	154587 Undiluted 93-4506-06	154589 Blank 93-4506-07
Paraffins (C4-C8)										
n-Butane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Isobutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
n-Pentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Isopentane [2-methylbutane]*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Neopetane [2,2-dimethylpropane]*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
n-Hexane	TO-14	ppbV	5	N.D.	–	46	–	46	–	N.D.
2-Methylpentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
3-Methylpentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2,2-Dimethylbutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2,3-Dimethylbutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Aromatics										
Benzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Toluene	TO-14	ppbV	5	13	–	8	–	10	–	N.D.
Ethyl Benzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
m,p-Xylenes	TO-14	ppbV	5	11	–	N.D.	–	N.D.	–	N.D.
o-Xylene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Styrene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3,5-Trimethylbenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2,4-Trimethylbenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Phenol	TO-14	ppbV	5	49	–	N.D.	–	N.D.	–	N.D.
Naphthalene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Naphthenes										
Cyclopropane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclobutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclopentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclohexane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ketones										
Acetone	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Butanone	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3-Butadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Propadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Olefins										
1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Methylpropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-2-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-2-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-methyl-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-methyl-1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
3-methyl-1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.

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Component Analyzed	Method	Unit	PQL	Concentration 154580 Diluted 93-4506-01	154581 Undiluted 93-4506-02	154583 Diluted 93-4506-03	154584 Undiluted 93-4506-04	154586 Diluted 93-4506-05	154587 Undiluted 93-4506-06	154589 Blank 93-4506-07
Acetylenes (C4-C5)										
1-Butyne*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Butyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1-Pentyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Pentyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethers										
MTBE	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Dimethyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethyl Methyl Ether*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Diethyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethyl Propyl Ether*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Dipropyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
VOCs by GC/FIDs										
Methane	TO-14/FID	ppbV	500	–	3,900	–	3,900	–	3,600	–
Ethane	TO-14/FID	ppbV	500	–	N.D.	–	N.D.	–	N.D.	–
Propane	TO-14/FID	ppbV	500	–	N.D.	–	N.D.	–	N.D.	–
Ethene	TO-14/FID	ppbV	500	–	N.D.	–	N.D.	–	N.D.	–
Propene	TO-14/FID	ppbV	500	–	N.D.	–	N.D.	–	N.D.	–
Ethyne	TO-14/FID	ppbV	500	–	N.D.	–	N.D.	–	N.D.	–
Propyne*	TO-14/FID	ppbV	500	–	N.D.	–	N.D.	–	N.D.	–

PQL : Practical Quantitation Limit
N.D. : Not Detected or Less Than The Quantitation Limit.
* Standards not available

Respectfully submitted,

Shu-Teh Pan
Lab Manager
Applied P & Ch Laboratory

Appendix C.4. Aldehyde/Ketone Calculations, Run Sheets and Analyses

CARB 430

DATE DATE ENTERED: 11/20/93

PLANT: NG Steam Generator
TEST DATE: 10/20/93
CITY: Confidential
OPERATOR: Jon Kawaguchi
RUN #: 1, 2, 3
ENTERED BY: Dave Hansell
SAMPLE LOCATION: STACK
CHECKED BY:

DATA ENTRY	SYMBOL	UNITS		DATA		DATA		DATA			
RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
AVERAGE METER TEMPERATURE	Fm	degree F		86.00		84.20		82.40		84.20	2.14
BAROMETRIC PRESSURE	Pbar	in. Hg		29.92		29.92		29.92		29.92	0.00
AVG. DELTA H	dH	in. H20		1.40		1.30		1.30		1.33	4.33
GAS SAMPLE VOLUME	Vm	cubic ft.		0.98		1.05		1.05		1.03	3.94
METER CALIBRATION FACTOR	Y	-		1.00		1.00		1.00		1.00	0.00
TOTAL SAMPLING TIME	min	minutes		60.00		60.00		60.00		60.00	0.00
SAMPLE 1ST IMPINGER VOLUME	Siwt,1	ml		9.60		11.20		13.40		11.40	16.74
SAMPLE 2ND IMPINGER VOLUME	Siwt,2	ml		9.70		10.00		9.60		9.77	2.13
BLANK 1ST IMPINGER VOLUME	Biwt,1	ml		9.00		9.10		9.50		9.20	2.88
BLANK 2ND IMPINGER VOLUME	Biwt,2	ml		9.20		9.20		9.20		9.20	0.00
SAMPLE WEIGHTS (1ST IMPINGER)											
Formaldehyde	Swt,1	µg		0.12		0.70		0.22		0.35	89.44
Acetaldehyde	Swt,1	µg		0.14	ND	0.10	ND	0.10	<	0.11	20.38
Acrolein	Swt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Propanal	Swt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Acetone	Swt,1	µg		0.10		0.63		0.15		0.29	99.76
Crotonaldehyde	Swt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Isobutyraldehyde	Swt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Swt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
SAMPLE WEIGHTS (2ND IMPINGER)											
Formaldehyde	Swt,2	µg		0.10		0.21		0.18		0.16	34.81
Acetaldehyde	Swt,2	µg		0.10		0.13	ND	0.10	<	0.11	15.75
Acrolein	Swt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Propanal	Swt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Acetone	Swt,2	µg	ND	0.10		0.14		0.21	<	0.15	37.12
Crotonaldehyde	Swt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Isobutyraldehyde	Swt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Swt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
BLANK WEIGHTS (1ST IMPINGER)											
Formaldehyde	Bwt,1	µg	ND	0.10		0.19		0.16	<	0.15	30.55
Acetaldehyde	Bwt,1	µg	ND	0.10		0.15		0.13	<	0.13	19.87
Acrolein	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Propanal	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Acetone	Bwt,1	µg		0.73		0.29		0.14		0.39	79.31
Crotonaldehyde	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Isobutyraldehyde	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
BLANK WEIGHTS (2ND IMPINGER)											
Formaldehyde	Bwt,2	µg		0.13		0.15		0.14		0.14	7.14
Acetaldehyde	Bwt,2	µg		0.13	ND	0.10		0.12	<	0.12	13.09
Acrolein	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Propanal	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Acetone	Bwt,2	µg		1.50		0.11		0.13		0.58	137.38
Crotonaldehyde	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Isobutyraldehyde	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00

CARB 430

	DATE DATE ENTERED: 11/20/93
PLANT: NG Steam Generator	TEST DATE: 10/20/93
CITY: Confidential	OPERATOR: Jon Kawaguchi
RUN #: 1, 2, 3	ENTERED BY: Dave Hansell
SAMPLE LOCATION: STACK	CHECKED BY:

CALCULATED DATA	SYMBOL	UNITS	DATA		DATA		DATA			
RUN NUMBER	-	-	R1		R2		R3		AVE	RSD
AVG. METER TEMPERATURE, Tm = Fm + 460	Tm	degrees R	546.00		544.20		542.40		544.20	0.33
GAS SAMPLE VOLUME AT STANDARD CONDITIONS, VmStd = 17.64Y (Vm/Tm) (Pbar + dH/13.6)	VmStd	dscm	0.027		0.029		0.029		0.028	4.21

SAMPLE IMPINGER CONCENTRATION (ng/ml), S or Bic= 1000*(S or Bwt,1+S or Bwt,2)/(S or Biwt,1+S or Biwt,2)

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Sic	ng/ml		11.40		42.92		17.39		23.90	70.03
Acetaldehyde	Sic	ng/ml		12.44	<	10.85	ND	8.70	<	10.66	17.61
Acrolein	Sic	ng/ml	ND	10.36	ND	9.43	ND	8.70	ND	9.50	8.80
Propanal	Sic	ng/ml	ND	10.36	ND	9.43	ND	8.70	ND	9.50	8.80
Acetone	Sic	ng/ml	<	10.36		36.32		15.65	<	20.78	66.02
Crotonaldehyde	Sic	ng/ml	ND	10.36	ND	9.43	ND	8.70	ND	9.50	8.80
Isobutyraldehyde	Sic	ng/ml	ND	10.36	ND	9.43	ND	8.70	ND	9.50	8.80
Methyl Ethyl Ketone	Sic	ng/ml	ND	10.36	ND	9.43	ND	8.70	ND	9.50	8.80
BLANK											
Formaldehyde	Bic	ng/ml	<	12.64		18.58		16.04	<	15.75	18.93
Acetaldehyde	Bic	ng/ml	<	12.64	<	13.66		13.37	<	13.22	3.99
Acrolein	Bic	ng/ml	ND	10.99	ND	10.93	ND	10.70	ND	10.87	1.43
Propanal	Bic	ng/ml	ND	10.99	ND	10.93	ND	10.70	ND	10.87	1.43
Acetone	Bic	ng/ml		122.53		21.86		14.44		52.94	114.05
Crotonaldehyde	Bic	ng/ml	ND	10.99	ND	10.93	ND	10.70	ND	10.87	1.43
Isobutyraldehyde	Bic	ng/ml	ND	10.99	ND	10.93	ND	10.70	ND	10.87	1.43
Methyl Ethyl Ketone	Bic	ng/ml	ND	10.99	ND	10.93	ND	10.70	ND	10.87	1.43

BLANK TO SAMPLE RATIO, Br=Sic/Average(Bic)

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
RATIO											
Formaldehyde	Br		RL	0.72	RL	2.72	RL	1.10		1.52	70.03
Acetaldehyde	Br		RL	0.94	RL	0.82	NA	NA		0.88	9.63
Acrolein	Br		NA	NA	NA	NA	NA	NA		NA	NA
Propanal	Br		NA	NA	NA	NA	NA	NA		NA	NA
Acetone	Br		RL	0.20	RL	0.69	RL	0.30		0.39	66.02
Crotonaldehyde	Br		NA	NA	NA	NA	NA	NA		NA	NA
Isobutyraldehyde	Br		NA	NA	NA	NA	NA	NA		NA	NA
Methyl Ethyl Ketone	Br		NA	NA	NA	NA	NA	NA		NA	NA

CARB 430

	DATE DATE ENTERED: 11/20/93
PLANT: NG Steam Generator	TEST DATE: 10/20/93
CITY: Confidential	OPERATOR: Jon Kawaguchi
RUN #: 1, 2, 3	ENTERED BY: Dave Hansell
SAMPLE LOCATION: STACK	CHECKED BY:

CORRECTED SAMPLE CONCENTRATION (ng/ml) Br>5 Cic=Sic-Average(Bic); Br<5 Cic=5*Average(Bic)

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Cic	ng/ml	RL	78.77	RL	78.77	RL	78.77	NC	78.77	0.00
Acetaldehyde	Cic	ng/ml	RL	66.11	RL	66.11	ND NA	8.70	< NC	46.97	70.57
Acrolein	Cic	ng/ml	ND NA	10.36	ND NA	9.43	ND NA	8.70	ND NC	9.50	8.80
Propanal	Cic	ng/ml	ND NA	10.36	ND NA	9.43	ND NA	8.70	ND NC	9.50	8.80
Acetone	Cic	ng/ml	RL	264.71	RL	264.71	RL	264.71	NC	264.71	0.00
Crotonaldehyde	Cic	ng/ml	ND NA	10.36	ND NA	9.43	ND NA	8.70	ND NC	9.50	8.80
Isobutyraldehyde	Cic	ng/ml	ND NA	10.36	ND NA	9.43	ND NA	8.70	ND NC	9.50	8.80
Methyl Ethyl Ketone	Cic	ng/ml	ND NA	10.36	ND NA	9.43	ND NA	8.70	ND NC	9.50	8.80

CORRECTED SAMPLE CONCENTRATION 1 (mg/dscm), Cc,1=Cic*(Swt,1+Swt,2)/VmStd/1e06

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Cc,1	mg/dscm	RL	0.057	RL	0.058	RL	0.062	NC	0.06	5.32
Acetaldehyde	Cc,1	mg/dscm	RL	0.047	RL	0.048	ND NA	0.007	< NC	0.03	69.19
Acrolein	Cc,1	mg/dscm	ND NA	0.007	ND NA	0.007	ND NA	0.007	ND NC	0.01	4.31
Propanal	Cc,1	mg/dscm	ND NA	0.007	ND NA	0.007	ND NA	0.007	ND NC	0.01	4.31
Acetone	Cc,1	mg/dscm	RL	0.190	RL	0.194	RL	0.210	NC	0.20	5.32
Crotonaldehyde	Cc,1	mg/dscm	ND NA	0.007	ND NA	0.007	ND NA	0.007	ND NC	0.01	4.31
Isobutyraldehyde	Cc,1	mg/dscm	ND NA	0.007	ND NA	0.007	ND NA	0.007	ND NC	0.01	4.31
Methyl Ethyl Ketone	Cc,1	mg/dscm	ND NA	0.007	ND NA	0.007	ND NA	0.007	ND NC	0.01	4.31

CORRECTED SAMPLE CONCENTRATION 2 (ppbv), Cc,2=1000*24.05/Mw

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Cc,2	ppbv	RL	45	RL	46	RL	50	NC	47.22	5.32
Acetaldehyde	Cc,2	ppbv	RL	26	RL	26	ND NA	4	< NC	18.73	69.19
Acrolein	Cc,2	ppbv	ND NA	3	ND NA	3	ND NA	3	ND NC	3.04	4.31
Propanal	Cc,2	ppbv	ND NA	3	ND NA	3	ND NA	3	ND NC	2.93	4.31
Acetone	Cc,2	ppbv	RL	79	RL	80	RL	87	NC	82.09	5.32
Crotonaldehyde	Cc,2	ppbv	ND NA	3	ND NA	2	ND NA	2	ND NC	2.43	4.31
Isobutyraldehyde	Cc,2	ppbv	ND NA	2	ND NA	2	ND NA	2	ND NC	2.37	4.31
Methyl Ethyl Ketone	Cc,2	ppbv	ND NA	2	ND NA	2	ND NA	2	ND NC	2.37	4.31

ND - Sample value below detection limit

< - Some sample values below detection limit

C - Blank Corrected

RL - Reporting Limit

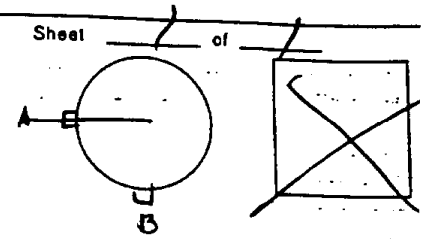
NA - Not Available

CARB 430 RUN SHEET

Plant
City
Location
Operators JK
Date 10/20/93
Run Number 1
Stack Diam. (in.) 35"
Static Pressure (Pa) -0.24 (in. H2O)
Barometric Pressure (Pb) 29.92 (in. Hg)
Ambient Temperature (°F) 80

Sample Box Number
Meter Box Number V3
Meter Calibration (Y)
Meter dH @
Probe Length 3'
Probe Liner Material S/S
Pretest Leak Rate 0 cfm @ 7 (in. Hg)
Post Test Leak Rate 0 cfm @ 7 (in. Hg)

Sheet 1 of 1



Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Rotameter Reading	Gas Sample Volume, Vm (l)	Flowrate liters/min	Stack Temp (°F)	Dry Gas Meter Outlet Temp, Tm (°C)	ΔH	Comments
1	0	1339		633.20					Fuel 1239 mcf/d
1	5	44	0.5	638.27	.5	N/A	27	1.6	Waste 126 mcf/d
	10	49	0.5	640.38	.5		28	1.4	
	15	54	0.5	642.41	.5		29	1.2	Fuel 1246 mcf/d
	20	59	0.5	644.75	.5		29	1.2	Waste 128 mcf/d
	25	1404	.5	647.06	.5		30	1.2	
	30	09	.5	649.42	.5		30	1.6	
	35	14	.5	651.73	.5		31	1.2	
	40	19	.5	654.00	.5		31	1.2	Fuel 1237 mcf/d
	45	24	.5	656.42	.5		31	1.4	Waste 124 mcf/d
	50	29	.5	659.00	.5		32	1.4	
	55	34	.5	661.45	.5		32	1.4	
	60	39	.5	664.02	.5		32	1.4	Fuel 1246 mcf/d
									Waste 124 mcf/d
Average/Total									

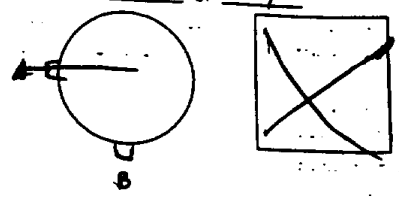
Flowrate at 0.50 liters/min +/- 10%
Pretest Probe Purge with Stack Gas
Pretest leak check with Charcoal Tube
Where gloves when operating train

CARB 430 RUN SHEET

Plant
City
Location
Operators JTC
Date 10/20/97
Run Number 2
Stack Diam. (in.) 35
Static Pressure (Pa) -.225 (in. H2O)
Barometric Pressure (Pb) 29.92 (in. Hg)
Ambient Temperature (°F) 90

Sample Box Number
Meter Box Number V3
Meter Calibration (Y)
Meter dH @
Probe Length 4'
Probe Liner Material S/S
Pretest Leak Rate 0.000 cfm @ 7 (in. Hg)
Post Test Leak Rate 0.000 cfm @ 7 (in. Hg)

Sheet 1 of 1



Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Rotameter Reading	Gas Sample Volume, Vm (l)	Flowrate liters/min	Stack Temp (°F)	Dry Gas Meter Outlet Temp, Tm (°C)	ΔH ~~Probe Temp.~~	Comments
1	0	1802		665.00					
1	5	07	.5	667.80	.5	N/A	28	1.2	
	10	12	.5	670.17	.5		29	1.2	Fuel Gas 1215 mcf/d
	15	17	.5	672.50	.5		29	1.6	Waste 120 mcf/d
	20	22	.5	675.07	.5		29	1.4	
	25	27	.5	677.48	.5		30	1.4	
	30	32	.5	680.06	.5		30	1.4	Fuel 1229
	35	37	.5	682.60	.5		30	1.2	Waste 144
	40	42	.5	684.94	.5		30	1.2	
	45	47	.5	687.00	.5		31	1.2	Fuel 1219
	50	52	.5	689.55	.5		30	1.2	Waste 120
	55	57	.5	692.01	.5		30	1.4	
	60	1902	.5	694.79	.5		30	1.4	
Average/Total									

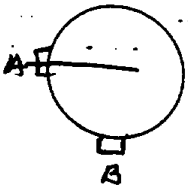
___ Flowrate at 0.50 liters/min +/- 10%
Pretest Probe Purge with Stack Gas
Pretest leak check with Charcoal Tube
Where gloves when operating train

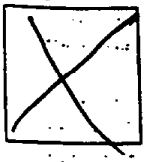
CARB 430 RUN SHEET

Plant
City
Location
Operators JK
Date 10/20/93
Run Number 3
Stack Diam. (in.) 35
Static Pressure (Pa) -0. (in. H2O)
Barometric Pressure (Pb) 29.92 (in. Hg)
Ambient Temperature (°F) 80

Sample Box Number
Meter Box Number V3
Meter Calibration (Y)
Meter dH @
Probe Length 3
Probe Liner Material S/S
Pretest Leak Rate 0 cfm @ 7 (in. Hg)
Post Test Leak Rate cfm @ (in. Hg)

Sheet 1 of 1





Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Rotameter Reading	Gas Sample Volume, Vm (l)	Flowrate liters/min	Stack Temp (°F)	Dry Gas Meter Outlet Temp, Tm (°C)	ΔH Probe Temp.	Comments
1	0	2000		702.14					
1	5	05	.5	705.52	0.5	N/A	28	1.2	
	10	10	.5	707.08	0.5		28	1.4	
	15	15	.5	709.47	.5		28	1.4	1239 mcf/d Fuel
	20	20	.5	711.97	.5		28	1.4	128 mcf/d Waste
	25	25	.5	714.49	.5		28	1.2	
	30	30	.5	716.90	.5		28	1.2	
	35	35	.5	719.41	.5		29	1.2	1247 mcf/d Fuel
	40	40	.5	721.93	.5		28	1.4	127 mcf/d Waste
	45	45	.5	724.32	.5		28	1.4	
	50	50	.5	726.91	.5		28	1.4	
	55	55	.5	729.26	.5		29	1.4	1245 mcf/d Fuel
	60	2100	.5	731.75	.5		29	1.4	126 mcf/d Waste
Average/Total									

Flowrate at 0.50 liters/min +/- 10%
Pretest Probe Purge with Stack Gas
Pretest leak check with Charcoal Tub
Where gloves when operating train

Energy and
Environmental
Research Corporation

FIELD SAMPLE TRACKING REPORT

PROJECT NO. 6373-020 PAGE 1

PLANT/PROJECT: _____

UNIT #

	SAMPLE NO.	RUN NO.	PROCESS STREAM/ LOCATION	SAMPLE DATA				SENT TO:	
				DESCRIPTION	DATE	TIME	SAMPLER	LABORATORY	DATE
OIA	139646	1		Waste Gas Fuel	10/20/93		JR	Air Toxics	10/21/93
OQA	139647	1		Natural Gas (Bomb) Fuel					
	139642	1		Aldehyde Front					
	139643	1		" Back					
	139644	1		" Blank 1 Front					
	139645	1		" Blank 1 Back					
	139648	2		" ~~Blank 2~~ Front		1930			
	139649	2		" ~~Blank 2~~ Back		1930			
	139650	2		" Blank #2 Front		1930			
	139651	2		" Blank #2 Back		1930			
	139652	3		" Blank 3 Front		2330			
	139653	3		" Blank 3 Back					
	139654	3		" Front					
	139655	3		Back					

Energy and
Environmental
Research Corporation

LAB SAMPLE
TRACKING REPORT
WORK REQUEST

PLANT _____ CHARGE NO. 6373-020

ENGINEER JD

REMARKS:

SAMPLE NO.	RUN NO.	SAMPLE DESCRIPTION	ANALYSIS REQUIRED	SAMPLE PREPARATION	DATE DELIVERED	DATE COMPLETE	COMMENTS
139646	1	Waste Gas Fuel	List 1				
139647	1	Natural Gas Fuel	List 1 (bomb)				
139642	1	Aldehyde Front	C1-C4 aldehyde C3-C4 ketones				
139643	1	Aldehyde Back					
139644	1	Aldehyde Blank 1 Front					
139645	1	Aldehyde Blank 1 Back					
139648	2	Aldehyde ~~Blank 2~~ Front					
139649	2	Aldehyde ~~Blank 2~~ Back					
139650	2	Aldehyde Front Blank #2					
139651	2	Aldehyde Back Blank #2					
139652	3	Aldehyde Blank 3 Front					
139653	3	Aldehyde Blank 3 Back					
139654	3	Aldehyde Front					
139655	3	Aldehyde Back					

Energy and
Environmental
Research Corporation

CHAIN OF CUSTODY

Plant
Unit
Location

Page 1 of 1

Project No. 6373-020

P.O No.

Sample No.	Test No.	Test Date	Description
139646	1	10/20/93	Waste Gas Fuel (Tedlar)
139647	1	10/20/93	Natural Gas (S/S bomb)
139642	1	10/20/93	Aldehyde (Front)
139643	1		Aldehyde (Back)
139644	1		Aldehyde (Blank #1) Front
139645	1		Aldehyde (Blank #1) Back
139648	2		Aldehyde ~~Blank 2~~ Front
139649	2		Aldehyde ~~Blank 2~~ BACK
139650	2		Aldehyde Front Blank #
139651	2		Aldehyde BACK Blank #
139652	3		Aldehyde Blank #3 Front
139653	3		Aldehyde Blank 3 Back
139654	3		Aldehyde Front
139655	3		Aldehyde Back

Sampling system prepared by JO
Test operator JO
Sample recovery by JO

Relinquished By	Recieved By	Time	Date	Reason
[signature]	L Robinson	1300	10/25/93	

Laboratory analysis by

Date

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9310214

Work Order Summary

CLIENT:	Mr. Jon Kawaguchi Energy & Environmental Research 8001 Irvine Blvd. Santa Ana, CA 92705	**BILL TO:**	Mr. Dave Hansel EER 18 Mason Irvine, CA 92718
PHONE:	714-552-1803	**INVOICE #**	2191
FAX:	714-859-3194	**P.O. #**	
DATE RECEIVED:	10/25/93	**PROJECT**	
DATE COMPLETED:	11/9/93	**AMOUNT$:**	$1,638.81

FRACTION #	NAME	TEST	PRICE
01A	139642	TO-5	$1575.00 /set.
01AA	139642 Duplicate	TO-5	
01B	139643	TO-5	
01C	139644	TO-5	
01D	139645	TO-5	
02A	139648	TO-5	
02AMS	139648 Matrix Spike	TO-5	
02B	139649	TO-5	
02C	139650	TO-5	
02D	139651	TO-5	
03A	139652	TO-5	
03B	139653	TO-5	
03C	139654	TO-5	
03D	139655	TO-5	
04A	Lab Blank	TO-5	
05A	Lab Spike	TO-5	

Misc. Charges	Shipping (10/19/93)	$63.81

CERTIFIED BY: Jerald J. Freeman
Laboratory Director

DATE: 11/10/93

180 BLUE RAVINE ROAD, SUITE B • FOLSOM, CA 95630
(916) 985-1000 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: 139642

ID#: 9310214-01A

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102603**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**9.6**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (uG)**	**Amount (uG)**
Formaldehyde	0.10	0.13
Acetaldehyde	0.10	0.15
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	Not Detected
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139642 Duplicate

ID#: 9310214-01AA

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102604**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**9.6**	**Date of Analysis:**	**10/26/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.11
Acetaldehyde	0.10	0.13
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.10
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139643

ID#: 9310214-01B

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102805**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**9.7**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (uG)**	**Amount (uG)**
Formaldehyde	0.10	0.10
Acetaldehyde	0.10	0.10
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	Not Detected
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139644

ID#: 9310214-01C

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102606**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**9.0**	**Date of Analysis:**	**10/26/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	Not Detected
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.73
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139645

ID#: 9310214-01D

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102607**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**9.2**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (uG)**	**Amount (uG)**
Formaldehyde	0.10	0.13
Acetaldehyde	0.10	0.13
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	1.5
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139648

ID#: 9310214-02A

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102608**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**11.8**	**Date of Analysis:**	**10/26/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.70
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.63
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139648 Matrix Spike

ID#: 9310214-02AMS

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102603**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**11.8**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (uG)**	**% Recovery**
Formaldehyde	0.10	72
Acetaldehyde	0.10	88
Acrolein	0.10	75
Propanal	0.10	Not Spiked
Acetone	0.10	Not Spiked
Crotonaldehyde	0.10	Not Spiked
Isobutyraldehyde	0.10	Not Spiked
Methyl Ethyl Ketone	0.10	Not Spiked

AIR TOXICS LTD.

SAMPLE NAME: 139649

ID#: 9310214-02B

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102812**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**10.0**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (uG)**	**Amount (uG)**
Formaldehyde	0.10	0.21
Acetaldehyde	0.10	0.13
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.14
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139650

ID#: 9310214-02C

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102610**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**9.1**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (uG)**	**Amount (uG)**
Formaldehyde	0.10	0.19
Acetaldehyde	0.10	0.15
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.29
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139651

ID#: 9310214-02D

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102611**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.2**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (uG)**	**Amount (uG)**
Formaldehyde	0.10	0.15
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.11
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139652

ID#: 9310214-03A

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102615**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**9.5**	**Date of Analysis:**	**10/28/93**

Compound	**Det. Limit (uG)**	**Amount (uG)**
Formaldehyde	0.10	0.16
Acetaldehyde	0.10	0.13
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.14
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139653

ID#: 9310214-03B

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102616**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**9.2**	**Date of Analysis:**	**10/26/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.14
Acetaldehyde	0.10	0.12
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.13
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139654

ID#: 9310214-03C

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102726**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**13.4**	**Date of Analysis:**	**10/27/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.22
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.15
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139655

ID#: 9310214-03D

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102618**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**9.6**	**Date of Analysis:**	**10/26/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.18
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.21
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9310214-04A

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102619**	**Date of Collection:**	**NA**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**10.0**	**Date of Analysis:**	**10/26/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	Not Detected
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	Not Detected
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: Lab Spike

ID#: 9310214-05A

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102620**	**Date of Collection:**	**NA**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/26/93**
Sample Volume (mL):	**11.0**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (uG)**	**% Recovery**
Formaldehyde	0.10	83
Acetaldehyde	0.10	83
Acrolein	0.10	85
Propanal	0.10	Not Spiked
Acetone	0.10	Not Spiked
Crotonaldehyde	0.10	Not Spiked
Isobutyraldehyde	0.10	Not Spiked
Methyl Ethyl Ketone	0.10	Not Spiked

Appendix C.5. Fuel Analyses

Energy and
Environmental
Research Corporation

CHAIN OF CUSTODY

Plant
Unit
Location

Page 1 of 1

Project No. 6373-020

P.O No.

Sample No.	Test No.	Test Date	Description
139646	1	10/20/93	Waste Gas Fuel (Tedlar)
139647	1	10/20/93	Natural Gas (S/S bomb)
139642	1	10/20/93	Aldehyde (Front)
139643	1		Aldehyde (Back)
139644	1		Aldehyde (Blank #1) Front
139645	1		Aldehyde (Blank #1) Back
139648	2		Aldehyde ~~Blank 2~~ Front
139649	2		Aldehyde ~~Blank 2~~ BACK
139650	2		Aldehyde Front Blank #2
139651	2		Aldehyde BACK Blank #.
139652	3		Aldehyde Blank #3 Front
139653	3		Aldehyde Blank 3 Back
139654	3		Aldehyde Front
139655	3		Aldehyde Back

Sampling system prepared by JO
Test operator JO
Sample recovery by JO

Relinquished By	Recieved By	Time	Date	Reason
[signature]	[signature]	1300	10/25/93	

Laboratory analysis by _____ Date _____

Energy and Environmental Research Corporation

LAB SAMPLE TRACKING REPORT WORK REQUEST

PLAN

CHARGE NO. 6373-020

ENGINEER JO

REMARKS:

	SAMPLE NO.	RUN NO.	SAMPLE DESCRIPTION	ANALYSIS REQUIRED	SAMPLE PREPARATION	DATE DELIVERED	DATE COMPLETE	COMMENTS
31A	139646	1	Waste Gas Fuel	List 1				
32A	139647	1	Natural Gas Fuel	List 1 (bomb)				
	139642	1	Aldehyde Front	C1-C4 aldehyde C3 C4 ketones				
	139643	1	Aldehyde Back					
	139644	1	Aldehyde Blank 1 Front					
	139645	1	Aldehyde Blank 1 Back					
	139648	2	Aldehyde ~~Blank 2~~ Front					
	139649	2	Aldehyde ~~Blank 2~~ Back					
	139650	2	Aldehyde Front Blank #2					
	139651	2	Aldehyde Back Blank #2					
	139652	3	Aldehyde Blank 3 Front					
	139653	3	Aldehyde Blank 3 Back					
	139654	3	Aldehyde Front					
	139655	3	Aldehyde Back					

Energy and
Environmental
Research Corporation

FIELD SAMPLE TRACKING REPORT

PROJECT NO. 6373-020 PAGE 1

PLANT/PROJECT

UNIT #. —

SAMPLE NO.	RUN NO.	PROCESS STREAM/ LOCATION	SAMPLE DATA				SENT TO:	
			DESCRIPTION	DATE	TIME	SAMPLER	LABORATORY	DATE
139646	1		Waste Gas Fuel	10/20/93		JQ	Air Toxics	10/21/93
139647	1		Natural Gas (Bomb) Fuel					
139642	1		Aldehyde Front					
139643	1		" Back					
139644	1		" Blank 1 Front					
139645	1		" Blank 1 Back					
139648	2		" ~~Blank 2~~ Front		1930			
139649	2		" ~~Blank 2~~ Back		1930			
139650	2		" Blank #2 Front		1930			
139651	2		" Blank #2 Back		1930			
139652	3		" Blank 3 Front		2330			
139653	3		" Blank 3 Back					
139654	3		" Front					
139655	3		Back					

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9310213

Work Order Summary

CLIENT: Mr. Jon Kawaguchi
Energy & Environmental Research
8001 Irvine Blvd.
Santa Ana, CA 92705

BILL TO: Same

PHONE: 714-552-1803
FAX: 714-859-3194
DATE RECEIVED: 10/25/93
DATE COMPLETED: 11/15/93

INVOICE # 2241
P.O. #
PROJECT #
AMOUNT$: $350.00

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	PRICE
01A	139646*	ASTM D-1945	Tedlar Bag	$175.00
02A	139647	ASTM D-1945	NA	$175.00
03A	Lab Blank	ASTM D-1945	NA	NC

LAB NARRATIVE:
***Sample received out of hold time; analyzed per client's request.**

CERTIFIED BY: Linda J. Freeman
Laboratory Director

DATE: 11/15/93

180 BLUE RAVINE ROAD, SUITE B • FOLSOM, CA 95630
(916) 985-1000 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: 139646*
ID#: 9310213-01A

NATURAL GAS ANALYSIS by ASTM D-1945
GC/TCD/FID

File Name:	**3102605**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (%)**	**Amount (%)**
Oxygen	0.001	0.36
Nitrogen	0.001	1.1
Carbon Monoxide	0.001	Not Detected
Methane	0.001	10
Carbon Dioxide	0.001	88
Ethane	0.001	0.12
Propane	0.001	0.046
Isobutane	0.001	0.008
Butane	0.001	0.14
Neopentane	0.001	0.005
Isopentane	0.001	0.004
n-Pentane	0.001	0.004
Ethylene	0.001	Not Detected
Propene	0.001	Not Detected
1-Butene	0.001	Not Detected
cis-2-Butene	0.001	Not Detected
trans-2-Butene	0.001	Not Detected
Cyclopentane	0.001	Not Detected
Ethyne	0.001	Not Detected
C6+	0.010	0.32
	Total (%) =	100

BTU/Cu. Ft. = 120
Specific Gravity (Air = 1.000) = 1.4

Container Type: Tedlar Bag

AIR TOXICS LTD.

SAMPLE NAME: 139647
ID#: 9310213-02A

NATURAL GAS ANALYSIS by ASTM D-1945
GC/TCD/FID

File Name:	**3102606**	**Date of Collection:**	**10/20/93**
Dil. Factor:	**1.0**	**Date of Analysis:**	**10/26/93**

Compound	**Det. Limit (%)**	**Amount (%)**
Oxygen	0.001	0.48
Nitrogen	0.001	2.2
Carbon Monoxide	0.001	Not Detected
Methane	0.001	73
Carbon Dioxide	0.001	15
Ethane	0.001	4.4
Propane	0.001	1.6
Isobutane	0.001	0.44
Butane	0.001	0.75
Neopentane	0.001	0.004
Isopentane	0.001	0.31
n-Pentane	0.001	0.29
Ethylene	0.001	Not Detected
Propene	0.001	Not Detected
1-Butene	0.001	Not Detected
cis-2-Butene	0.001	Not Detected
trans-2-Butene	0.001	Not Detected
Cyclopentane	0.001	0.083
Ethyne	0.001	Not Detected
C6+	0.010	1.4
	Total (%) =	100

BTU/Cu. Ft. = 990
Specific Gravity (Air = 1.000) = 0.81

Container Type: Sample Bomb

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank
ID#: 9310213-03A

NATURAL GAS ANALYSIS by ASTM D-1945
GC/TCD/FID

File Name:	**3102604**	**Date of Collection:**	**NA**
Dil. Factor:	**1.0**	**Date of Analysis:**	**10/26/93**

Compound	Det. Limit (%)		Amount (%)
Oxygen	0.001		Not Detected
Nitrogen	0.001		100
Carbon Monoxide	0.001		Not Detected
Methane	0.001		Not Detected
Carbon Dioxide	0.001		Not Detected
Ethane	0.001		Not Detected
Propane	0.001		Not Detected
Isobutane	0.001		Not Detected
Butane	0.001		Not Detected
Neopentane	0.001		Not Detected
Isopentane	0.001		Not Detected
n-Pentane	0.001		Not Detected
Ethylene	0.001		Not Detected
Propene	0.001		Not Detected
1-Butene	0.001		Not Detected
cis-2-Butene	0.001		Not Detected
trans-2-Butene	0.001		Not Detected
Cyclopentane	0.001		Not Detected
Ethyne	0.001		Not Detected
C6+	0.010		Not Detected
		Total (%) =	100

BTU/Cu. Ft. = NA
Specific Gravity (Air = 1.000) = NA

Container Type: NA

APPENDIX D - FIELD GAS PROCESS HEATER

Appendix D.1. CEM Calibrations and Calculations

CEM NO AND NOX CALIBRATIONS

PLANT: Field Gas Internal Combustion Engine
CITY, STATE: Confidential
LOCATION: Stack

TEST DATE: 10/22/93

RUN NUMBER: NO,NO2
RUN START TIME: 10:21
RUN END TIME: 12:24
CEM OPERATOR: Rob Cambell

ANALYTE		O2	CO2	NOx
CONCENTRATION UNIT		%, dry	%, dry	ppmv, dry
HIGH-RANGE GAS FRACTION OF SPAN		1	1	1
SPAN		4.5	9	492.1
SPAN GAS CONCENTRATION, Cma	HIGH	4.5	9	492.1
	MID	2.5	4.4	252
	ZERO	0	0	0
INITIAL ANALYZER CALIBRATION CHECK, Cai	HIGH	4.5	9	492.7
	MID	2.5	4.43	252.6
	ZERO	0.0	0.0	7.2
INITIAL ANALYZER CALIBRATION ERROR, Ei	HIGH	0.0%	0.0%	0.1%
Ei = ((Cai - Cma)/Span)x100%	MID	0.0%	0.3%	0.1%
	ZERO	0.0%	0.1%	1.5%
INITIAL BIAS CHECK, Cbi	UPSCALE HIGH (H) OR MID (M)?	M	H	H
(SELECT UPSCALE CALIBRATION GAS CLOSEST TO EFFLUENT GAS CONCENTRATION)	UPSCALE	2.48	9.00	491.00
	ZERO	0.0	0.0	7.4
INITITAL SYSTEM CALIBRATION BIAS, Bi	UPSCALE	-0.4%	0.0%	-0.3%
Bi = ((Cbi-Cai)/Span)x100%	ZERO	0.0%	-0.1%	0.0%
FINAL ANALYZER CALIBRATION CHECK, Caf	HIGH	4.5	8.97	486.6
	MID	2.5	4.43	252.4
	ZERO	0.1	0.0	6.5
FINAL ANALYZER CALIBRATION ERROR, Ef	HIGH	0.0%	-0.3%	-1.1%
Ef = ((Caf - Cma)/Span)x100%	MID	0.0%	0.3%	0.1%
	ZERO	1.1%	-0.4%	1.3%
FINAL BIAS CHECK, Cbf	UPSCALE HIGH (H) OR MID (M)?	M	H	H
(SELECT UPSCALE CALIBRATION GAS CLOSEST TO EFFLUENT GAS CONCENTRATION)	UPSCALE	2.52	9.00	486.60
	ZERO	0.0	0.0	6.6
FINAL SYSTEM CALIBRATION BIAS, Bf	UPSCALE	0.4%	0.3%	0.0%
Bf = ((Cbf-Caf)/Span)x100%	ZERO	-0.4%	0.1%	0.0%
ANALYZER DRIFT	HIGH	0.0%	-0.3%	-1.2%
D = ((Caf - Cai)/(Span))x100%	MID	0.0%	0.0%	0.0%
	ZERO	1.1%	-0.6%	-0.1%
SYSTEM DRIFT	UPSCALE	0.9%	0.0%	-0.9%
D = ((Cbf - Cbi)/(Span))x100%	ZERO	0.7%	-0.3%	-0.2%

Field Gas Internal Combustion Engine						
10/22/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:10:21:39.000	3.31	8.57		515.88		408.27
00:10:22:38.992	3.29	8.62		529.88		418.88
00:10:23:38.988	5.97	7.31		446.59		415.99
00:10:24:38.980	4.58	8.03		502.44		428.39
00:10:25:38.977	4.48	8.10		518.06		439.03
00:10:26:38.969	3.10	8.76		540.20		422.50
00:10:27:38.969	2.99	8.78		527.11		409.75
00:10:28:38.957	2.92	8.79		527.13		408.18
00:10:29:39.004	2.83	8.85	538.40		414.84	
00:10:30:39.000	2.78	8.91	545.45		419.12	
00:10:31:38.992	2.78	8.89	543.55		417.20	
00:10:32:38.988	2.75	8.90	535.20		410.56	
00:10:33:38.960	2.75	8.85	517.47		396.96	
00:10:34:38.984	2.73	8.85	509.53		390.44	
00:10:35:38.969	2.74	9.06	508.44		388.29	
00:10:36:38.965	2.76	8.82		503.46		386.43
00:10:37:38.957	2.73	8.80		497.01		380.85
00:10:38:39.004	2.73	8.81		504.09		386.28
00:10:39:39.055	2.71	8.82		495.82		379.52
00:10:40:38.992	2.72	8.81		493.47		377.93
00:10:41:38.988	2.70	8.84		501.22		383.45
00:10:42:39.035	2.68	8.85		510.82		390.36
00:10:43:38.977	2.68	8.86	509.85		389.62	
00:10:44:38.969	2.87	8.88	509.33		389.01	
00:10:45:38.965	2.67	8.86	512.52		391.45	
00:10:46:38.957	2.66	8.88	520.45		397.29	
00:10:47:39.004	2.67	8.89	512.48		391.42	
00:10:48:39.000	2.63	8.92	519.30		395.76	
00:10:49:38.992	2.60	8.95	522.52		397.57	
00:10:50:38.988	2.63	8.91		522.89		398.50
00:10:51:38.980	2.62	8.93		521.38		397.13
00:10:52:38.977	2.62	8.91		521.84		397.48
00:10:53:38.969	2.61	8.88		517.02		393.60

Field Gas Internal Combustion Engine						
10/22/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:10:54:38.965	2.61	8.89		521.41		396.94
00:10:55:38.957	2.59	8.95		522.65		397.45
00:10:56:39.008	2.62	8.92		512.92		390.69
00:10:57:39.000	2.63	8.91		509.95		388.64
00:10:58:38.992	2.64	8.85		505.51		385.47
00:10:59:38.988	2.68	8.84		501.71		383.40
00:11:00:38.980	2.68	8.86		499.55		381.34
00:11:01:38.977	2.66	8.86	503.52		384.37	
00:11:02:38.969	2.66	8.87	508.19		387.93	
00:11:03:38.965	2.63	8.87	515.95		393.21	
00:11:04:38.957	2.64	8.85	520.69		397.04	
00:11:05:39.008	2.64	8.83	510.48		389.25	
00:11:06:39.008	2.68	8.83	502.31		383.44	
00:11:07:38.992	2.62	8.83	501.05		381.65	
00:11:08:38.988	2.62	8.82		501.25		381.80
00:11:09:38.960	2.65	8.80		488.39		372.61
00:11:10:38.977	2.65	8.81				
00:11:11:38.969	2.60	8.86				
00:11:12:38.965	2.60	8.81		501.88		381.87
00:11:13:38.957	2.51	8.89		508.95		385.36
00:11:14:39.008	2.05	9.11		520.56		384.58
00:11:15:39.000	2.07	9.09	512.43		378.98	
00:11:16:38.992	2.05	9.11	514.66		380.22	
00:11:17:38.992	2.05	9.11	512.42		378.57	
00:11:18:38.980	2.05	9.09	508.37		375.58	
00:11:19:38.977	2.07	9.06	501.02		370.54	
00:11:20:38.969	2.07	9.06	505.58		373.91	
00:11:21:38.965	2.07	9.06	508.66		376.19	
00:11:22:38.957	2.07	9.05		504.75		373.30
00:11:23:39.008	2.07	9.02		496.90		367.49
00:11:24:39.000	2.07	9.04		499.81		369.64
00:11:25:38.992	2.05	9.06		509.12		376.13
00:11:26:38.988	2.06	9.09		504.23		372.71

Field Gas Internal Combustion Engine						
10/22/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:11:27:38.980	2.05	9.05		499.08		368.71
00:11:28:38.977	2.08	9.02		497.68		368.26
00:11:29:38.969	2.08	9.05	494.60		365.98	
00:11:30:38.965	2.07	9.04	496.59		367.26	
00:11:31:38.957	2.06	9.03	495.57		366.31	
00:11:32:39.008	2.06	9.05	499.05		368.89	
00:11:33:39.004	2.04	9.06	493.66		364.52	
00:11:34:38.992	2.08	9.05	492.26		363.87	
00:11:35:38.988	2.06	9.07	501.87		370.97	
00:11:36:38.980	2.08	9.05		485.63		358.97
00:11:37:38.977	2.09	9.00		472.41		349.75
00:11:38:38.969	2.08	9.03		487.24		360.54
00:11:39:38.965	2.08	9.04		478.02		353.71
00:11:40:38.957	2.09	9.01		489.65		362.51
00:11:41:39.063	2.10	9.07		508.45		376.63
00:11:42:39.004	2.08	9.08		507.38		375.44
00:11:52:25.004	2.13	9.01		498.53		369.87
00:11:53:24.996	2.15	9.01		491.00		364.67
00:11:54:24.988	2.15	9.01		493.65		366.64
00:11:55:24.980	2.13	9.04		497.89		369.39
00:11:56:24.996	2.11	9.06		498.80		369.68
00:11:57:24.969	2.12	9.04		485.63		360.11
00:11:58:24.965	2.10	8.99		473.37		350.64
00:11:59:24.957	2.10	9.00	479.15		354.93	
00:12:00:25.008	2.09	9.05	492.85		364.88	
00:12:01:25.004	2.09	9.01	479.41		354.93	
00:12:02:24.992	2.11	8.97	465.13		344.72	
00:12:03:24.988	2.11	8.93	463.11		343.23	
00:12:04:24.980	2.10	8.96	467.57		346.35	
00:12:05:24.977	2.10	8.97	468.57		347.09	
00:12:06:25.027	2.09	8.95		465.30		344.48
00:12:07:24.965	2.10	8.95		462.30		342.44
00:12:08:24.957	2.09	8.94		459.98		340.55

Field Gas Internal Combustion Engine						
10/22/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:12:09:25.008	2.11	8.94		464.57		344.31
00:12:10:25.004	2.08	9.00		484.13		358.24
00:12:11:24.992	2.08	9.01		485.19		359.02
00:12:12:24.988	2.10	8.99		481.81		356.90
00:12:13:24.980	2.10	8.94	459.83		340.61	
00:12:14:24.977	2.10	8.96	461.12		341.57	
00:12:15:24.969	2.11	8.95	465.02		344.64	
00:12:16:24.969	2.32	8.85	465.09		348.57	
00:12:17:24.957	2.10	8.96	469.62		347.87	
00:12:18:25.008	2.11	8.96	475.11		352.12	
00:12:19:25.004	2.17	8.95	481.40		357.92	
00:12:20:24.992	4.12	8.02		435.09		360.86
00:12:21:24.988	4.34	7.90		416.98		350.40
00:12:22:24.980	3.38	8.38		439.30		349.05
00:12:23:24.977	2.51	8.74		455.59		344.96
00:12:24:24.969	4.21	7.98		416.18		347.02
AVERAGE	2.51	8.88	499.89	494.32	375.46	377.12

Appendix D.2. Flow Calculations and Run Sheets

FLOW RATE

PLANT: FG Internal Combustion Engine
CITY: Confidential
RUN NO: 1,2,3
SAMPLE LOCATION: STACK

DATE ENTERED: 11/30/93
DATE: 22-Oct-93
OPERATOR: Jon Kawaguchi
ENTERED BY: David Hansell
CHECKED BY:

DATA ENTRY	SYMBOL	UNITS	DATA	DATA	DATA	DATA
RUN NUMBER	-	-	R1	R2	R3	Average
ROUND STACK, DIAMETER	ds	inches	6.0	6.0	6.0	6.00
RECTANGULAR STACK, LENGTH	L	inches				
WIDTH	W	inches				
AVERAGE STACK TEMPERATURE	Fs	degrees F	569.5	605.8	572.6	582.6
AVERAGE METER TEMPERATURE	Fm	degrees F	106.0	110.0	110.0	108.7
BAROMETRIC PRESSURE	Pbar	in. Hg	29.94	29.94	29.94	29.940
STACK STATIC PRESSURE	Pg	in. H20	0.720	0.650	0.460	0.610
AVG. DELTA H	dH	in. H20	1.600	1.900	1.500	1.667
AVG. VELOCITY HEAD	dP	in. H20	0.50	0.46	0.39	0.448
PITOT COEFFICIENT	Cp	-	0.840	0.840	0.840	0.840
GAS SAMPLE VOLUME	Vm	cubic ft.	29.4	29.7	29.6	29.550
METER CALIBRATION FACTOR	Y	-	1.000	1.000	1.000	1.000
TOTAL SAMPLING TIME	min	minutes	45	40	45	43.333
STACK GAS OXYGEN CONTENT	Co2,m	%	2.50	2.50	2.50	2.500
STACK GAS CARBON DIOXIDE CONTENT	Cco2,m	%	8.89	8.89	8.89	8.890
TOTAL IMPINGER GAIN (WATER & PARTICULATE)	Ww	grams	118.4	106.0	112.3	112.233

CALCULATED DATA	SYMBOL	UNITS	DATA	DATA	DATA	DATA
RUN NUMBER	-	-	R1	R2	R3	Average
STACK AREA, As = 3.14*(ds)**2/576 (ROUND)	As	sq. feet	0.196	0.196	0.196	0.196
= L * W/144 (RECTANGULAR)			0.000	0.000	0.000	0.000
AVG. STACK TEMPERATURE, Ts = Fs + 460	Ts	degrees R	1029.5	1065.8	1032.6	1042.6
AVG. METER TEMPERATURE, Tm = Fm + 460	Tm	degrees R	566.0	570.0	570.0	568.7
GAS SAMPLE VOLUME AT STANDARD CONDITIONS, VmStd = 17.64Y (Vm/Tm) (Pbar + dH/13.6)	VmStd	cubic ft.	27.5	27.6	27.6	27.6
VOLUME OF WATER VAPOR, VwStd = 0.04707*Ww	VwStd	cubic ft.	5.6	5.0	5.3	5.3
MOISTURE FRACTION, Bws = VwStd/(VmStd + VwStd)	Bws	-	0.168	0.153	0.161	0.161
DRY STACK GAS MOL. WEIGHT, Md = 0.32(Co2,m)+ 0.44(Cco2,m)+0.28{100-(Co2,m)-(Cco2,m)}	Md	g/g-mole	29.52	29.52	29.52	29.52
WET STACK GAS MOLECULAR WEIGHT, Mw = Md(1-Bws)+18.0(Bws)	Mw	g/g-mole	27.58	27.76	27.67	27.67
ABSOLUTE STACK PRESSURE, Ps = Pbar + Pg/13.6	Ps	in. Hg	29.99	29.99	29.97	29.98
STACK GAS VELOCITY						
vs = 85.49 Cp { sqrt[(dP*Ts) /(Ps*Mw)] }	vs	ft/s	56.5	54.8	50.0	53.8
vm = 0.3048 * vs	vsm	m/s	17.22	16.71	15.24	16.39
ACTUAL STACK GAS FLOW RATE, Q = 60*vs*As	Q	acf/min	665.8	646.0	589.2	633.7
DRY GAS STACK FLOW RATE (DRY,STP)						
Qsd = 17.64*Q*(1-Bws)*(Ps/Ts)	Qsd	dscf/min	284.5	271.5	253.2	269.7
Qsdm = Qsd/35.32	Qsdm	dscm/min	8.1	7.7	7.2	7.6

PLANT
DATE 10/22/93
LOCATION
STACK I.D. 6"
PITOT NO./Cp 162/.84 TC# 50
BAROMETRIC PRESSURE, In Hg 29.44
STATIC GAUGE PRESSURE, In H20 +0.72
OPERATORS RC, JK
PITOT PRE TEST LEAK CHECK Good
PITOT POST TEST LEAK CHECK Good

SCHEMATIC OF TRAVERSE POINT LAYOUT

A

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	0930	.44	545	
2		.47	563	
3		.53	579	
4		.56	588	
AVERAGE				

B

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1		.47	572	
2		.44	574	
3		.51	565	
4		.57	571	
AVERAGE				

SWIRL ACCEPTANCE LIMITS

Average(abs. value) less than 10°
No points with reverse flow
No more than 4 points above 30°

ΔP MINIMUM LIMITS

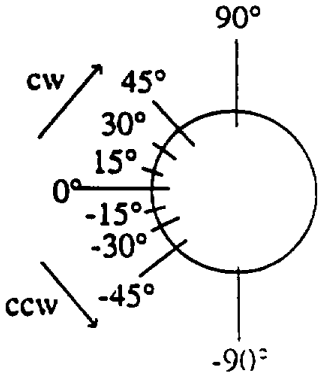
Conditions for more sensitive manometer
1. For 12 or more points on a velocity traverse: 10% of the points's $\Delta p < 0.05"$
2. For <12 points on a velocity traverse more than 1 point's $\Delta p < 0.05"$

Rt Mean Avg Δp =

$$\left[\frac{\sum_i (\Delta p_{si})^{1/2}}{N}\right]^2$$

Rt Mean Avg Ts =

$$\left[\frac{\sum_i (Ts_i)^{1/2}}{N}\right]^2$$



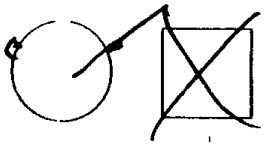
EPA METHOD 4

Plant ___
City ___
Location ___
Operators VK
Date 10/22/93
Run Number 1
Stack Diam. (in.) 6

Sample Box Number orange
Meter Box Number N1
Meter Calibration (Y) 1.0002
Meter dH @ 1.9512
Pitot Tube No. 162 Cp .84
Probe Length 4' Tc No. 50

Probe Liner Material S/S
Static Pressure (Ps) +.46 (in. H2O)
Barometric Pressure (Pb) ___ (in. Hg)
Ambient Temperature (°F) 80
Pretest Leak Rate 0.01 cfm @ 19 (in. Hg)
Post Test Leak Rate 0.01 cfm @ 21 (in. Hg)

Sheet 1 of 1



Sampling Time, (min)	Clock Time (24 h)	Vacuum (in. Hg)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Outlet Temp. Tm (°F)	Impinger Outlet Temp. (°F)	Comments
0	1019			54.050			
5	24	18	1.6	62.430	101	65	
10	29	18	1.6	65.840	102	61	
15	34	18	1.6	69.195	103	59	
20	39	19	1.6	72.535	105	59	
25	44	19	1.6	75.970	106	60	
30	49	19	1.6	79.205	106	61	
35	54	19	1.6	81.540	107	62	
40	59	19	1.6	84.950	108	63	
45	1104	19	1.6	89.205	108	65	
				30.155	105		

IMPINGER WEIGHT SHEET

Plant/city: _____

Location: _____

Train Set No. Orange

Run No.: 1

Operator: JK

Run Time: 48 min

Impinger No.	Solution Used	Solution (ml)	Configuration		Weight (grams)	Inspection Comments
1	DI	100	Mod	Final	696.1	
				Initial	590.0	
				Wt. gain	106.1	
2	DI	100	GS	Final	618.2	
				Initial	611.9	
				Wt. gain	6.3	
3	Empty	—	Mod	Final	483.9	
				Initial	483.2	
				Wt. gain	0.7	
4	Silica	300g	Mod	Final	695.8	
				Initial	690.5	
				Wt. gain	5.3	
5				Final		
				Initial		
				Wt. gain		
6				Final		
				Initial		
				Wt. gain		
Flask				Final		
				Initial		
				Wt. gain		

TOTAL WEIGHT GAIN OF IMPINGERS (grams) 118.4

Train set up: Date: _____
Signature: _____

Train recovery: Date: _____
Signature: _____

EER

PRELIMINARY VELOCITY TRAVERSE

PLANT
DATE 10/22/95
LOCATION
STACK I.D. 6"
PITOT NO./Cp 162/.84 TC# 50
BAROMETRIC PRESSURE, In Hg 29.94
STATIC GAUGE PRESSURE, In H20 +0.65
OPERATORS RC, JC
PITOT PRE TEST LEAK CHECK Good
PITOT POST TEST LEAK CHECK

SCHEMATIC OF TRAVERSE POINT LAYOUT

A

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	1143	.49	609	
2		.46	609	
3		.46	610	
4		.45	612	
AVERAGE				

B

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1		.39	588	
2		.40	612	
3		.58	602	
4		.50	604	
AVERAGE				

SWIRL ACCEPTANCE LIMITS

Average(abs. value) less than 10°
No points with reverse flow
No more than 4 points above 30°

ΔP MINIMUM LIMITS

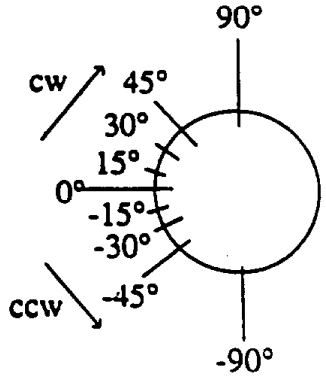
Conditions for more sensitive manometer
1. For 12 or more points on a velocity traverse: 10% of the points's Δp < 0.05"
2. For <12 points on a velocity traverse more than 1 point's Δp <0.05"

Ft Mean Avg Δp =

$$\left[\frac{\sum_i (\Delta p_{si})^{1/2}}{N}\right]^2$$

Ft Mean Avg Ts =

$$\left[\frac{\sum_i (Ts_i)^{1/2}}{N}\right]^2$$



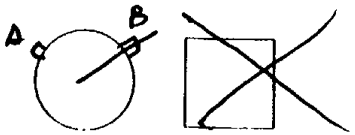
EPA METHOD 4

Plant
City
Location
Operators JC
Date 10/22/95
Run Number 2
Stack Diam. (in.) 6

Sample Box Number Black
Meter Box Number N1
Meter Calibration (Y) 1.0002
Meter dH @ 1.9512
Pitot Tube No. 102 Cp .84
Probe Length 4' Tc No. 50

Probe Liner Material S/S
Static Pressure (Pa) +0.65 (in. H2O)
Barometric Pressure (Pb) 29.94 (in. Hg)
Ambient Temperature (°F) 100
Pretest Leak Rate 0.002 cfm @ 15 (in. Hg)
Post Test Leak Rate 0.000 cfm @ 13 (in. Hg)

Sheet 1 of 1



Sampling Time, (min)	Clock Time (24 h)	Vacuum (in. Hg)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp. (°F)	Comments
0	1220			89.430			
5	25	11	1.9	* ~~90.130~~	108	63	*93.190
10	30	11	1.9	96.940	109	64	
15	35	11	1.9	100.665	111	61	
20	40	11	1.9	104.380	112	62	
25	45	11	1.9	108.060	109	63	
30	50	11	1.9	111.725	109	64	
35	55	11	1.9	115.395	110	63	
40	1300	11	1.9	119.080	109	61	

IMPINGER WEIGHT SHEET

Train Set No. Black ~~Black~~

Plant/city: _____

Location: _____

Run No.: 2

Operator: JIC

Run Time: 40 min

Impinger No.	Solution Used	Solution (ml)	Configuration		Weight (grams)	Inspection Comments
1	DI	100.	Mod	Final	793.0	
				Initial	775.0	
				Wt. gain		
2	DI	100	GS	Final	634.1	
				Initial	602.4	
				Wt. gain		
3	Empty	—	Mod	Final	468.3	
				Initial	467.4	
				Wt. gain		
4	Silica	300g	Mod	Final	631.8	
				Initial	626.4	
				Wt. gain		
5				Final		
				Initial		
				Wt. gain		
6				Final		
				Initial		
				Wt. gain		
Flask				Final		
				Initial		
				Wt. gain		

TOTAL WEIGHT GAIN OF IMPINGERS (grams) _____

Train set up: Date: _____
Signature: _____

Train recovery: Date: _____
Signature: _____

EER

VELOCITY TRAVERSE

PLANT
DATE 10/22 1937
LOCATION
STACK I.D. 6
PITOT NO./Cp 142/.84 TC# 50
BAROMETRIC PRESSURE, In Hg
STATIC GAUGE PRESSURE, In H20 +.46
OPERATORS RC, JB
PITOT PRE TEST LEAK CHECK Good
PITOT POST TEST LEAK CHECK

SCHEMATIC OF TRAVERSE POINT LAYOUT

A

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	1500	.39	584	
2		.35	588	0
3		.39	590	
4		.35	586	0
AVERAGE				

B

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1		.25	495	0
2		.41	555	
3		.48	586	0
4		.53	595	
AVERAGE				

SWIRL ACCEPTANCE LIMITS

Average(abs. value) less than 10°
No points with reverse flow
No more than 4 points above 30°

ΔP MINIMUM LIMITS

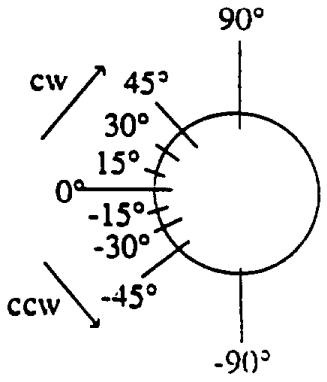
Conditions for more sensitive manometer
1. For 12 or more points on a velocity traverse: 10% of the points's Δp < 0.05"
2. For <12 points on a velocity traverse more than 1 point's Δp <0.05"

Rt Mean Avg Δp =

$$\left[\frac{\sum_{i}(\Delta p_{si})^{1/2}}{N}\right]^2$$

Rt Mean Avg Ts =

$$\left[\frac{\sum_{i}(T_{si})^{1/2}}{N}\right]^2$$



EER

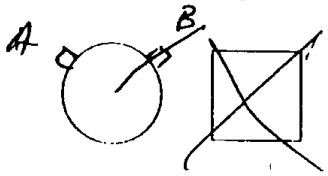
EPA METHOD 4

Plant
City
Location
Operators JK
Date 10/22/93
Run Number 3
Stack Diam, (in.) 6

Sample Box Number Orange
Meter Box Number N1
Meter Calibration (Y) 1.0002
Meter dH @ 1.9512
Pilot Tube No. 162 Cp .84
Probe Length 4' Tc No. 58

Probe Liner Material 316
Static Pressure (Pa) (in. H2O)
Barometric Pressure (Pb) 29.94 (in. Hg)
Ambient Temperature (°F) 106
Pretest Leak Rate 0.005 cfm @ 20 (in. Hg)
Post Test Leak Rate 0.004 cfm @ 19 (in. Hg)

Sheet 1 of 1



Sampling Time, (min)	Clock Time (24 h)	Vacuum (in. Hg)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp (°F)	Comments
0	1529			119.320			
5	34	17	1.5	122.615	109	53	
10	39	17	1.5	125.915	108	56	
15	44	17	1.5	129.225	110	58	
20	49	17	1.5	132.525	110	57	
25	54	17	1.5	135.815	111	59	
30	59	17	1.5	139.100	112	60	
35	1604	17	1.5	142.375	112	61	
40	09	17	1.5	145.655	112	62	
45	14	17	1.5	149.960	111	63	

IMPINGER WEIGHT SHEET

Plant/cit: _____

Location: _____

Train Set No. _____

Run No.: 3

Operator: JC

Run Time: 45 min

Impinger No.	Solution Used	Solution (ml)	Configuration		Weight (grams)	Inspection Comments
1	DI	100	Mod	Final	796.4	
				Initial	696.1	
				Wt. gain		
2	DI	100	GS	Final	623.8	
				Initial	617.2	
				Wt. gain		
3	Empty	—	Mod	Final	486.4	
				Initial	483.9	
				Wt. gain		
4	Silica	300g	Mod	Final	700.5	
				Initial	695.8	
				Wt. gain		
5				Final		
				Initial		
				Wt. gain		
6				Final		
				Initial		
				Wt. gain		
Flask				Final		
				Initial		
				Wt. gain		

TOTAL WEIGHT GAIN OF IMPINGERS (grams) _____

Train set up: Date: _____
Signature: _____

Train recovery: Date: _____
Signature: _____

EER

Appendix D.3. Tedlar Bag Analyses

Energy and
Environmental
Research Corporation

FIELD SAMPLE TRACKING REPORT

PROJECT NO. 6373-020 PAGE 1

PLANT/PROJECT

UNIT #

SAMPLE NO.	RUN NO.	PROCESS STREAM/ LOCATION	SAMPLE DATA				SENT TO:	
			DESCRIPTION	DATE	TIME	SAMPLER	LABORATORY	DATE
154591	1	Stack	Diluted	10-22-93	14:28 / 14:54	R. Campbell		
154590	1		Undiluted	10-22-93	14:28 / 14:54	R. Campbell		
154592	1		Condensate	10-22-93	14:28 / 14:54	R. Campbell		
154593	2		Diluted	10-22-93	14:54 / 15:24	R. Campbell		
154594	2		Undiluted	10-22-93	14:54 / 15:24	R. Campbell		
154595	2		Condensate	10-22-93	14:54 / 15:24	R. Campbell		
154596	3		Diluted	10-22-93	15:24 / 15:54	R. Campbell		
154597	3		Undiluted	10-22-93	15:24 / 15:54	R. Campbell		
154598	3		Condensate	10-22-93	15:24 / 15:54	R. Campbell		
154599	4		Blank	10-22-93	15:55 / 16:24	R. Campbell		
154600	4		Condensate	10-22-93	15:55 / 16:24	R. Campbell		
			(drop					

Applied P & Ch Laboratory
4086 E. Mission Blvd., Pomona, CA 91766
Tel: (909) 622-5148 Fax: (909) 622-3199

APCL Analytical Report

Submitted to:
Energy and Environmental Research Corporation
Attention: Dave Hansell
8001 Irvine Blvd.
Santa Ana, CA 92706
Tel: (714)552-1803 Fax: (714)857-1943

Service ID #: 801-934506B
Collected by: R. Campbell
Collected on: 10/20/93
Sample description:
Air Bag Samples from
Project: 6373

Received : 10/23/93
Tested : 11/23-24/93
Reported : 11/15/93

Analysis of VOCs in Air

801-934506B Page 1 of 3

Component Analyzed	Method	Unit	PQL	Concentration 154591 Diluted 93-4506-08	154590 Undiluted 93-4506-09	154593 Diluted 93-4506-10	154594 Undiluted 93-4506-11	154596 Diluted 93-4506-12	154597 Undiluted 93-4506-13	154599 Blank 93-4506-14
Chlorinated Hydrocarbons										
Chloromethane	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Bromomethane	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Chloroethane	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,1-Dichloroethene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Methylene Chloride	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,1-Dichloroethene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
cis-1,2-Dichloroethene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Chloroform	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,1,1-Trichloroethane	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Carbon Tetrachloride	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,2-Dichloroethane	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Trichloroethene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,2-Dichloropropane	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
cis-1,3-Dichloropropene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
trans-1,3-Dichloropropene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,1,2-Trichloroethane	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Tetrachloroethene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Ethylene Dibromide	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Ethylene Dichloride	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Chlorobenzene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,1,2,2-Tetrachloroethane	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,3-Dichlorobenzene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,4-Dichlorobenzene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Chlorotoluene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,2-Dichlorobenzene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,2,4-Trichlorobenzene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Hexachlorobutadiene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
trans-1,2-Dichloroethene	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
1,1,1,2-Tetrachloroethane	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.
Carbon Disulfide	TO-14	ppbV	5	N.D.	—	N.D.	—	N.D.	—	N.D.

CADHS ELAP CERTIFICATION NUMBER 1431

Applied P & Ch Laboratory
4086 E. Mission Blvd., Pomona, CA 91766
Tel: (909) 622-5148 Fax: (909) 622-3199

APCL Analytical Report

Analysis of VOCs in Air

Component Analyzed	Method	Unit	PQL	Concentration 154591 Diluted 93-4506-08	154590 Undiluted 93-4506-09	154593 Diluted 93-4506-10	154594 Undiluted 93-4506-11	154596 Diluted 93-4506-12	154597 Undiluted 93-4506-13	154599 Blank 93-4506-14
Paraffins (C4-C6)										
n-Butane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Isobutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
n-Pentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Isopentane [2-methylbutane]*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Neopetane [2,2-dimethylpropane]*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
n-Hexane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Methylpentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
3-Methylpentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2,2-Dimethylbutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2,3-Dimethylbutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Aromatics										
Benzene	TO-14	ppbV	5	23	–	55	–	47	–	N.D.
Toluene	TO-14	ppbV	5	17	–	24	–	23	–	8
Ethyl Benzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
m,p-Xylenes	TO-14	ppbV	5	7	–	7	–	7	–	N.D.
o-Xylene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Styrene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3,5-Trimethylbenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2,4-Trimethylbenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Phenol	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Naphthalene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Naphthenes										
Cyclopropane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclobutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclopentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclohexane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ketones										
Acetone	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Butanone	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3-Butadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Propadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Olefins										
1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Methylpropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-2-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-2-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-methyl-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-methyl-1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
3-methyl-1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.

CADHS ELAP CERTIFICATION NUMBER 1431

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APCL Analytical Report

Analysis of VOCs in Air

801-934506B Page 3 of 3

Component Analyzed	Method	Unit	PQL	Concentration 154591 Diluted 93-4506-08	154590 Undiluted 93-4506-09	154593 Diluted 93-4506-10	154594 Undiluted 93-4506-11	154596 Diluted 93-4506-12	154597 Undiluted 93-4506-13	154599 Blank 93-4506-14
Acetylenes (C4-C5)										
1-Butyne*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Butyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1-Pentyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Pentyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethers										
MTBE	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Dimethyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethyl Methyl Ether*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Diethyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethyl Propyl Ether*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Dipropyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
VOCs by GC/FIDs										
Methane	TO-14/FID	ppbV	500	–	484,000	–	482,000	–	480,000	–
Ethane	TO-14/FID	ppbV	500	–	69,200	–	68,000	–	68,700	–
Propane	TO-14/FID	ppbV	500	–	47,900	–	45,800	–	48,800	–
Ethene	TO-14/FID	ppbV	500	–	101,000	–	51,400	–	52,500	–
Propene	TO-14/FID	ppbV	500	–	14,500	–	13,500	–	14,700	–
Ethyne	TO-14/FID	ppbV	500	–	54,800	–	103,000	–	105,000	–
Propyne*	TO-14/FID	ppbV	500	–	N.D.	–	N.D.	–	N.D.	–

PQL : Practical Quantitation Limit
N.D. : Not Detected or Less Than The Quantitation Limit.
* Standards not available

Respectfully submitted,

Shu-Teh Pan
Lab Manager
Applied P & Ch Laboratory

CADHS ELAP CERTIFICATION NUMBER 1431

Appendix D.4. Aldehyde/Ketone Calculations, Run Sheets and Analyses

CARB 430

	DATE DATE ENTERED: 11/20/93
PLANT: Field Gas ICE	TEST DATE: 10/22/93
CITY: Confidential	OPERATOR: Jon Kawaguchi
RUN #: 1, 2, 3	ENTERED BY: Dave Hansell
SAMPLE LOCATION: STACK	CHECKED BY:

DATA ENTRY	SYMBOL	UNITS		DATA		DATA		DATA			
RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
AVERAGE METER TEMPERATURE	Fm	degree F		107.60		114.80		114.80		112.40	3.70
BAROMETRIC PRESSURE	Pbar	in. Hg		29.94		29.94		29.94		29.94	0.00
AVG. DELTA H	dH	in. H20		1.10		1.20		1.20		1.17	4.95
GAS SAMPLE VOLUME	Vm	cubic ft.		1.06		1.08		1.11		1.08	2.32
METER CALIBRATION FACTOR	Y	-		1.00		1.00		1.00		1.00	0.00
TOTAL SAMPLING TIME	min	minutes		60.00		60.00		60.00		60.00	0.00
SAMPLE 1ST IMPINGER VOLUME	Siwt,1	ml		10.10		10.50		11.40		10.67	6.24
SAMPLE 2ND IMPINGER VOLUME	Siwt,2	ml		9.40		9.50		9.80		9.57	2.18
BLANK 1ST IMPINGER VOLUME	Biwt,1	ml		9.80		9.60		9.40		9.60	2.08
BLANK 2ND IMPINGER VOLUME	Biwt,2	ml		9.40		9.60		9.20		9.40	2.13
SAMPLE WEIGHTS (1ST IMPINGER)											
Formaldehyde	Swt,1	µg		42.00		200.00		320.00		187.33	74.43
Acetaldehyde	Swt,1	µg		15.50		34.00		28.00		25.83	36.54
Acrolein	Swt,1	µg	ND	0.60		6.70		7.70	<	5.00	76.86
Propanal	Swt,1	µg		0.73	ND	2.10	ND	2.10	<	1.64	48.13
Acetone	Swt,1	µg		1.75		2.60	ND	2.10	<	2.15	19.87
Crotonaldehyde	Swt,1	µg	ND	0.60	ND	2.10	ND	2.10	ND	1.60	54.13
Isobutyraldehyde	Swt,1	µg	ND	0.60	ND	2.10	ND	2.10	ND	1.60	54.13
Methyl Ethyl Ketone	Swt,1	µg		1.25		2.80		3.10		2.38	41.66
SAMPLE WEIGHTS (2ND IMPINGER)											
Formaldehyde	Swt,2	µg		0.39		0.71		0.60		0.57	28.69
Acetaldehyde	Swt,2	µg		10.00		15.00		7.80		10.93	33.75
Acrolein	Swt,2	µg		1.10		3.10		1.60		1.93	53.84
Propanal	Swt,2	µg		0.73		1.60		0.68		1.00	51.56
Acetone	Swt,2	µg		0.45		1.60		0.12		0.72	107.41
Crotonaldehyde	Swt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Isobutyraldehyde	Swt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Swt,2	µg		0.85		1.50		0.90		1.08	33.39
BLANK WEIGHTS (1ST IMPINGER)											
Formaldehyde	Bwt,1	µg	ND	0.10		0.10		0.15	<	0.12	24.74
Acetaldehyde	Bwt,1	µg	ND	0.10		0.12	ND	0.10	<	0.11	10.83
Acrolein	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Propanal	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Acetone	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Crotonaldehyde	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Isobutyraldehyde	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
BLANK WEIGHTS (2ND IMPINGER)											
Formaldehyde	Bwt,2	µg	ND	0.10		0.10	ND	0.10	<	0.10	0.00
Acetaldehyde	Bwt,2	µg	ND	0.10		0.11	ND	0.10	<	0.10	5.59
Acrolein	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Propanal	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Acetone	Bwt,2	µg	ND	0.10		0.31		0.21	<	0.21	50.83
Crotonaldehyde	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Isobutyraldehyde	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00

CARB 430

PLANT: Field Gas ICE
CITY: Confidential
RUN #: 1, 2, 3
SAMPLE LOCATION: STACK

DATE DATE ENTERED: 11/20/93
TEST DATE: 10/22/93
OPERATOR: Jon Kawaguchi
ENTERED BY: Dave Hansell
CHECKED BY:

CALCULATED DATA	SYMBOL	UNITS	DATA		DATA		DATA			
RUN NUMBER	-	-	R1		R2		R3		AVE	RSD
AVG. METER TEMPERATURE, Tm = Fm + 460	Tm	degrees R	567.60		574.80		574.80		572.40	0.73
GAS SAMPLE VOLUME AT STANDARD CONDITIONS, VmStd = 17.64Y (Vm/Tm) (Pbar + dH/13.6)	VmStd	dscm	0.028		0.028		0.029		0.028	1.80

SAMPLE IMPINGER CONCENTRATION (ng/ml), S or Bic= 1000*(S or Bwt,1+S or Bwt,2)/(S or Biwt,1+S or Biwt,2)

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Sic	ng/ml		2174		10036		15123		9111	72
Acetaldehyde	Sic	ng/ml		1308		2450		1689		1815	32
Acrolein	Sic	ng/ml	<	87		490		439	<	339	65
Propanal	Sic	ng/ml		75	<	185	<	131	<	130	42
Acetone	Sic	ng/ml		113		210	<	105	<	143	41
Crotonaldehyde	Sic	ng/ml	ND	36	ND	110	ND	104	ND	83	49
Isobutyraldehyde	Sic	ng/ml	ND	36	ND	110	ND	104	ND	83	49
Methyl Ethyl Ketone	Sic	ng/ml		108		215		189		170	33
BLANK											
Formaldehyde	Bic	ng/ml	ND	10		10	<	13	<	11	15
Acetaldehyde	Bic	ng/ml	ND	10		12	ND	11	<	11	7
Acrolein	Bic	ng/ml	ND	10	ND	10	ND	11	ND	11	2
Propanal	Bic	ng/ml	ND	10	ND	10	ND	11	ND	11	2
Acetone	Bic	ng/ml	ND	10	<	21	<	17	<	16	34
Crotonaldehyde	Bic	ng/ml	ND	10	ND	10	ND	11	ND	11	2
Isobutyraldehyde	Bic	ng/ml	ND	10	ND	10	ND	11	ND	11	2
Methyl Ethyl Ketone	Bic	ng/ml	ND	10	ND	10	ND	11	ND	11	2

BLANK TO SAMPLE RATIO, Br=Sic/Average(Bic)

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
RATIO											
Formaldehyde	Br		C	190.28	C	878.40	C	1323.68		797.45	71.61
Acetaldehyde	Br		C	118.35	C	221.73	C	152.83		164.30	32.04
Acrolein	Br		NA	NA	NA	NA	NA	NA		NA	NA
Propanal	Br		NA	NA	NA	NA	NA	NA		NA	NA
Acetone	Br		C	6.99	C	13.01	C	6.49		8.83	41.11
Crotonaldehyde	Br		NA	NA	NA	NA	NA	NA		NA	NA
Isobutyraldehyde	Br		NA	NA	NA	NA	NA	NA		NA	NA
Methyl Ethyl Ketone	Br		NA	NA	NA	NA	NA	NA		NA	NA

CARB 430

	DATE DATE ENTERED: 11/20/93
PLANT: Field Gas ICE	TEST DATE: 10/22/93
CITY: Confidential	OPERATOR: Jon Kawaguchi
RUN #: 1, 2, 3	ENTERED BY: Dave Hansell
SAMPLE LOCATION: STACK	CHECKED BY:

CORRECTED SAMPLE CONCENTRATION (ng/ml) Br>5 Cic=Sic-Average(Bic); Br<5 Cic=5*Average(Bic)

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Cic	ng/ml	C	2162	C	10024	C	15111	C	9099	72
Acetaldehyde	Cic	ng/ml	C	1297	C	2439	C	1678	C	1804	32
Acrolein	Cic	ng/ml	< NA	87	NA	490	NA	439	< NC	339	65
Propanal	Cic	ng/ml	NA	75	< NA	185	< NA	131	< NC	130	42
Acetone	Cic	ng/ml	C	97	C	194	< C	89	< C	126	46
Crotonaldehyde	Cic	ng/ml	ND NA	36	ND NA	110	ND NA	104	ND NC	83	49
Isobutyraldehyde	Cic	ng/ml	ND NA	36	ND NA	110	ND NA	104	ND NC	83	49
Methyl Ethyl Ketone	Cic	ng/ml	NA	108	NA	215	NA	189	NC	170	33

CORRECTED SAMPLE CONCENTRATION 1 (mg/dscm), Cc,1=Cic*(Swt,1+Swt,2)/VmStd/1e06

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Cc,1	mg/dscm	C	1.507	C	7.118	C	11.067	C	6.56	73.19
Acetaldehyde	Cc,1	mg/dscm	C	0.903	C	1.732	C	1.229	C	1.29	32.41
Acrolein	Cc,1	mg/dscm	< NA	0.061	NA	0.348	NA	0.321	< NC	0.24	65.21
Propanal	Cc,1	mg/dscm	NA	0.052	< NA	0.131	< NA	0.096	< NC	0.09	42.58
Acetone	Cc,1	mg/dscm	C	0.067	C	0.138	< C	0.065	< C	0.09	45.94
Crotonaldehyde	Cc,1	mg/dscm	ND NA	0.025	ND NA	0.078	ND NA	0.076	ND NC	0.06	50.36
Isobutyraldehyde	Cc,1	mg/dscm	ND NA	0.025	ND NA	0.078	ND NA	0.076	ND NC	0.06	50.36
Methyl Ethyl Ketone	Cc,1	mg/dscm	NA	0.075	NA	0.153	NA	0.138	NC	0.12	33.85

CORRECTED SAMPLE CONCENTRATION 2 (ppbv), Cc,2=1000*24.05/Mw

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Cc,2	ppbv	C	1208	C	5706	C	8872	C	5261.91	73.19
Acetaldehyde	Cc,2	ppbv	C	494	C	947	C	672	C	703.98	32.41
Acrolein	Cc,2	ppbv	< NA	26	NA	149	NA	138	< NC	104.36	65.21
Propanal	Cc,2	ppbv	NA	22	< NA	54	< NA	40	< NC	38.59	42.58
Acetone	Cc,2	ppbv	C	28	C	57	< C	27	< C	37.30	45.94
Crotonaldehyde	Cc,2	ppbv	ND NA	9	ND NA	27	ND NA	26	ND NC	20.51	50.36
Isobutyraldehyde	Cc,2	ppbv	ND NA	8	ND NA	26	ND NA	25	ND NC	19.94	50.36
Methyl Ethyl Ketone	Cc,2	ppbv	NA	25	NA	51	NA	46	NC	40.74	33.85

ND - Sample value below detection limit

< - Some sample values below detection limit

C - Blank Corrected

RL - Reporting Limit

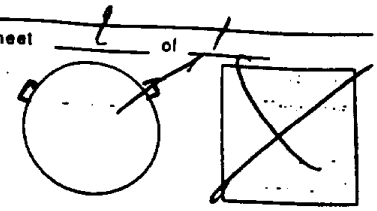
NA - Not Available

CARB 430 RUN SHEET

Plant
City
Location
Operators JK
Date 10/22/93
Run Number 1
Stack Diam. (in.) 6
Static Pressure (Pa) -0.46 (in. H2O)
Barometric Pressure (Pb) (in. Hg)
Ambient Temperature (°F) 98

Sample Box Number
Meter Box Number U3
Meter Calibration (Y)
Meter dH @
Probe Length 4
Probe Liner Material S/S
Pretest Leak Rate 000 cfm @ 5 (in. Hg)
Post Test Leak Rate cfm @ (in. Hg)

Sheet 1 of 1



4007402
Well 27-

Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Rotameter Reading	Gas Sample Volume, Vm (l)	Flowrate liters/min	Stack Temp (°F)	Dry Gas Meter Outlet Temp, Tm (°C)	ΔH Probe Temp.	Comments
1	0	1017		731.76					
1	5	22	.5	734.10	.5	N/A	38	1.2	RPM steady 1170
	10	27	.5	736.70	.5		38	1.2	
	15	32	.5	739.31	.5		39	1.2	
	20	37	.5	741.81	.5		40	1.2	
	25	42	.5	744.42	.5		41	1.2	
	30	47	.5	746.80	.5		41	1.2	
	35	52	.5	749.32	.5		42	1.2	
	40	57	.5	751.92	.5		43	1.0	
	45	1102	.5	754.65	.5		43	1.0	
	50	07	.5	756.90	.5		43	1.2	
	55	12	.5	759.25	.5		44	1.2	
	60	17	.5	761.79	.5		45	1.2	
Average/Total									

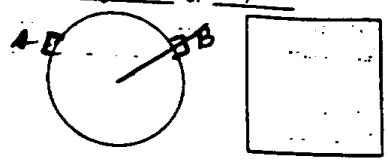
Flowrate at 0.50 liters/min +/- 10%
Pretest Probe Purge with Stack Gas
Pretest leak check with Charcoal Tube
Where gloves when operating train

CARB 430 RUN SHEET

Plant
City
Location
Operators JC
Date 11/22/93
Run Number 2
Stack Diam. (in) ~~0.65~~ 6
Static Pressure (Pa) +0.65 (in. H2O)
Barometric Pressure (Pb) (in. Hg)
Ambient Temperature (°F) 100

Sample Box Number
Meter Box Number U3
Meter Calibration (Y)
Meter dH @
Probe Length 4
Probe Liner Material S/S
Pretest Leak Rate 000 cfm @ 5 (in. Hg)
Post Test Leak Rate cfm @ (in. Hg)

Sheet 1 of 1



Traverse Point No.	Sampling Time, (Min)	Clock Time (24 h)	Rotameter Reading	Gas Sample Volume, Vm (l)	Flowrate liters/min	Stack Temp (°F)	Dry Gas Meter Outlet Temp, Tm (°C)	ΔH Probe Temp.	Comments
1	0	1228		762.90					Re-Start Lost power from generator
1	5	2814	.5	765.55	.5	N/A	44	1.2	
	10	3317	.5	767.10	.5		45	1.2	
	15	3924	.5	770.70	.5		46	1.2	
	20	4329	.5	773.27	.5		46	1.2	
	25	4834	.5	775.70	.5		46	1.2	
	30	5329	.5	779.33	.5		46	1.2	
	35	5844	.5	780.82	.5		47	1.2	
	40	1304	.5	783.42	.5		47	1.2	
	45	0854	.5	785.97	.5		47	1.2	
	50	1359	.5	788.43	.5		48	1.2	
	55	1804	.5	791.02	.5		47	1.2	
	60	2309	.5	793.49	.5		47	1.2	
Average/Total									

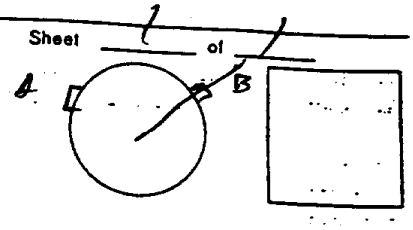
Flowrate at 0.50 liters/min +/- 10%
Pretest Probe Purge with Stack Gas
Pretest leak check with Charcoal Tube
Where gloves when operating train

CARB 430 RUN SHEET

Plant
City
Location
Operators JLR
Date 10/22/93
Run Number 3
Stack Diam. (in.) 4
Static Pressure (Pa) _____ (in. H2O)
Barometric Pressure (Pb) 29.94 (in. Hg)
Ambient Temperature (°F) 106

Sample Box Number
Meter Box Number V3
Meter Calibration (Y)
Meter dH @
Probe Length 4'
Probe Liner Material S/S
Pretest Leak Rate 0.000 cfm @ 6 (in. Hg)
Post Test Leak Rate ____ cfm @ ____ (in. Hg)

Sheet 1 of 1



Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Rotameter Reading	Gas Sample Volume, Vm (l)	Flowrate liters/min	Stack Temp (°F)	Dry Gas Meter Outlet Temp, Tm (°C)	ΔH	Comments
1	0	1527		793.50					
1	5	32	.5	796.21	.5	N/A	44	1.2	
	10	37	.5	798.92	.5		44	1.2	
	15	42	.5	801.65	.5		44	1.3	
	20	47	.5	804.17	.5		45	1.2	
	25	52	.5	806.90	.5		45	1.2	
	30	57	.5	809.43	.5		46	1.1	
	35	1602	.5	812.11	.5		46	1.2	
	40	07	.5	814.62	.5		46	1.0	
	45	12	.5	817.25	.5		47	1.4	
	50	17	.5	819.69	.5		47	1.3	
	55	22	.5	822.35	.5		46	1.2	
	60	27	.5	824.85	.5	✓	46	1.3	
Average, Total									

Flowrate at 0.50 liters/min +/- 10%
Pretest Probe Purge with Stack Gas
Pretest leak check with Charcoal Tube
Where gloves when operating train

Energy and
Environmental
Research Corporation

CHAIN OF CUSTODY

Plant
Unit
Location

Page 1 of 2

Project No. 6373-020

P.O No.

Sample No.	Test No.	Test Date	Description
139656 ✓	1	10/22/93	Aldehyde Blank #1 Front
139657 ✓	1		Aldehyde " " Back
139658 ✓	1		" Front
139659 ✓	1		" Back
139660 ✓	2		" Blank #2 Front
139661 ✓	2		" " Back
139662 ✓	2		" Front
139663 ✓	2		" Back
139664 ✓	3		" Blank #3 Front
139665 ✓	3		" " Back
139666 ✓	3		" Front
139667 ✓	3		" Back
139670 ✓			Trip Spike
139671 ✓			Trip Blank

Sampling system prepared by JK
Test operator JK
Sample recovery by JK

Relinquished By	Recieved By	Time	Date	Reason
[signature]	[signature] ATL	1240	10/26/93	

Laboratory analysis by _____ Date _____

Energy and
Environmental
Research Corporation

CHAIN OF CUSTODY

Plant
Unit
Location

Page 2 of 2

Project No. 6373-020 P.O No.

Sample No.	Test No.	Test Date	Description
139668		10/22/93	Trip Spike
139669		↓	Trip Blank
01A 139672			Fuel Gas ✓

Sampling system prepared by JK
Test operator JK
Sample recovery by JK

Relinquished By	Recieved By	Time	Date	Reason
[signature]	[signature] ATL	1240	10/20/93	

Laboratory analysis by _____ Date _____

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9310223

Work Order Summary

CLIENT: Mr. Jon Kawaguchi
Energy & Environmental Research
8001 Irvine Blvd.
Santa Ana, CA 92705

BILL TO: Same

PHONE: 714-552-1803
FAX: 714-859-3194
DATE RECEIVED: 10/26/93
DATE COMPLETED: 11/11/93

INVOICE # 2220
P.O. #
PROJECT #
AMOUNT$: $1,651.44

FRACTION #	NAME	TEST	PRICE
01A	139656	TO-5	$1575.00/set
01B	139657	TO-5	
01C	139658	TO-5	
01CC	139658 Duplicate	TO-5	
01D	139659	TO-5	
02A	139660	TO-5	
02B	139661	TO-5	
02C	139662	TO-5	
02CMS	139662 Matrix Spike*	TO-5	
02D	139663	TO-5	
03A	139664	TO-5	
03B	139665	TO-5	
03C	139666	TO-5	
03D	139667	TO-5	
04A	139670 Trip Spike	TO-5	
05A	139671 Trip Blank	TO-5	
06A	139668 Trip Spike	TO-5	
07A	139669 Trip Blank	TO-5	
08A	Lab Blank	TO-5	
09A	Lab Spike	TO-5	
Shipping (10/25/93 @ $35.47 and 10/27/93 @ $40.97)			$76.44

LAB NARRATIVE:
B = Compound present in laboratory blank, background subtraction not performed.
***No recovery due to matrix effects.**

CERTIFIED BY: Linda J. Freeman
Laboratory Director

DATE: 11/11/93

180 BLUE RAVINE ROAD, SUITE B • FOLSOM, CA 95630
(916) 985-1000 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: 139656

ID#: 9310223-01A

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102903**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.8**	**Date of Analysis:**	**10/29/93**

Compound	**Det. Limit (uG)**	**Amount (uG)**
Formaldehyde	0.10	Not Detected
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	Not Detected
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139657

ID#: 9310223-01B

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102904**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.4**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	Not Detected
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	Not Detected
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139658

ID#: 9310223-01C

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102937**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**6.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**10.1**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.60	44
Acetaldehyde	0.60	16
Acrolein	0.60	Not Detected
Propanal	0.60	0.80
Acetone	0.60	1.8 B
Crotonaldehyde	0.60	Not Detected
Isobutyraldehyde	0.60	Not Detected
Methyl Ethyl Ketone	0.60	1.2

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: 139658 Duplicate

ID#: 9310223-01CC

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102938**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**6.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**10.1**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.60	40
Acetaldehyde	0.60	15
Acrolein	0.60	Not Detected
Propanal	0.60	0.66
Acetone	0.60	1.7 B
Crotonaldehyde	0.60	Not Detected
Isobutyraldehyde	0.60	Not Detected
Methyl Ethyl Ketone	0.60	1.3

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: 139659

ID#: 9310223-01D

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102927**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.4**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.39
Acetaldehyde	0.10	10
Acrolein	0.10	1.1
Propanal	0.10	0.73
Acetone	0.10	0.45 B
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	0.85

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: 139660

ID#: 9310223-02A

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102908**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.6**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.10
Acetaldehyde	0.10	0.12
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	Not Detected
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139661

ID#: 9310223-02B

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102909**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.6**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.10
Acetaldehyde	0.10	0.11
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.31 B
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: 139662

ID#: 9310223-02C

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102939**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**21**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**10.5**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	2.1	200
Acetaldehyde	2.1	34
Acrolein	2.1	6.7
Propanal	2.1	Not Detected
Acetone	2.1	2.6 B
Crotonaldehyde	2.1	Not Detected
Isobutyraldehyde	2.1	Not Detected
Methyl Ethyl Ketone	2.1	2.8

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: 139662 Matrix Spike*

ID#: 9310223-02CMS

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102940**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**21**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**10.5**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	% Recovery
Formaldehyde	2.1	0*
Acetaldehyde	2.1	0*
Acrolein	2.1	0*
Propanal	2.1	Not Spiked
Acetone	2.1	Not Spiked
Crotonaldehyde	2.1	Not Spiked
Isobutyraldehyde	2.1	Not Spiked
Methyl Ethyl Ketone	2.1	Not Spiked

***No recovery due to matrix effects.**

AIR TOXICS LTD.

SAMPLE NAME: 139663

ID#: 9310223-02D

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102912**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.5**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.71
Acetaldehyde	0.10	15
Acrolein	0.10	3.1
Propanal	0.10	1.6
Acetone	0.10	1.6 B
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	1.5

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: 139664

ID#: 9310223-03A

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102925**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.4**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.15
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	Not Detected
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: 139665

ID#: 9310223-03B

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102926**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.2**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	Not Detected
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.21 B
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: 139666

ID#: 9310223-03C

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102941**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**21.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**11.4**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	2.1	320
Acetaldehyde	2.1	28
Acrolein	2.1	7.7
Propanal	2.1	Not Detected
Acetone	2.1	Not Detected
Crotonaldehyde	2.1	Not Detected
Isobutyraldehyde	2.1	Not Detected
Methyl Ethyl Ketone	2.1	3.1

AIR TOXICS LTD.

SAMPLE NAME: 139667

ID#: 9310223-03D

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102934**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**9.8**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.60
Acetaldehyde	0.10	7.8
Acrolein	0.10	1.6
Propanal	0.10	0.68
Acetone	0.10	0.12 B
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	0.90

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: 139670 Trip Spike

ID#: 9310223-04A

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102946**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**11.0**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	% Recovery
Formaldehyde	0.10	95
Acetaldehyde	0.10	100
Acrolein	0.10	Not Spiked
Propanal	0.10	Not Spiked
Acetone	0.10	Not Spiked
Crotonaldehyde	0.10	Not Spiked
Isobutyraldehyde	0.10	Not Spiked
Methyl Ethyl Ketone	0.10	Not Spiked

AIR TOXICS LTD.

SAMPLE NAME: 139671 Trip Blank

ID#: 9310223-05A

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102929**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**10.0**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.11
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.16 B
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: 139668 Mobile Trip Spike

ID#: 9310223-06A

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102947**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**11.0**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	% Recovery
Formaldehyde	0.10	97
Acetaldehyde	0.10	91
Acrolein	0.10	Not Spiked
Propanal	0.10	Not Spiked
Acetone	0.10	Not Spiked
Crotonaldehyde	0.10	Not Spiked
Isobutyraldehyde	0.10	Not Spiked
Methyl Ethyl Ketone	0.10	Not Spiked

AIR TOXICS LTD.

SAMPLE NAME: 139669 Mobile Trip Blank

ID#: 9310223-07A

Aldehydes and Ketones in Ambient Air

(EPA Method TO-5)

High Pressure Liquid Chromatography

File Name:	**4102931**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**10.0**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	0.20
Acetaldehyde	0.10	0.10
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.14 B
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

B = Compound present in laboratory blank, background subtraction not performed.

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 9310223-08A

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102932**	**Date of Collection:**	**NA**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**10.0**	**Date of Analysis:**	**10/29/93**

Compound	Det. Limit (uG)	Amount (uG)
Formaldehyde	0.10	Not Detected
Acetaldehyde	0.10	Not Detected
Acrolein	0.10	Not Detected
Propanal	0.10	Not Detected
Acetone	0.10	0.22
Crotonaldehyde	0.10	Not Detected
Isobutyraldehyde	0.10	Not Detected
Methyl Ethyl Ketone	0.10	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: Lab Spike

ID#: 9310223-09A

Aldehydes and Ketones in Ambient Air
(EPA Method TO-5)
High Pressure Liquid Chromatography

File Name:	**4102948**	**Date of Collection:**	**NA**
Dil. Factor:	**1.0**	**Date of Extraction:**	**10/28/93**
Sample Volume (mL):	**11.0**	**Date of Analysis:**	**10/29/93**

Compound	**Det. Limit (uG)**	**% Recovery**
Formaldehyde	0.10	101
Acetaldehyde	0.10	84
Acrolein	0.10	99
Propanal	0.10	Not Spiked
Acetone	0.10	Not Spiked
Crotonaldehyde	0.10	Not Spiked
Isobutyraldehyde	0.10	Not Spiked
Methyl Ethyl Ketone	0.10	Not Spiked

Appendix D.5. Fuel Analyses

Energy and
Environmental
Research Corporation

CHAIN OF CUSTODY

Plant
Unit
Location

Page 2 of 2

Project No. 6373-020 P.O No.

Sample No.	Test No.	Test Date	Description
139668		10/22/93	Trip Spike
139669		↓	Trip Blank
01A 139672		↓	Fuel Gas ✓

Sampling system prepared by JK
Test operator JK
Sample recovery by JK

Relinquished By	Recieved By	Time	Date	Reason
[signature]	L Robinson ATL	1230	10/26/93	

Laboratory analysis by _____ Date _____

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9310222

Work Order Summary

CLIENT: Mr. Jon Kawaguchi
Energy & Environmental Research
8001 Irvine Blvd.
Santa Ana, CA 92705

BILL TO: Same

PHONE: 714-552-1803
FAX: 714-859-3194
DATE RECEIVED: 10/26/93
DATE COMPLETED: 11/15/93

INVOICE # 2240
P.O. #
PROJECT # 6373-020
AMOUNT$: $175.00

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	PRICE
01A	139672	ASTM D-1945	NA	$175.00
02A	Lab Blank	ASTM D-1945	NA	NC

CERTIFIED BY: [signature]
Laboratory Director

DATE: 11/15/93

180 BLUE RAVINE ROAD, SUITE B • FOLSOM, CA 95630
(916) 985-1000 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: 139672
ID#: 9310222-01A

NATURAL GAS ANALYSIS by ASTM D-1945
GC/TCD/FID

File Name:	**3110504**	**Date of Collection:**	**10/22/93**
Dil. Factor:	**1.0**	**Date of Analysis:**	**11/5/93**

Compound	**Det. Limit (%)**	**Amount (%)**
Oxygen	0.001	0.036
Nitrogen	0.001	0.66
Carbon Monoxide	0.001	Not Detected
Methane	0.001	69
Carbon Dioxide	0.001	4.0
Ethane	0.001	11
Propane	0.001	11
Isobutane	0.001	1.3
Butane	0.001	2.4
Neopentane	0.001	0.002
Isopentane	0.001	0.31
n-Pentane	0.001	0.18
Ethylene	0.001	Not Detected
Propene	0.001	Not Detected
1-Butene	0.001	Not Detected
cis-2-Butene	0.001	Not Detected
trans-2-Butene	0.001	Not Detected
Cyclopentane	0.001	0.016
Ethyne	0.001	Not Detected
C6+	0.010	0.057
	Total (%) =	100

BTU/Cu. Ft. = 1300
Specific Gravity (Air = 1.000) = 0.81

Container Type: Sample Bomb

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank
ID#: 9310222-02A

NATURAL GAS ANALYSIS by ASTM D-1945
GC/TCD/FID

File Name:	**3110503**	**Date of Collection:**	**NA**
Dil. Factor:	**1.0**	**Date of Analysis:**	**11/5/93**

Compound	Det. Limit (%)	Amount (%)
Oxygen	0.001	Not Detected
Nitrogen	0.001	100
Carbon Monoxide	0.001	Not Detected
Methane	0.001	Not Detected
Carbon Dioxide	0.001	Not Detected
Ethane	0.001	Not Detected
Propane	0.001	Not Detected
Isobutane	0.001	Not Detected
Butane	0.001	Not Detected
Neopentane	0.001	Not Detected
Isopentane	0.001	Not Detected
n-Pentane	0.001	Not Detected
Ethylene	0.001	Not Detected
Propene	0.001	Not Detected
1-Butene	0.001	Not Detected
cis-2-Butene	0.001	Not Detected
trans-2-Butene	0.001	Not Detected
Cyclopentane	0.001	Not Detected
Ethyne	0.001	Not Detected
C6+	0.010	Not Detected
	Total (%) =	100

BTU/Cu. Ft. = NA
Specific Gravity (Air = 1.000) = NA

Container Type: NA

APPENDIX E - NATURAL GAS IC ENGINE

Appendix E.1. CEM Calibrations and Calculations

CEM NO AND NOX CALIBRATIONS

PLANT: Pipeline Gas Internal Combustion Engine
CITY, STATE: Confidential
LOCATION: Stack

TEST DATE: 10/26/93

RUN NUMBER: NO,NO2
RUN START TIME: 11:16
RUN END TIME: 13:19
CEM OPERATOR: Rob Cambell

ANALYTE		O2	CO2	NOx
CONCENTRATION UNIT		%, dry	%, dry	ppmv, dry
HIGH-RANGE GAS FRACTION OF SPAN		1	1	1
SPAN		4.5	17.7	492.1
SPAN GAS CONCENTRATION, Cma	HIGH	4.5	17.7	492.1
	MID	2.5	9	230
	ZERO	0	0	0
INITIAL ANALYZER CALIBRATION CHECK, Cai	HIGH	4.5	17.72	491.5
	MID	2.51	9.1	232.5
	ZERO	0.0	0.0	8.1
INITIAL ANALYZER CALIBRATION ERROR, Ei	HIGH	0.0%	0.1%	-0.1%
Ei = ((Cai - Cma)/Span)x100%	MID	0.2%	0.6%	0.5%
	ZERO	0.2%	0.2%	1.6%
INITIAL BIAS CHECK, Cbi UPSCALE HIGH (H) OR MID (M)?		M	M	M
(SELECT UPSCALE CALIBRATION GAS CLOSEST TO EFFLUENT GAS CONCENTRATION)	UPSCALE	2.50	9.04	230.09
	ZERO	0.0	0.0	8.4
INITITAL SYSTEM CALIBRATION BIAS, Bi	UPSCALE	-0.2%	-0.3%	-0.5%
Bi = ((Cbi-Cai)/Span)x100%	ZERO	-0.4%	0.0%	0.1%
FINAL ANALYZER CALIBRATION CHECK, Caf	HIGH	4.5	17.63	480.56
	MID	2.52	9.07	230
	ZERO	0.0	0.0	8.2
FINAL ANALYZER CALIBRATION ERROR, Ef	HIGH	0.0%	-0.4%	-2.3%
Ef = ((Caf - Cma)/Span)x100%	MID	0.4%	0.4%	0.0%
	ZERO	0.2%	0.2%	1.7%
FINAL BIAS CHECK, Cbf UPSCALE HIGH (H) OR MID (M)?		M	M	M
(SELECT UPSCALE CALIBRATION GAS CLOSEST TO EFFLUENT GAS CONCENTRATION)	UPSCALE	2.50	9.01	224.90
	ZERO	0.0	0.1	8.3
FINAL SYSTEM CALIBRATION BIAS, Bf	UPSCALE	-0.4%	-0.3%	-1.0%
Bf = ((Cbf-Caf)/Span)x100%	ZERO	0.2%	0.1%	0.0%
ANALYZER DRIFT	HIGH	0.0%	-0.5%	-2.2%
D = ((Caf - Cai)/(Span))x100%	MID	0.2%	-0.2%	-0.5%
	ZERO	0.0%	0.0%	0.0%
SYSTEM DRIFT	UPSCALE	0.0%	-0.2%	-1.1%
D = ((Cbf - Cbi)/(Span))x100%	ZERO	0.7%	0.1%	0.0%

NG Internal Combustion Engine						
10/26/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:11:17:36.000	0.01	11.86		225.41		150.34
00:11:18:35.988	-0.03	11.86		70.01		46.61
00:11:19:35.980	-0.03	11.88		127.59		84.94
00:11:20:35.977	-0.03	11.88		98.70		65.71
00:11:21:36.027	-0.04	11.88		129.17		85.95
00:11:22:36.020	-0.03	11.87		253.34		168.65
00:11:23:36.016	-0.03	11.89		191.56		127.52
00:11:24:36.008	0.01	11.87		416.67		277.91
00:11:25:36.004	-0.03	11.89		182.66		121.60
00:11:26:35.992	-0.04	11.90		83.90		55.83
00:11:27:35.988	-0.04	11.90		98.50		65.54
00:11:28:36.039	0.02	11.87		597.98		399.03
00:11:29:35.977	-0.03	11.89		230.56		153.49
00:11:30:36.027	-0.03	11.90	160.32		106.73	
00:11:31:36.027	-0.02	11.90	266.72		177.64	
00:11:32:36.016	-0.04	11.91	144.00		95.82	
00:11:33:36.008	-0.04	11.91	127.22		84.65	
00:11:34:36.004	0.02	11.87	468.27		312.48	
00:11:35:35.992	-0.01	11.89		383.78		255.73
00:11:36:35.988	-0.03	11.90		225.56		150.16
00:11:37:35.980	-0.01	11.90		369.41		246.16
00:11:38:35.977	-0.05	11.91		65.27		43.41
00:11:39:36.027	-0.01	11.89		423.53		282.22
00:11:40:36.020	-0.01	11.90	332.95		221.86	
00:11:41:36.016	-0.04	11.91	146.70		97.61	
00:11:42:36.008	-0.04	11.92	151.65		100.91	
00:11:43:36.004	-0.04	11.92	151.45		100.77	
00:11:44:35.992	-0.05	11.92	102.54		68.20	
00:11:45:35.988	-0.02	11.91		322.77		214.98
00:11:46:35.980	-0.05	11.91		77.30		51.41
00:11:47:35.977	-0.05	11.91		50.54		33.61
00:11:48:36.027	-0.04	11.91		219.75		146.22
00:11:49:36.020	-0.05	11.91		60.45		40.20

NG Internal Combustion Engine						
10/26/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:11:50:36.016	-0.05	11.90	84.34		56.09	
00:11:51:36.008	-0.07	11.85	18.69		12.42	
00:11:52:36.004	-0.06	11.85	8.50		5.65	
00:11:53:35.992	-0.06	11.83	8.37		5.56	
00:11:54:35.992	-0.02	11.80	22.61		15.06	
00:11:55:35.992	0.00	11.87	390.28		260.19	
00:11:56:35.977	-0.05	11.89	59.95		39.87	
00:11:57:36.027	-0.03	11.88	289.60		192.79	
00:11:58:36.020	-0.04	11.90	112.59		74.92	
00:11:59:36.016	-0.05	11.89	44.13		29.35	
00:12:00:36.008	-0.04	11.89		198.63		132.17
00:12:01:36.004	-0.05	11.89		47.78		31.78
00:12:02:35.992	-0.05	11.89		64.50		42.90
00:12:03:35.988	-0.05	11.88		67.41		44.83
00:12:04:35.980	-0.05	11.88		169.48		112.72
00:12:05:35.977	-0.04	11.88		183.54		122.13
00:12:06:36.027	-0.02	11.88		334.63		222.87
00:12:07:36.020	-0.04	11.89		224.72		149.53
00:12:08:36.016	-0.05	11.90		94.30		62.72
00:12:09:36.008	-0.04	11.90		162.67		108.24
00:12:10:36.004	-0.04	11.90	154.12		102.55	
00:12:11:35.992	-0.05	11.89	125.81		83.67	
00:12:12:35.988	-0.05	11.89	47.72		31.74	
00:12:13:35.980	-0.05	11.89		118.19		78.61
00:12:14:35.977	-0.05	11.88		52.39		34.84
00:12:15:36.027	-0.04	11.89		175.44		116.74
00:12:16:36.020	-0.05	11.88		53.43		35.54
00:12:17:36.016	-0.05	11.85		34.05		22.65
00:12:18:36.008	-0.05	11.87		50.51		33.59
00:12:19:36.004	-0.05	11.87		63.10		41.97
00:12:20:35.992	-0.04	11.88	159.76		106.30	
00:12:21:35.988	-0.04	11.88	144.09		95.88	
00:12:22:35.980	-0.04	11.88	93.80		62.41	

NG Internal Combustion Engine						
10/26/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:12:23:35.977	-0.04	11.86	101.38		67.46	
00:12:24:36.027	-0.05	11.84	33.81		22.49	
00:12:25:36.020	-0.04	11.86		85.94		57.18
00:12:26:36.016	-0.05	11.84		39.58		26.32
00:12:27:36.008	-0.05	11.85		75.77		50.39
00:12:28:36.004	-0.05	11.85		52.67		35.03
00:12:29:35.992	-0.04	11.83		54.66		36.37
00:12:30:36.043	-0.05	11.83		42.30		28.13
00:12:31:35.996	-0.04	11.85	65.76		43.76	
00:12:32:35.977	-0.04	11.85	87.60		58.29	
00:12:33:36.027	-0.05	11.83	44.18		29.38	
00:12:34:36.020	-0.04	11.85	121.20		80.65	
00:12:35:36.016	-0.05	11.84		56.85		37.81
00:12:36:36.008	-0.04	11.85		159.14		105.89
00:12:37:36.004	-0.04	11.84		116.57		77.57
00:12:38:35.996	-0.04	11.84		140.13		93.24
00:12:39:35.996	-0.04	11.83		42.08		28.00
00:12:40:35.996	-0.04	11.83	80.03		53.25	
00:12:41:35.977	-0.04	11.84	87.35		58.12	
00:12:42:36.027	-0.04	11.82	111.30		74.06	
00:12:43:36.020	-0.04	11.85	91.75		61.05	
00:12:44:36.016	-0.04	11.82	125.25		83.34	
00:12:45:36.008	-0.04	11.85		112.70		74.99
00:12:46:36.004	-0.04	11.80		42.37		28.19
00:12:47:35.996	-0.04	11.83		110.99		73.85
00:12:48:35.988	-0.04	11.81		52.31		34.81
00:12:49:35.980	-0.03	11.83		122.58		81.60
00:12:50:35.977	-0.04	11.84	101.12		67.29	
00:12:51:36.027	-0.04	11.84	78.33		52.12	
00:12:52:36.020	-0.04	11.82	117.59		78.24	
00:12:53:36.016	-0.04	11.83	88.02		58.57	
00:12:54:36.008	-0.04	11.82	92.20		61.35	
00:12:55:36.004	-0.04	11.82		83.23		55.38

NG Internal Combustion Engine						
10/26/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:12:56:35.996	-0.04	11.84		105.28		70.05
00:12:57:35.988	-0.04	11.83		70.60		46.98
00:12:58:35.980	-0.03	11.82		130.53		86.90
00:12:59:35.977	-0.04	11.81		63.27		42.10
00:13:00:36.027	-0.04	11.83	75.74		50.40	
00:13:01:36.020	-0.04	11.84	114.44		76.15	
00:13:02:36.016	-0.04	11.84	87.04		57.92	
00:13:03:36.008	-0.04	11.84	90.82		60.43	
00:13:04:36.004	-0.04	11.82	47.25		31.44	
00:13:05:35.996	-0.03	11.85		142.70		95.00
00:13:06:35.992	-0.03	11.84		114.69		76.35
00:13:07:35.984	-0.03	11.85		165.48		110.16
00:13:08:35.977	-0.04	11.84		86.23		57.38
00:13:09:36.027	-0.04	11.83		113.05		75.22
00:13:10:36.020	-0.04	11.83	47.88		31.86	
00:13:11:36.020	-0.04	11.81	44.59		29.67	
00:13:12:36.008	-0.04	11.84	83.15		55.33	
00:13:13:36.004	-0.04	11.78	118.97		79.16	
00:13:14:35.996	-0.04	11.84	109.00		72.53	
00:13:15:35.992	-0.04	11.81		66.32		44.13
00:13:16:35.980	-0.04	11.77		41.02		27.29
00:13:17:35.977	-0.03	11.82		84.77		56.43
00:13:18:36.027	-0.03	11.80		143.97		95.84
00:13:19:36.020	-0.04	11.82		49.81		33.14
AVERAGE	-0.04	11.86	116.58	137.56	77.60	91.59

Appendix E.2. Flow Calculations and Run Sheets

FLOW RATE

PLANT: NG Internal Combustion Engine
CITY: Confidential
RUN NO: 1,2,3
SAMPLE LOCATION: STACK

DATE ENTERED: 1/5/94
DATE: 27-Oct-93
OPERATOR: Jon Kawaguchi
ENTERED BY: David Hansell
CHECKED BY:

DATA ENTRY	SYMBOL	UNITS	DATA	DATA	DATA	DATA
RUN NUMBER	-	-	R1	R2	R3	Average
ROUND STACK, DIAMETER	ds	inches	9.0	9.0	9.0	9.00
RECTANGULAR STACK, LENGTH	L	inches				
WIDTH	W	inches				
AVERAGE STACK TEMPERATURE	Fs	degrees F	969.3	963.5	987.2	973.3
AVERAGE METER TEMPERATURE	Fm	degrees F	95.0	101.0	108.0	101.3
BAROMETRIC PRESSURE	Pbar	in. Hg	29.94	29.91	29.91	29.920
STACK STATIC PRESSURE	Pg	in. H20	1.600	3.100	3.100	2.600
AVG. DELTA H	dH	in. H20	1.900	1.900	1.900	1.900
AVG. VELOCITY HEAD	dP	in. H20	0.70	0.91	0.74	0.786
PITOT COEFFICIENT	Cp	-	0.840	0.840	0.840	0.840
GAS SAMPLE VOLUME	Vm	cubic ft.	33.5	33.3	33.0	33.270
METER CALIBRATION FACTOR	Y	-	1.000	1.011	1.011	1.007
TOTAL SAMPLING TIME	min	minutes	45	45	45	45.000
STACK GAS OXYGEN CONTENT	Co2,m	%	0.00	0.00	0.00	0.000
STACK GAS CARBON DIOXIDE CONTENT	Cco2,m	%	11.86	11.86	11.86	11.860
TOTAL IMPINGER GAIN (WATER & PARTICULATE)	Ww	grams	163.7	144.0	153.6	153.767

CALCULATED DATA	SYMBOL	UNITS	DATA	DATA	DATA	DATA
RUN NUMBER	-	-	R1	R2	R3	Average
STACK AREA, As = 3.14*(ds)**2/576 (ROUND)	As	sq. feet	0.442	0.442	0.442	0.442
= L * W/144 (RECTANGULAR)			0.000	0.000	0.000	0.000
AVG. STACK TEMPERATURE, Ts = Fs + 460	Ts	degrees R	1429.3	1423.5	1447.2	1433.3
AVG. METER TEMPERATURE, Tm = Fm + 460	Tm	degrees R	555.0	561.0	568.0	561.3
GAS SAMPLE VOLUME AT STANDARD CONDITIONS, VmStd = 17.64Y (Vm/Tm) (Pbar + dH/13.6)	VmStd	cubic ft.	32.0	31.8	31.2	31.7
VOLUME OF WATER VAPOR, VwStd = 0.04707*Ww	VwStd	cubic ft.	7.7	6.8	7.2	7.2
MOISTURE FRACTION, Bws = VwStd/(VmStd + VwStd)	Bws	-	0.194	0.176	0.188	0.186
DRY STACK GAS MOL. WEIGHT, Md = 0.32(Co2,m)+ 0.44(Cco2,m)+0.28[100-(Co2,m)-(Cco2,m)]	Md	g/g-mole	29.90	29.90	29.90	29.90
WET STACK GAS MOLECULAR WEIGHT, Mw = Md(1-Bws)+18.0(Bws)	Mw	g/g-mole	27.59	27.81	27.66	27.68
ABSOLUTE STACK PRESSURE, Ps = Pbar + Pg/13.6	Ps	in. Hg	30.06	30.14	30.14	30.11
STACK GAS VELOCITY vs = 85.49 Cp [sqrt[(dP*Ts) /(Ps*Mw)]]	vs	ft/s	79.0	89.5	81.6	83.3
vm = 0.3048 * vs	vsm	m/s	24.07	27.28	24.87	25.40
ACTUAL STACK GAS FLOW RATE, Q = 60*vs*As	Q	acf/min	2092.9	2372.4	2162.7	2209.3
DRY GAS STACK FLOW RATE (DRY,STP) Qsd = 17.64*Q*(1-Bws)*(Ps/Ts)	Qsd	dscf/min	625.7	730.4	644.9	667.0
Qsdm = Qsd/35.32	Qsdm	dscm/min	17.7	20.7	18.3	18.9

VELOCITY TRAVERSE

PLANT
DATE 10/27/93
LOCATION
STACK I.D. 9"
PITOT NO./Cp 162/.84 TC# 50
BAROMETRIC PRESSURE, In Hg 29.91
STATIC GAUGE PRESSURE, In H20 +3.1
OPERATORS RC, JC
PITOT PRE TEST LEAK CHECK Good
PITOT POST TEST LEAK CHECK Good

A

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	08:30	.82	955	
2	08:31	.895	956	
3	08:31	.92	966	
4	08:32	.92	967	
5	08:33	.91	967	
6	08:34	.87	966	
AVERAGE				

SCHEMATIC OF TRAVERSE POINT LAYOUT

B

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	08:35	.95	957	
2	08:36	.98	964	
3	08:37	.99	967	
4	08:38	1.05	968	
5	08:39	.95	967	
6	08:40	.94	962	
AVERAGE				

SWIRL ACCEPTANCE LIMITS

Average(abs. value) less than 10°
No points with reverse flow
No more than 4 points above 30°

ΔP MINIMUM LIMITS

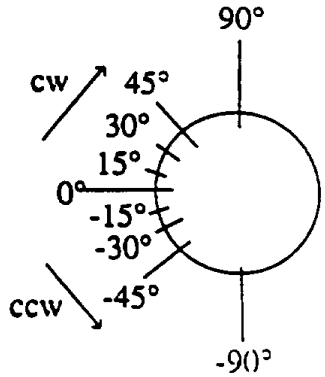
Conditions for more sensitive manometer
1. For 12 or more points on a velocity traverse: 10% of the points's Δp < 0.05"
2. For <12 points on a velocity traverse more than 1 point's Δp <0.05"

Rt Mean Avg Δp =

$$\left[\frac{\sum_{1}(\Delta p_{si})^{1/2}}{N}\right]^2$$

Rt Mean Avg Ts =

$$\left[\frac{\sum_{1}(Ts_i)^{1/2}}{N}\right]^2$$



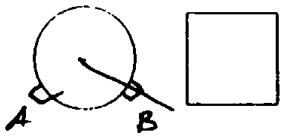
EPA METHOD 4

Plant
City
Location
Operators JK
Date 10/27/91
Run Number 2
Stack Diam. (in.) 9

Sample Box Number Orange
Meter Box Number 45
Meter Calibration (Y) 1.0111
Meter dH @ 1.9032
Pilot Tube No. 162 Cp .84
Probe Length 16" Tc No. 50

Probe Liner Material S/S
Static Pressure (Pa) +3.1 (in. H2O)
Barometric Pressure (Pb) 29.91 (in. Hg)
Ambient Temperature (°F) 92
Prelest Leak Rate .007 cfm @ 19 (in. Hg)
Post Test Leak Rate 0.000 cfm @ 12 (in. Hg)

Sheet 1 of 1



Sampling Time, (min)	Clock Time (24 h)	Vacuum (in. Hg)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp (°F)	Comments
0	0902			911.585			3300 scfh
5	07	10	1.9	915.405	96	60	
10	12	10	1.9	919.797	97	61	
15	17	10	1.9	922.790	99	65	3300 scfh
20	22	10	1.9	926.465	101	61	
25	27	10	1.9	930.150	102	62	
30	32	10	1.9	933.835	102	62	3100 scfh
35	37	10	1.9	937.525	103	62	
40	42	10	1.9	941.200	104	63	
45	47	10	1.9	944.895	104	64	

IMPINGER WEIGHT SHEET

Plant/city: _____

Location: _____

Train Set No. Orange

Run No.: ~~3~~ 2

Operator: JR

Run Time: 45 min

Impinger No.	Solution Used	Solution (ml)	Configuration		Weight (grams)	Inspection Comments
1	DI	100	Mod	Final	708.5	
				Initial	684.3	
				Wt. gain		
2	DI	100	GS	Final	615.1	
				Initial	605.7	
				Wt. gain		
3	Empty	—	Mod	Final	486.3	
				Initial	486.3	
				Wt. gain		
4	Silica	300g	Mod	Final	708.8	
				Initial	708.4	
				Wt. gain		
5				Final		
				Initial		
				Wt. gain		
6				Final		
				Initial		
				Wt. gain		
Flask				Final		
				Initial		
				Wt. gain		

TOTAL WEIGHT GAIN OF IMPINGERS (grams) _____

Train set up: Date: _____
Signature: _____

Train recovery: Date: _____
Signature: _____

EER

EPA METHOD 4

Plant
City
Location
Operators JK
Date 10/27/93
Run Number 3
Stack Diam. (in.) 9"

Sample Box Number Black
Meter Box Number N5
Meter Calibration (Y) 1.0111
Meter dH @ 1.9032
Pilot Tube No. 162 Cp .84
Probe Length 16" Tc No. 50

Probe Liner Material 316
Static Pressure (Pa) (in. H2O)
Barometric Pressure (Pb) 29.91 (in. Hg)
Ambient Temperature (°F) 104
Pretest Leak Rate 0.01 cfm @ 19 (in. Hg)
Post Test Leak Rate 0005 cfm @ 12 (in. Hg)

Sheet 1 of 1

A B

Sampling Time, (min)	Clock Time (24 h)	Vacuum (in. Hg)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp (°F)	Comments
0	1047			945.590			3400 scfh
5	52	8	1.9	949.358	102	59	
10	57	8	1.9	953.125	104	62	
15	1102	8	1.9	956.800	106	63	3400 scfh
20	07	8	1.9	960.505	107	64	
25	12	8	1.9	964.200	107	65	
30	17	8	1.9	967.910	108	65	3700 scfh
35	22	8	1.9	971.635	108	65	
40	27	8	1.9	975.360	108	65	3700 scfh
45	32	8	1.9	979.035	109	64	
							3700 scfh

IMPINGER WEIGHT SHEET

Plant/city:

Location:

Train Set No. Black

Run No.: 3

Operator: JK

Run Time: 45 min

Impinger No.	Solution Used	Solution (ml)	Configuration		Weight (grams)	Inspection Comments
1	DI	100	Mod	Final	704.5	
				Initial	474.5	
				Wt. gain		Clear
2	DI	100	GS	Final	645.7	
				Initial	634.2	
				Wt. gain		Clear
3	Empty	—	Mod	Final	469.0	
				Initial	467.5	
				Wt. gain		
4	Silica	300g	Mod	Final	638.5	
				Initial	631.6	
				Wt. gain		
5				Final		
				Initial		
				Wt. gain		
6				Final		
				Initial		
				Wt. gain		
Flask				Final		
				Initial		
				Wt. gain		

TOTAL WEIGHT GAIN OF IMPINGERS (grams)

Train set up: Date:

Signature:

Train recovery: Date: 10-27-93

Signature: R Campbell

EER

PLANT
DATE 10/27/93
LOCATION
STACK I.D. 9"
PITOT NO./Cp 162 / .84 TC# 50
BAROMETRIC PRESSURE, In Hg 29.91
STATIC GAUGE PRESSURE, In H20
OPERATORS RE, JC
PITOT PRE TEST LEAK CHECK Good
PITOT POST TEST LEAK CHECK

SCHEMATIC OF TRAVERSE POINT LAYOUT

A

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	12:00 [redacted]	.64	974	
2	12:01	.72	988	
3	12:02	.785	993	
4	12:03	.78	995	
5	12:04	.83	995	
6	12:05	.79	992	
AVERAGE				

Pot Change

B

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	12:07	.70	988	
2	12:08	.770	988	
3	12:09	.815	992	
4	12:10	.810	992	
5	12:11	.645	977	
6	12:12	.635	972	
AVERAGE				

SWIRL ACCEPTANCE LIMITS

Average(abs. value) less than 10°
No points with reverse flow
No more than 4 points above 30°

ΔP MINIMUM LIMITS

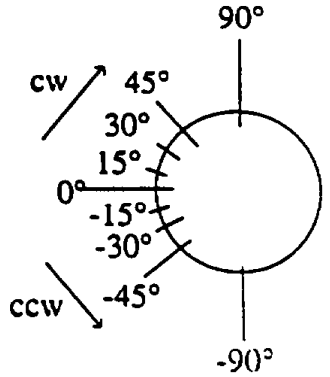
Conditions for more sensitive manometer
1. For 12 or more points on a velocity traverse: 10% of the points's $\Delta p < 0.05"$
2. For <12 points on a velocity traverse more than 1 point's $\Delta p < 0.05"$

Rt Mean Avg Δp =

$$\left[\frac{\sum_i (\Delta p_{si})^{1/2}}{N}\right]^2$$

Rt Mean Avg Ts =

$$\left[\frac{\sum_i (Ts_i)^{1/2}}{N}\right]^2$$



E E R

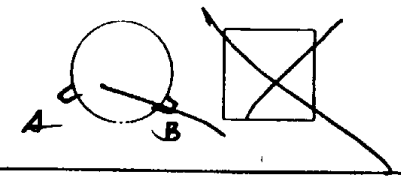
EPA METHOD 4

Plant
City
Location
Operators JR
Date 10/27/93
Run Number 4
Stack Diam. (in.) 9

Box Number Orange
Meter Box Number N5
Meter Calibration (Y) 1.0111
Meter dH @ 1.9032
Pitot Tube No. 162 Cp .84
Probe Length 4' Tc No. 60

Probe Liner Material S/S
Static Pressure (Pa) -3.1 (in. H2O)
Barometric Pressure (Pb) 29.91 (in. Hg)
Ambient Temperature (°F) 106
Pretest Leak Rate 0.002 cfm @ 15 (in. Hg)
Post Test Leak Rate 0.001 cfm @ 15 (in. Hg)

Sheet 1 of 1



Sampling Time, (min)	Clock Time (24 h)	Vacuum (in. Hg)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Outlet Temp. Tm (°F)	Impinger Outlet Temp. (°F)	Comments
0	1241			979.150			
5	46	8	1.5	982.545	103	66	
10	51	10	1.9	986.450	105	60	
15	56	10	1.9	989.915	106	60	
20	1301	10	1.9	993.625	107	61	
25	06	10	1.9	997.335	108	60	
30	11	10	1.9	1001.035	109	60	
35	16	10	1.9	4.745	109	61	
40	21	10	1.9	8.450	110	60	
45	26	10	1.9	12.155	111	60	

IMPINGER WEIGHT SHEET

Plant/city:

Location

Train Set No. Orange

Run No.: 4

Operator: J.K.

Run Time:

Impinger No.	Solution Used	Solution (ml)	Configuration		Weight (grams)	Inspection Comments
1	DI	100+	Mod	Final	866.6	
				Initial	808.5	
				Wt. gain		Clear
2	DI	100+	GS	Final	706.2	
				Initial	695.7	
				Wt. gain		Clear
3	EMPTY	—	Mod	Final	487.5	
				Initial	486.3	
				Wt. gain		Some moisture
4	Silica	300G	Mod	Final	722.0	
				Initial	718.8	
				Wt. gain		3/4 Spent
5				Final		
				Initial		
				Wt. gain		
6				Final		
				Initial		
				Wt. gain		
Flask				Final		
				Initial		
				Wt. gain		

TOTAL WEIGHT GAIN OF IMPINGERS (grams)

Train set up: Date:

Signature:

Train recovery: Date: 10-27-93

Signature: R. Campbell

EER

Appendix E.3. Tedlar Bag Analyses

Energy and
Environmental
Research Corporation

FIELD SAMPLE TRACKING REPORT

PROJECT NO. 6373 – PAGE 1

PLANT/PROJECT _____

UNIT #

SAMPLE NO.	RUN NO.	PROCESS STREAM LOCATION	SAMPLE DATA				SENT TO:	
			DESCRIPTION	DATE	TIME	SAMPLER	LABORATORY	DATE
154601	1	Stack	Diluted	10-27-93	09:45 / 10:15	R. Campbell		
154602	1	Stack	Undiluted	10-27-93	09:45 / 10:15	R. Campbell		
154603	1	Stack	Condensate	10-27-93	09:45 / 10:15	R. Campbell		
154604	2	Stack	Diluted	10-27-93	10:15 / 10:45	R. Campbell		
154605	2	Stack	Undiluted	10-27-93	10:15 / 10:45	R. Campbell		
154606	2	Stack	Condensate	10-27-93	10:15 / 10:45	R. Campbell		
154607	3	Stack	Diluted	10-27-93	10:56 / 11:26	R. Campbell		
154608	3	Stack	Undiluted	10-27-93	10:56 / 11:26	R. Campbell		
154609	3	Stack	Condensate	10-27-93	10:56 / 11:26	R. Campbell		
154610	4	through system	Blank	10-27-93	11:26	R. Campbell		

Energy and
Environmental
Research Corporation

CHAIN OF CUSTODY

Plant
Unit
Location

Page 1 of

Project No. 6373-020

P.O No.

Sample No.	Test No.	Test Date	Description Bag samples
154601	1	10-27-93	Diluted
154602	1	10-27-93	Undiluted
154604	2	10-27-93	Diluted
154605	2	10-27-93	Undiluted
154607	3	10-27-93	Diluted
154608	3	10-27-93	Undiluted
154610	4	10-27-93	Blank

Sampling system prepared by R. Campbell
Test operator R. Campbell
Sample recovery by R. Campbell in field filled bags

Relinquished By	Recieved By	Time	Date	Reason

4566

Laboratory analysis by

Date

Applied P & Ch Laboratory
4086 E. Mission Blvd., Pomona, CA 91766
Tel: (909) 622-5148 Fax: (909) 622-3199

APCL Analytical Report

Submitted to:
Energy and Environmental Research Corporation
Attention: Dave Hansell
8001 Irvine Blvd.
Santa Ana, CA 92706
Tel: (714)552-1803 Fax: (714)857-1943

Service ID #: 801-934566
Collected by: R. Campbell
Collected on: 10/27/93
Sample description:
Air Bag Samples from
Project 6373-020

Received : 10/28/93
Tested : 10/29/93
Reported : 11/17/93

Analysis of VOCs in Air

801-934566 Page 1 of 3

Component Analyzed	Method	Unit	PQL	Concentration 154601 Diluted 93-4566-01	154602 Undiluted 93-4566-02	154604 Diluted 93-4566-03	154605 Undiluted 93-4566-04	154607 Diluted 93-4566-05	154608 Undiluted 93-4566-06	154610 Blank 93-4566-07
Chlorinated Hydrocarbons										
Chloromethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Bromomethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Methylene Chloride	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-1,2-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chloroform	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,1-Trichloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Carbon Tetrachloride	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2-Dichloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Trichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2-Dichloropropane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-1,3-Dichloropropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-1,3-Dichloropropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,2-Trichloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Tetrachloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethylene Dibromide	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethylene Dichloride	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,2,2-Tetrachloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3-Dichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,4-Dichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chlorotoluene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2-Dichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2,4-Trichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Hexachlorobutadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-1,2-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,1,2-Tetrachloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Carbon Disulfide	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.

CADHS ELAP CERTIFICATION NUMBER 1431

Applied P & Ch Laboratory
4066 E. Mission Blvd., Pomona, CA 91766
Tel: (909) 622-5148 Fax: (909) 622-3199

APCL Analytical Report

Analysis of VOCs in Air

Component Analyzed	Method	Unit	PQL	Concentration 154601 Diluted 93-4506-01	154602 Undiluted 93-4506-02	154604 Diluted 93-4506-03	154605 Undiluted 93-4506-04	154607 Diluted 93-4506-05	154608 Undiluted 93-4506-06	154610 Blank 93-4506-07
Paraffins (C4-C6)										
n-Butane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Isobutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
n-Pentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Isopentane [2-methylbutane]*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Neopetane [2,2-dimethylpropane]*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
n-Hexane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Methylpentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
3-Methylpentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2,2-Dimethylbutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2,3-Dimethylbutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Aromatics										
Benzene	TO-14	ppbV	5	7	–	8	–	7	–	N.D.
Toluene	TO-14	ppbV	5	15	–	17	–	17	–	N.D.
Ethyl Benzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
m,p-Xylenes	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
o-Xylene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Styrene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3,5-Trimethylbenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2,4-Trimethylbenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Phenol	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Naphthalene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Naphthenes										
Cyclopropane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclobutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclopentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclohexane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ketones										
Acetone	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Butanone	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3-Butadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Propadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Olefins										
1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Methylpropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-2-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-2-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-methyl-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-methyl-1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
3-methyl-1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.

CADHS ELAP CERTIFICATION NUMBER 1431

Applied P & Ch Laboratory
4066 E. Mission Blvd., Pomona, CA 91766
Tel: (909) 622-5148 Fax: (909) 622-3199

APCL Analytical Report

Analysis of VOCs in Air

801-934566 Page 3 of 3

Component Analyzed	Method	Unit	PQL	Concentration 154601 Diluted 93-4566-01	154602 Undiluted 93-4566-02	154604 Diluted 93-4566-03	154605 Undiluted 93-4566-04	154607 Diluted 93-4566-05	154608 Undiluted 93-4566-06	154610 Blank 93-4566-07
Acetylenes (C4-C5)										
1-Butyne*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Butyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1-Pentyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Pentyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethers										
MTBE	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Dimethyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethyl Methyl Ether*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Diethyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethyl Propyl Ether*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Dipropyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
VOCs by GC/FIDs										
Methane	TO-14/FID	ppbV	500	–	1,090,000	–	1,070,000	–	1,020,000	–
Ethane	TO-14/FID	ppbV	500	–	39,900	–	38,700	–	36,000	–
Propane	TO-14/FID	ppbV	500	–	5,560	–	5,630	–	5,680	–
Ethene	TO-14/FID	ppbV	500	–	23,600	–	26,400	–	25,500	–
Propene	TO-14/FID	ppbV	500	–	1,870	–	1,740	–	1,960	–
Ethyne	TO-14/FID	ppbV	500	–	9,050	–	8,980	–	8,770	–
Propyne*	TO-14/FID	ppbV	500	–	N.D.	–	N.D.	–	N.D.	–

PQL : Practical Quantitation Limit
N.D. : Not Detected or Less Than The Quantitation Limit.
* Standards not available

Respectfully submitted,

Shu-Teh Pan
Lab Manager
Applied P & Ch Laboratory

CADHS ELAP CERTIFICATION NUMBER 1431

Appendix E.4. Aldehyde/Ketone Calculations, Run Sheets and Analyses

CARB 430

DATE DATE ENTERED: 11/20/93

PLANT: Natural Gas ICE
CITY: Confidential
RUN #: 1, 2, 3
SAMPLE LOCATION: Uncontrolled

TEST DATE: 10/27/93
OPERATOR: Jon Kawaguchi
ENTERED BY: Dave Hansell
CHECKED BY:

DATA ENTRY	SYMBOL	UNITS		DATA		DATA		DATA			
RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
AVERAGE METER TEMPERATURE	Fm	degree F		105.00		108.50		112.10		108.53	3.27
BAROMETRIC PRESSURE	Pbar	in. Hg		29.91		29.91		29.91		29.91	0.00
AVG. DELTA H	dH	in. H20		1.30		1.30		1.20		1.27	4.56
GAS SAMPLE VOLUME	Vm	cubic ft.		0.87		0.88		0.88		0.88	0.66
METER CALIBRATION FACTOR	Y	-		1.00		1.00		1.00		1.00	0.00
TOTAL SAMPLING TIME	min	minutes		60.00		60.00		60.00		60.00	0.00
SAMPLE 1ST IMPINGER VOLUME	Siwt,1	ml		13.00		10.40		13.00		12.13	12.37
SAMPLE 2ND IMPINGER VOLUME	Siwt,2	ml		9.80		9.50		9.90		9.73	2.14
BLANK 1ST IMPINGER VOLUME	Biwt,1	ml		9.90		9.80		9.50		9.73	2.14
BLANK 2ND IMPINGER VOLUME	Biwt,2	ml		9.50		9.80		9.80		9.70	1.79
SAMPLE WEIGHTS (1ST IMPINGER)											
Formaldehyde	Swt,1	µg		330.00		410.00		400.00		380.00	11.47
Acetaldehyde	Swt,1	µg		6.80		8.40		8.40		7.87	11.74
Acrolein	Swt,1	µg		2.65		3.10		4.50		3.42	28.24
Propanal	Swt,1	µg	ND	1.10	ND	2.10	ND	2.10	ND	1.77	32.68
Acetone	Swt,1	µg		1.55	ND	2.10	ND	2.10	<	1.92	16.57
Crotonaldehyde	Swt,1	µg	ND	1.10	ND	2.10	ND	2.10	ND	1.77	32.68
Isobutyraldehyde	Swt,1	µg	ND	1.10	ND	2.10	ND	2.10	ND	1.77	32.68
Methyl Ethyl Ketone	Swt,1	µg	ND	1.10	ND	2.10	ND	2.10	ND	1.77	32.68
SAMPLE WEIGHTS (2ND IMPINGER)											
Formaldehyde	Swt,2	µg		1.50		0.64		2.10		1.41	51.92
Acetaldehyde	Swt,2	µg		3.90		1.20		3.30		2.80	50.63
Acrolein	Swt,2	µg		1.40	ND	0.10		2.20	<	1.23	85.94
Propanal	Swt,2	µg		0.12	ND	0.10		1.50	<	0.57	139.98
Acetone	Swt,2	µg		0.21		2.30		0.64		1.05	105.11
Crotonaldehyde	Swt,2	µg		0.21	ND	0.10		0.44	<	0.25	69.40
Isobutyraldehyde	Swt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Swt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
BLANK WEIGHTS (1ST IMPINGER)											
Formaldehyde	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Acetaldehyde	Bwt,1	µg		0.14	ND	0.10	ND	0.10	<	0.11	20.38
Acrolein	Bwt,1	µg	ND	0.10	ND	0.10		0.14	<	0.11	20.38
Propanal	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Acetone	Bwt,1	µg		0.18	ND	0.10	ND	0.10	<	0.13	36.46
Crotonaldehyde	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Isobutyraldehyde	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Bwt,1	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
BLANK WEIGHTS (2ND IMPINGER)											
Formaldehyde	Bwt,2	µg	ND	0.10	ND	0.10		0.15	<	0.12	24.74
Acetaldehyde	Bwt,2	µg		0.12		0.10		0.11		0.11	9.09
Acrolein	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Propanal	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Acetone	Bwt,2	µg		0.34		0.63		0.72		0.56	35.25
Crotonaldehyde	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Isobutyraldehyde	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00
Methyl Ethyl Ketone	Bwt,2	µg	ND	0.10	ND	0.10	ND	0.10	ND	0.10	0.00

CARB 430

	DATE DATE ENTERED: 11/20/93
PLANT: Natural Gas ICE	TEST DATE: 10/27/93
CITY: Confidential	OPERATOR: Jon Kawaguchi
RUN #: 1, 2, 3	ENTERED BY: Dave Hansell
SAMPLE LOCATION: Uncontrolled	CHECKED BY:

CALCULATED DATA	SYMBOL	UNITS	DATA		DATA		DATA			
RUN NUMBER	-	-	R1		R2		R3		AVE	RSD
AVG. METER TEMPERATURE, Tm = Fm + 460	Tm	degrees R	565.00		568.50		572.10		568.53	0.62
GAS SAMPLE VOLUME AT STANDARD CONDITIONS, VmStd = 17.64Y (Vm/Tm) (Pbar + dH/13.6)	VmStd	dscm	0.023		0.023		0.023		0.023	0.35

SAMPLE IMPINGER CONCENTRATION (ng/ml). S or Bic= 1000*(S or Bwt,1+S or Bwt,2)/(S or Biwt,1+S or Biwt,2)

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Sic	ng/ml		14539		20635		17559		17578	17.34
Acetaldehyde	Sic	ng/ml		469		482		511		488	4.36
Acrolein	Sic	ng/ml		178	<	161		293	<	210	34.10
Propanal	Sic	ng/ml	<	54	ND	111	<	157	<	107	48.50
Acetone	Sic	ng/ml		77	<	221	<	120	<	139	53.08
Crotonaldehyde	Sic	ng/ml	<	57	ND	111	<	111	<	93	33.09
Isobutyraldehyde	Sic	ng/ml	ND	53	ND	111	ND	96	ND	86	34.88
Methyl Ethyl Ketone	Sic	ng/ml	ND	53	ND	111	ND	96	ND	86	34.88
BLANK											
Formaldehyde	Bic	ng/ml	ND	10	ND	10	<	13	<	11	13.96
Acetaldehyde	Bic	ng/ml		13	<	10	<	11	<	11	14.66
Acrolein	Bic	ng/ml	ND	10	ND	10	<	12	<	11	11.46
Propanal	Bic	ng/ml	ND	10	ND	10	ND	10	ND	10	0.78
Acetone	Bic	ng/ml		27	<	37	<	42	<	36	22.48
Crotonaldehyde	Bic	ng/ml	ND	10	ND	10	ND	10	ND	10	0.78
Isobutyraldehyde	Bic	ng/ml	ND	10	ND	10	ND	10	ND	10	0.78
Methyl Ethyl Ketone	Bic	ng/ml	ND	10	ND	10	ND	10	ND	10	0.78

BLANK TO SAMPLE RATIO, Br=Sic/Average(Bic)

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
RATIO											
Formaldehyde	Br		C	1303	C	1850	C	1574		1576	17.34
Acetaldehyde	Br		C	41	C	42	C	44		42	4.36
Acrolein	Br		C	16	C	15	C	27		19	34.10
Propanal	Br		NA	NA	NA	NA	NA	NA		NA	NA
Acetone	Br		RL	2	C	6	RL	3		4	53.08
Crotonaldehyde	Br		NA	NA	NA	NA	NA	NA		NA	NA
Isobutyraldehyde	Br		NA	NA	NA	NA	NA	NA		NA	NA
Methyl Ethyl Ketone	Br		NA	NA	NA	NA	NA	NA		NA	NA

CARB 430

	DATE DATE ENTERED: 11/20/93
PLANT: Natural Gas ICE	TEST DATE: 10/27/93
CITY: Confidential	OPERATOR: Jon Kawaguchi
RUN #: 1, 2, 3	ENTERED BY: Dave Hanscll
SAMPLE LOCATION: Uncontrolled	CHECKED BY:

CORRECTED SAMPLE CONCENTRATION (ng/ml) Br>5 Cic=Sic-Average(Bic); Br<5 Cic=5*Average(Bic)

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Cic	ng/ml	C	14528	C	20624	C	17548	C	17567	17.35
Acetaldehyde	Cic	ng/ml	C	458	C	471	C	499	C	476	4.47
Acrolein	Cic	ng/ml	C	167	< C	150	C	282	< C	199	35.97
Propanal	Cic	ng/ml	< NA	54	ND NA	111	< NA	157	< NC	107	48.50
Acetone	Cic	ng/ml	RL	178	< C	186	RL	178	< C	180	2.57
Crotonaldehyde	Cic	ng/ml	< NA	57	ND NA	111	< NA	111	< NC	93	33.09
Isobutyraldehyde	Cic	ng/ml	ND NA	53	ND NA	111	ND NA	96	ND NC	86	34.88
Methyl Ethyl Ketone	Cic	ng/ml	ND NA	53	ND NA	111	ND NA	96	ND NC	86	34.88

CORRECTED SAMPLE CONCENTRATION 1 (mg/dscm), Cc,1=Cic*(Swt,1+Swt,2)/VmStd/1e06

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Cc,1	mg/dscm	C	14.36	C	17.70	C	17.44	C	16.50	11.26
Acetaldehyde	Cc,1	mg/dscm	C	0.45	C	0.40	C	0.50	C	0.45	10.24
Acrolein	Cc,1	mg/dscm	C	0.16	< C	0.13	C	0.28	< C	0.19	41.37
Propanal	Cc,1	mg/dscm	< NA	0.05	ND NA	0.09	< NA	0.16	< NC	0.10	51.30
Acetone	Cc,1	mg/dscm	RL	0.18	< C	0.16	RL	0.18	< C	0.17	5.68
Crotonaldehyde	Cc,1	mg/dscm	< NA	0.06	ND NA	0.09	< NA	0.11	< NC	0.09	31.53
Isobutyraldehyde	Cc,1	mg/dscm	ND NA	0.05	ND NA	0.09	ND NA	0.10	ND NC	0.08	30.85
Methyl Ethyl Ketone	Cc,1	mg/dscm	ND NA	0.05	ND NA	0.09	ND NA	0.10	ND NC	0.08	30.85

CORRECTED SAMPLE CONCENTRATION 2 (ppbv), Cc,2=1000*24.05/Mw

RUN NUMBER	-	-		R1		R2		R3		AVE	RSD
SAMPLE											
Formaldehyde	Cc,2	ppbv	C	11513	C	14190	C	13985	C	13229	11.26
Acetaldehyde	Cc,2	ppbv	C	247	C	221	C	271	C	247	10.24
Acrolein	Cc,2	ppbv	C	71	< C	55	C	120	< C	82	41.37
Propanal	Cc,2	ppbv	< NA	22	ND NA	39	< NA	65	< NC	42	51.30
Acetone	Cc,2	ppbv	RL	73	< C	66	RL	73	< C	71	5.68
Crotonaldehyde	Cc,2	ppbv	< NA	20	ND NA	33	< NA	38	< NC	30	31.53
Isobutyraldehyde	Cc,2	ppbv	ND NA	17	ND NA	32	ND NA	32	ND NC	27	30.85
Methyl Ethyl Ketone	Cc,2	ppbv	ND NA	17	ND NA	32	ND NA	32	ND NC	27	30.85

ND - Sample value below detection limit

< - Some sample values below detection limit

C - Blank Corrected

RL - Reporting Limit

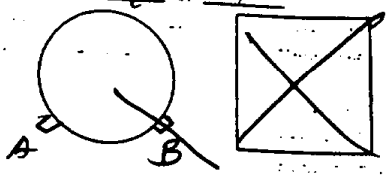
NA - Not Available

CARB 430 RUN SHEET

Plant
City
Location
Operators JG
Date 10/27/93
Run Number 1
Stack Diam. (in.) 9
Static Pressure (Pa) +3.1 (in. H2O)
Barometric Pressure (Pb) 29.91 (in. Hg)
Ambient Temperature (°F) 92

Sample Box Number
Meter Box Number V3
Meter Calibration (Y)
Meter dH @
Probe Length 3'
Probe Liner Material S/S
Pretest Leak Rate 0.000 cfm @ 7 (in. Hg)
Post Test Leak Rate 0.000 cfm @ 7 (in. Hg)

Sheet 1 of 1



Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Rotameter Reading	Gas Sample Volume, Vm (l)	Flowrate liters/min	Stack Temp (°F)	Dry Gas Meter Outlet Temp, Tm (°C)	ΔH ~~Probe Temp. (°F)~~	Comments
1	0	0900		824.90					
1	5	05	.5	827.50	.5	N/A	38	1.4	
	10	10	.5	830.16	.5		39	1.3	
	15	15	.5	832.66	.5		39	1.3	
	20	20	.5	835.31	.5		40	1.3	
	25	25	.5	837.77	.5		40	1.4	
	30	30	.5	840.33	.5		41	1.3	
	35	35	.5	842.90	.5		41	1.4	
	40	40	.5	845.43	.5		42	1.5	
	45	45	.5	848.01	.5		42	1.2	
	50	50	.5	850.56	.5		42	1.3	
	55	55	.5	853.19	.5		43	1.3	
	60	1000	.5	855.66	.5		43	1.3	
Average/Total									

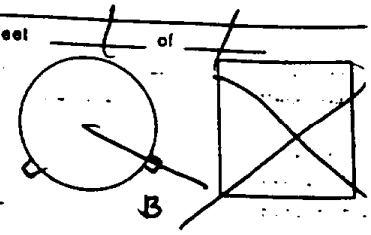
Flowrate at 0.50 liters/min +/- 10%
Pretest Probe Purge with Stack Gas
Pretest leak check with Charcoal Tube
Where gloves when operating train

CARB 430 RUN SHEET

Plant
City
Location
Operators JK
Date 10/27/93
Run Number 2
Stack Diam. (in.) 9
Static Pressure (Pa) +3.1 (in. H2O)
Barometric Pressure (Pb) 29.91 (in. Hg)
Ambient Temperature (°F) 104

Sample Box Number
Meter Box Number V3
Meter Calibration (Y)
Meter dH @
Probe Length 16"
Probe Liner Material S/S
Pretest Leak Rate 0.000 cfm @ 7 (in. Hg)
Post Test Leak Rate ____ cfm @ ____ (in. Hg)

Sheet 1 of 1



Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 h)	Rotameter Reading	Gas Sample Volume, Vm (l)	Flowrate liters/min	Stack Temp (°F)	Dry Gas Meter Outlet Temp, Tm (°C)	ΔH	Comments
1	0	1045		855.72					
1	5	50	.5	858.35	.5	N/A	41	1.3	
	10	55	.5	860.94	.5		41	1.2	
	15	1100	.5	863.43	.5		41	1.3	
	20	05	.5	866.21	.5		42	1.3	
	25	10	.5	868.65	.5		42	1.3	
	30	15	.5	871.17	.5		42	1.2	
	35	20	.5	873.74	.5		43	1.3	
	40	25	.5	876.42	.5		43	1.4	
	45	30	.5	879.00	.5		44	1.3	
	50	35	.5	881.57	.5		44	1.3	
	55	40	.5	884.09	.5		44	1.3	
	60	45	.5	886.78	.5		44	1.3	
Average/Total									

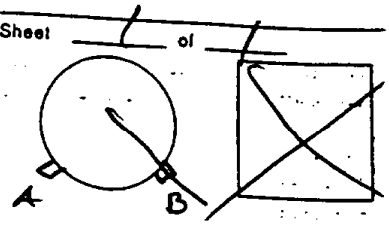
Flowrate at 0.50 liters/min +/- 10%
Pretest Probe Purge with Stack Gas
Pretest leak check with Charcoal Tube
Where gloves when operating train

CARB 430 RUN SHEET

Plant ____
City ____
Location ____
Operators VK
Date 10/27/93
Run Number 3
Stack Diam. (in.) 9
Static Pressure (Pa) +3.1 (in. H2O)
Barometric Pressure (Pb) 29.91 (in. Hg)
Ambient Temperature (°F) 106

Sample Box Number ____
Meter Box Number U3
Meter Calibration (Y) ____
Meter dH @ ____
Probe Length 16"
Probe Liner Material S/S
Pretest Leak Rate 0.000 cfm @ 7 (in. Hg)
Post Test Leak Rate ____ cfm @ ____ (in. Hg)

Sheet 1 of 1



Traverse Point No.	Sampling Time, (Min.)	Clock Time (24 hr)	Rotameter Reading	Gas Sample Volume, Vm (l)	Flowrate liters/min	Stack Temp (°F)	Dry Gas Meter Outlet Temp, Tm (°C)	ΔH Probe Temp.	Comments
1	0	1238		886.91					4400 ~~cf~~
1	5	43	.5	889.30	.5	N/A	42	1.3	
	10	48	.5	891.86	.5		42	1.2	
	15	53	.5	894.25	.5		43	1.2	4400 ~~cf~~
	20	58	.5	896.93	.5		43	1.2	
	25	1303	.5	899.50	.5		44	1.4	5000 ~~cf~~
	30	08	.5	901.97	.5		44	1.2	
	35	13	.5	904.74	.5		45	1.2	
	40	18	.5	907.28	.5		45	1.2	5000 ~~cf~~
	45	23	.5	910.05	.5		45	1.2	
	50	28	.5	912.62	.5		46	1.3	
	55	33	.5	915.41	.5		46	1.2	Fuel flows in reading X1000 (sq root cfh)
	60	38	.5	917.95	.5		46	1.3	5000
Average/Total									

Flowrate at 0.50 liters/min +/- 10%
Pretest Probe Purge with Stack Gas
Pretest leak check with Charcoal Tube
Where gloves when operating train

Energy and Environmental Research Corporation

18 Mason, Irvine, CA 92718
tel: (714) 859-8851
fax: (714) 859-3194

Laboratory Report Due by _____ to:

EER Contact: Jon Kawaguchi Address: 8001 Irvine Blvd
tel: (714) 552-1803 Santa Ana, CA 92705
fax: (714) 857-1943

Bill to: P.O. No.: _____
EER Corporation
18 Mason
Irvine, CA 92718

Sample Chain of Custody Record

page 1 of 1

EER Project No: 6373-020
Project Name: UKB VOC
Site Name:
Sampling System Prepared by: JK
Test Operator(s): JK
Samples Recovered by: JK

Laboratory I.D. No.	EER Label No.	FIELD SAMPLE IDENTIFICATION AND SAMPLING INFORMATION: Test ID / Location	Physical Description	Date	Time	No. of Containers	Analyses Required: Aldehydes C1-C4	Ketones C3-C4					ADDITIONAL INFORMATION (e.g. Volumes, TT, Holding Times, Sample Preparation, Addl Instructions, etc.)
~~152484~~	152484	1/Stack	Aldehyde Blank 1 Front	10/27/93		1	✓	✓					
	152485	1/Stack	" Blank 1 Back			1	✓	✓					
	152486	1/Stack	" Front			1	✓	✓					
	152487	1/Stack	" Back			1	✓	✓					
	152488	2/Stack	" Blank 2 Front			1	✓	✓					
	152489	2/Stack	" Blank 2 Back			1	✓	✓					
	152490	2/Stack	" Front			1	✓	✓					
	152491	2/Stack	" Back			1	✓	✓					
	152492	3/Stack	" Blank 3 Front			1	✓	✓					
	152493	3/Stack	" Blank 3 Back			1	✓	✓					

Method of Shipment: Fed X
Shipment I.D.:
Date Shipped: 10/28/93
Samples Shipped to: Air Toxics
Attention:

Remarks (RUSH!, units: mg/L, ppm, etc.):

After analysis: ☐ Archive samples (Hold for ____ months, then dispose.)
☐ Return samples to: EER Corporation 8001 Irvine Blvd., Irvine, CA 92705

Relinquished by: (Sign & Print)	Date / Time:	Received by: (Sign & Print)	Date / Time:
Jon Kawaguchi	11/27/93 1701	Jon Kelm L. Robinson	11/27/93 1500

TOP - ORIGINAL MUST STAY WITH SAMPLES MIDDLE - LABORATORY COPY BOTTOM - EER COPY RETAIN WITH FIELD LOG

Appendix E.1. CEM Calibrations and Calculations

CEM NO AND NOX CALIBRATIONS

PLANT: Pipeline Gas Internal Combustion Engine
CITY, STATE: Confidential
LOCATION: Stack

TEST DATE: 10/26/93

RUN NUMBER: NO,NO2
RUN START TIME: 11:16
RUN END TIME: 13:19
CEM OPERATOR: Rob Cambell

ANALYTE		O2	CO2	NOx
CONCENTRATION UNIT		%, dry	%, dry	ppmv, dry
HIGH-RANGE GAS FRACTION OF SPAN		1	1	1
SPAN		4.5	17.7	492.1
SPAN GAS CONCENTRATION, Cma	HIGH	4.5	17.7	492.1
	MID	2.5	9	230
	ZERO	0	0	0
INITIAL ANALYZER CALIBRATION CHECK, Cai	HIGH	4.5	17.72	491.5
	MID	2.51	9.1	232.5
	ZERO	0.0	0.0	8.1
INITIAL ANALYZER CALIBRATION ERROR, Ei	HIGH	0.0%	0.1%	-0.1%
Ei = ((Cai - Cma)/Span)x100%	MID	0.2%	0.6%	0.5%
	ZERO	0.2%	0.2%	1.6%
INITIAL BIAS CHECK, Cbi — UPSCALE HIGH (H) OR MID (M)?		M	M	M
(SELECT UPSCALE CALIBRATION GAS CLOSEST TO EFFLUENT GAS CONCENTRATION)	UPSCALE	2.50	9.04	230.09
	ZERO	0.0	0.0	8.4
INITITAL SYSTEM CALIBRATION BIAS, Bi	UPSCALE	-0.2%	-0.3%	-0.5%
Bi = ((Cbi-Cai)/Span)x100%	ZERO	-0.4%	0.0%	0.1%
FINAL ANALYZER CALIBRATION CHECK, Caf	HIGH	4.5	17.63	480.56
	MID	2.52	9.07	230
	ZERO	0.0	0.0	8.2
FINAL ANALYZER CALIBRATION ERROR, Ef	HIGH	0.0%	-0.4%	-2.3%
Ef = ((Caf - Cma)/Span)x100%	MID	0.4%	0.4%	0.0%
	ZERO	0.2%	0.2%	1.7%
FINAL BIAS CHECK, Cbf — UPSCALE HIGH (H) OR MID (M)?		M	M	M
(SELECT UPSCALE CALIBRATION GAS CLOSEST TO EFFLUENT GAS CONCENTRATION)	UPSCALE	2.50	9.01	224.90
	ZERO	0.0	0.1	8.3
FINAL SYSTEM CALIBRATION BIAS, Bf	UPSCALE	-0.4%	-0.3%	-1.0%
Bf = ((Cbf-Caf)/Span)x100%	ZERO	0.2%	0.1%	0.0%
ANALYZER DRIFT	HIGH	0.0%	-0.5%	-2.2%
D = ((Caf - Cai)/(Span))x100%	MID	0.2%	-0.2%	-0.5%
	ZERO	0.0%	0.0%	0.0%
SYSTEM DRIFT	UPSCALE	0.0%	-0.2%	-1.1%
D = ((Cbf - Cbi)/(Span))x100%	ZERO	0.7%	0.1%	0.0%

NG Internal Combustion Engine						
10/26/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:11:17:36.000	0.01	11.86		225.41		150.34
00:11:18:35.988	-0.03	11.86		70.01		46.61
00:11:19:35.980	-0.03	11.88		127.59		84.94
00:11:20:35.977	-0.03	11.88		98.70		65.71
00:11:21:36.027	-0.04	11.88		129.17		85.95
00:11:22:36.020	-0.03	11.87		253.34		168.65
00:11:23:36.016	-0.03	11.89		191.56		127.52
00:11:24:36.008	0.01	11.87		416.67		277.91
00:11:25:36.004	-0.03	11.89		182.66		121.60
00:11:26:35.992	-0.04	11.90		83.90		55.83
00:11:27:35.988	-0.04	11.90		98.50		65.54
00:11:28:36.039	0.02	11.87		597.98		399.03
00:11:29:35.977	-0.03	11.89		230.56		153.49
00:11:30:36.027	-0.03	11.90	160.32		106.73	
00:11:31:36.027	-0.02	11.90	266.72		177.64	
00:11:32:36.016	-0.04	11.91	144.00		95.82	
00:11:33:36.008	-0.04	11.91	127.22		84.65	
00:11:34:36.004	0.02	11.87	468.27		312.48	
00:11:35:35.992	-0.01	11.89		383.78		255.73
00:11:36:35.988	-0.03	11.90		225.56		150.16
00:11:37:35.980	-0.01	11.90		369.41		246.16
00:11:38:35.977	-0.05	11.91		65.27		43.41
00:11:39:36.027	-0.01	11.89		423.53		282.22
00:11:40:36.020	-0.01	11.90	332.95		221.86	
00:11:41:36.016	-0.04	11.91	146.70		97.61	
00:11:42:36.008	-0.04	11.92	151.65		100.91	
00:11:43:36.004	-0.04	11.92	151.45		100.77	
00:11:44:35.992	-0.05	11.92	102.54		68.20	
00:11:45:35.988	-0.02	11.91		322.77		214.98
00:11:46:35.980	-0.05	11.91		77.30		51.41
00:11:47:35.977	-0.05	11.91		50.54		33.61
00:11:48:36.027	-0.04	11.91		219.75		146.22
00:11:49:36.020	-0.05	11.91		60.45		40.20

NG Internal Combustion Engine						
10/26/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:11:50:36.016	-0.05	11.90	84.34		56.09	
00:11:51:36.008	-0.07	11.85	18.69		12.42	
00:11:52:36.004	-0.06	11.85	8.50		5.65	
00:11:53:35.992	-0.06	11.83	8.37		5.56	
00:11:54:35.992	-0.02	11.80	22.61		15.06	
00:11:55:35.992	0.00	11.87	390.28		260.19	
00:11:56:35.977	-0.05	11.89	59.95		39.87	
00:11:57:36.027	-0.03	11.88	289.60		192.79	
00:11:58:36.020	-0.04	11.90	112.59		74.92	
00:11:59:36.016	-0.05	11.89	44.13		29.35	
00:12:00:36.008	-0.04	11.89		198.63		132.17
00:12:01:36.004	-0.05	11.89		47.78		31.78
00:12:02:35.992	-0.05	11.89		64.50		42.90
00:12:03:35.988	-0.05	11.88		67.41		44.83
00:12:04:35.980	-0.05	11.88		169.48		112.72
00:12:05:35.977	-0.04	11.88		183.54		122.13
00:12:06:36.027	-0.02	11.88		334.63		222.87
00:12:07:36.020	-0.04	11.89		224.72		149.53
00:12:08:36.016	-0.05	11.90		94.30		62.72
00:12:09:36.008	-0.04	11.90		162.67		108.24
00:12:10:36.004	-0.04	11.90	154.12		102.55	
00:12:11:35.992	-0.05	11.89	125.81		83.67	
00:12:12:35.988	-0.05	11.89	47.72		31.74	
00:12:13:35.980	-0.05	11.89		118.19		78.61
00:12:14:35.977	-0.05	11.88		52.39		34.84
00:12:15:36.027	-0.04	11.89		175.44		116.74
00:12:16:36.020	-0.05	11.88		53.43		35.54
00:12:17:36.016	-0.05	11.85		34.05		22.65
00:12:18:36.008	-0.05	11.87		50.51		33.59
00:12:19:36.004	-0.05	11.87		63.10		41.97
00:12:20:35.992	-0.04	11.88	159.76		106.30	
00:12:21:35.988	-0.04	11.88	144.09		95.88	
00:12:22:35.980	-0.04	11.88	93.80		62.41	

NG Internal Combustion Engine						
10/26/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:12:23:35.977	-0.04	11.86	101.38		67.46	
00:12:24:36.027	-0.05	11.84	33.81		22.49	
00:12:25:36.020	-0.04	11.86		85.94		57.18
00:12:26:36.016	-0.05	11.84		39.58		26.32
00:12:27:36.008	-0.05	11.85		75.77		50.39
00:12:28:36.004	-0.05	11.85		52.67		35.03
00:12:29:35.992	-0.04	11.83		54.66		36.37
00:12:30:36.043	-0.05	11.83		42.30		28.13
00:12:31:35.996	-0.04	11.85	65.76		43.76	
00:12:32:35.977	-0.04	11.85	87.60		58.29	
00:12:33:36.027	-0.05	11.83	44.18		29.38	
00:12:34:36.020	-0.04	11.85	121.20		80.65	
00:12:35:36.016	-0.05	11.84		56.85		37.81
00:12:36:36.008	-0.04	11.85		159.14		105.89
00:12:37:36.004	-0.04	11.84		116.57		77.57
00:12:38:35.996	-0.04	11.84		140.13		93.24
00:12:39:35.996	-0.04	11.83		42.08		28.00
00:12:40:35.996	-0.04	11.83	80.03		53.25	
00:12:41:35.977	-0.04	11.84	87.35		58.12	
00:12:42:36.027	-0.04	11.82	111.30		74.06	
00:12:43:36.020	-0.04	11.85	91.75		61.05	
00:12:44:36.016	-0.04	11.82	125.25		83.34	
00:12:45:36.008	-0.04	11.85		112.70		74.99
00:12:46:36.004	-0.04	11.80		42.37		28.19
00:12:47:35.996	-0.04	11.83		110.99		73.85
00:12:48:35.988	-0.04	11.81		52.31		34.81
00:12:49:35.980	-0.03	11.83		122.58		81.60
00:12:50:35.977	-0.04	11.84	101.12		67.29	
00:12:51:36.027	-0.04	11.84	78.33		52.12	
00:12:52:36.020	-0.04	11.82	117.59		78.24	
00:12:53:36.016	-0.04	11.83	88.02		58.57	
00:12:54:36.008	-0.04	11.82	92.20		61.35	
00:12:55:36.004	-0.04	11.82		83.23		55.38

NG Internal Combustion Engine						
10/26/93						
Time	O2	CO2	NO	NOx	NO	NOx
	%, Dry	%, Dry	ppmv, Dry	ppmv, Dry	ppmv, Dry 7%O2	ppmv, Dry 7%O2
00:12:56:35.996	-0.04	11.84		105.28		70.05
00:12:57:35.988	-0.04	11.83		70.60		46.98
00:12:58:35.980	-0.03	11.82		130.53		86.90
00:12:59:35.977	-0.04	11.81		63.27		42.10
00:13:00:36.027	-0.04	11.83	75.74		50.40	
00:13:01:36.020	-0.04	11.84	114.44		76.15	
00:13:02:36.016	-0.04	11.84	87.04		57.92	
00:13:03:36.008	-0.04	11.84	90.82		60.43	
00:13:04:36.004	-0.04	11.82	47.25		31.44	
00:13:05:35.996	-0.03	11.85		142.70		95.00
00:13:06:35.992	-0.03	11.84		114.69		76.35
00:13:07:35.984	-0.03	11.85		165.48		110.16
00:13:08:35.977	-0.04	11.84		86.23		57.38
00:13:09:36.027	-0.04	11.83		113.05		75.22
00:13:10:36.020	-0.04	11.83	47.88		31.86	
00:13:11:36.020	-0.04	11.81	44.59		29.67	
00:13:12:36.008	-0.04	11.84	83.15		55.33	
00:13:13:36.004	-0.04	11.78	118.97		79.16	
00:13:14:35.996	-0.04	11.84	109.00		72.53	
00:13:15:35.992	-0.04	11.81		66.32		44.13
00:13:16:35.980	-0.04	11.77		41.02		27.29
00:13:17:35.977	-0.03	11.82		84.77		56.43
00:13:18:36.027	-0.03	11.80		143.97		95.84
00:13:19:36.020	-0.04	11.82		49.81		33.14
AVERAGE	-0.04	11.86	116.58	137.56	77.60	91.59

Appendix E.2. Flow Calculations and Run Sheets

FLOW RATE

PLANT: NG Internal Combustion Engine
CITY: Confidential
RUN NO: 1,2,3
SAMPLE LOCATION: STACK

DATE ENTERED: 1/5/94
DATE: 27-Oct-93
OPERATOR: Jon Kawaguchi
ENTERED BY: David Hansell
CHECKED BY:

DATA ENTRY	SYMBOL	UNITS	DATA	DATA	DATA	DATA
RUN NUMBER	-	-	R1	R2	R3	Average
ROUND STACK, DIAMETER	ds	inches	9.0	9.0	9.0	9.00
RECTANGULAR STACK, LENGTH	L	inches				
WIDTH	W	inches				
AVERAGE STACK TEMPERATURE	Fs	degrees F	969.3	963.5	987.2	973.3
AVERAGE METER TEMPERATURE	Fm	degrees F	95.0	101.0	108.0	101.3
BAROMETRIC PRESSURE	Pbar	in. Hg	29.94	29.91	29.91	29.920
STACK STATIC PRESSURE	Pg	in. H20	1.600	3.100	3.100	2.600
AVG. DELTA H	dH	in. H20	1.900	1.900	1.900	1.900
AVG. VELOCITY HEAD	dP	in. H20	0.70	0.91	0.74	0.786
PITOT COEFFICIENT	Cp	-	0.840	0.840	0.840	0.840
GAS SAMPLE VOLUME	Vm	cubic ft.	33.5	33.3	33.0	33.270
METER CALIBRATION FACTOR	Y	-	1.000	1.011	1.011	1.007
TOTAL SAMPLING TIME	min	minutes	45	45	45	45.000
STACK GAS OXYGEN CONTENT	Co2,m	%	0.00	0.00	0.00	0.000
STACK GAS CARBON DIOXIDE CONTENT	Cco2,m	%	11.86	11.86	11.86	11.860
TOTAL IMPINGER GAIN (WATER & PARTICULATE)	Ww	grams	163.7	144.0	153.6	153.767

CALCULATED DATA	SYMBOL	UNITS	DATA	DATA	DATA	DATA
RUN NUMBER	-	-	R1	R2	R3	Average
STACK AREA, As = 3.14*(ds)**2/576 (ROUND)	As	sq. feet	0.442	0.442	0.442	0.442
= L * W/144 (RECTANGULAR)			0.000	0.000	0.000	0.000
AVG. STACK TEMPERATURE, Ts = Fs + 460	Ts	degrees R	1429.3	1423.5	1447.2	1433.3
AVG. METER TEMPERATURE, Tm = Fm + 460	Tm	degrees R	555.0	561.0	568.0	561.3
GAS SAMPLE VOLUME AT STANDARD CONDITIONS, VmStd = 17.64Y (Vm/Tm) (Pbar + dH/13.6)	VmStd	cubic ft.	32.0	31.8	31.2	31.7
VOLUME OF WATER VAPOR, VwStd = 0.04707*Ww	VwStd	cubic ft.	7.7	6.8	7.2	7.2
MOISTURE FRACTION, Bws = VwStd/(VmStd + VwStd)	Bws	-	0.194	0.176	0.188	0.186
DRY STACK GAS MOL. WEIGHT, Md = 0.32(Co2,m)+ 0.44(Cco2,m)+0.28[100-(Co2,m)-(Cco2,m)]	Md	g/g-mole	29.90	29.90	29.90	29.90
WET STACK GAS MOLECULAR WEIGHT, Mw = Md(1-Bws)+18.0(Bws)	Mw	g/g-mole	27.59	27.81	27.66	27.68
ABSOLUTE STACK PRESSURE, Ps = Pbar + Pg/13.6	Ps	in. Hg	30.06	30.14	30.14	30.11
STACK GAS VELOCITY						
vs = 85.49 Cp { sqrt[(dP*Ts) /(Ps*Mw)] }	vs	ft/s	79.0	89.5	81.6	83.3
vm = 0.3048 * vs	vsm	m/s	24.07	27.28	24.87	25.40
ACTUAL STACK GAS FLOW RATE, Q = 60*vs*As	Q	acf/min	2092.9	2372.4	2162.7	2209.3
DRY GAS STACK FLOW RATE (DRY,STP)						
Qsd = 17.64*Q*(1-Bws)*(Ps/Ts)	Qsd	dscf/min	625.7	730.4	644.9	667.0
Qsdm = Qsd/35.32	Qsdm	dscm/min	17.7	20.7	18.3	18.9

VELOCITY TRAVERSE

PLANT
DATE 10/27/93
LOCATION
STACK I.D. 9"
PITOT NO./Cp 162/.84 TC# 50
BAROMETRIC PRESSURE, In Hg 29.91
STATIC GAUGE PRESSURE, In H20 +3.1
OPERATORS RC, JC
PITOT PRE TEST LEAK CHECK Good
PITOT POST TEST LEAK CHECK Good

SCHEMATIC OF TRAVERSE POINT LAYOUT

A

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	08:30	.82	955	
2	08:31	.895	956	
3	08:31	.92	966	
4	08:32	.92	967	
5	08:33	.91	967	
6	08:34	.87	966	
AVERAGE				

B

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	08:35	.95	957	
2	08:36	.98	964	
3	08:37	.99	967	
4	08:38	1.05	968	
5	08:39	.95	967	
6	08:40	.84	962	
AVERAGE				

SWIRL ACCEPTANCE LIMITS

Average(abs. value) less than 10°
No points with reverse flow
No more than 4 points above 30°

ΔP MINIMUM LIMITS

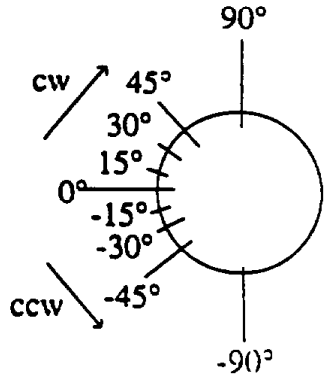
Conditions for more sensitive manometer
1. For 12 or more points on a velocity traverse: 10% of the points's Δp < 0.05"
2. For <12 points on a velocity traverse more than 1 point's Δp <0.05"

Rt Mean Avg Δp =

$$\left[\frac{\sum_{1}(\Delta p_{si})^{1/2}}{N}\right]^2$$

Rt Mean Avg Ts =

$$\left[\frac{\sum_{1}(T_{si})^{1/2}}{N}\right]^2$$



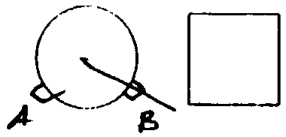
EPA METHOD 4

Plant
City
Location
Operators JK
Date 10/27/91
Run Number 2
Stack Diam. (in.) 9

Sample Box Number Orange
Meter Box Number 45
Meter Calibration (Y) 1.0411
Meter dH @ 1.9032
Pitot Tube No. 162 Cp .84
Probe Length 16" Tc No. 50

Probe Liner Material S/S
Static Pressure (Pa) +3.1 (in. H2O)
Barometric Pressure (Pb) 29.91 (in. Hg)
Ambient Temperature (°F) 92
Pretest Leak Rate .007 cfm @ 19 (in. Hg)
Post Test Leak Rate 0.000 cfm @ 12 (in. Hg)

Sheet 1 of 1



Sampling Time, (min)	Clock Time (24 h)	Vacuum (in. Hg)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Outlet Temp, Tm (°F)	Impinger Outlet Temp (°F)	Comments
0	0902			911.585			3300 scfh
5	07	10	1.9	915.405	96	60	
10	12	10	1.9	918.797	97	61	
15	17	10	1.9	922.790	99	65	3300 scfh
20	22	10	1.9	926.465	101	62	
25	27	10	1.9	930.150	102	62	
30	32	10	1.9	933.835	102	62	3100 scfh
35	37	10	1.9	937.525	103	62	
40	42	10	1.9	941.200	104	63	
45	47	10	1.9	944.895	104	64	

IMPINGER WEIGHT SHEET

Plant/city: _____

Location: _____

Train Set No. Orange

Run No.: 2

Operator: JR

Run Time: 45 min

Impinger No.	Solution Used	Solution (ml)	Configuration		Weight (grams)	Inspection Comments
1	DI	100	Mod	Final	708.5	
				Initial	684.3	
				Wt. gain		
2	DI	100	GS	Final	615.1	
				Initial	605.7	
				Wt. gain		
3	Empty	—	Mod	Final	486.3	
				Initial	486.3	
				Wt. gain		
4	Silica	300g	Mod	Final	708.8	
				Initial	708.4	
				Wt. gain		
5				Final		
				Initial		
				Wt. gain		
6				Final		
				Initial		
				Wt. gain		
Flask				Final		
				Initial		
				Wt. gain		

TOTAL WEIGHT GAIN OF IMPINGERS (grams) _____

Train set up: Date: _____
Signature: _____

Train recovery: Date: _____
Signature: _____

EED

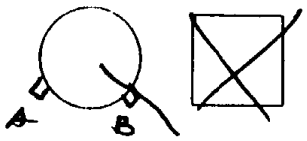
EPA METHOD 4

Plant
City
Location
Operators JK
Date 10/27/93
Run Number 3
Stack Diam, (in.) 9"

Sample Box Number Black
Meter Box Number N5
Meter Calibration (Y) 1.0111
Meter dH @ 1.9032
Pilot Tube No. 162 Cp .84
Probe Length 16" Tc No. 50

Probe Liner Material S/S
Static Pressure (Pa) (in. H2O)
Barometric Pressure (Pb) 29.91 (in. Hg)
Ambient Temperature (°F) 104
Pretest Leak Rate 0.01 cfm @ 18 (in. Hg)
Post Test Leak Rate 0005 cfm @ 12 (in. Hg)

Sheet 1 of 1



Sampling Time, (min)	Clock Time (24 h)	Vacuum (in. Hg)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Outlet Temp. Tm (°F)	Impinger Outlet Temp. (°F)	Comments
0	1047			945.590			3400 scfh
5	52	8	1.9	949.358	102	59	
10	57	8	1.9	953.125	104	62	
15	1102	8	1.9	956.800	106	63	3400 scfh
20	07	8	1.9	960.505	107	64	
25	12	8	1.9	964.200	107	65	
30	17	8	1.9	967.910	108	65	3700 scfh
35	22	8	1.9	971.635	108	65	
40	27	8	1.9	975.360	108	65	3700 scfh
45	32	8	1.9	979.035	109	64	
							3700 scfh

IMPINGER WEIGHT SHEET

Plant/city:

Location:

Train Set No. Black

Run No.: 3

Operator: JK

Run Time: 45 min

Impinger No.	Solution Used	Solution (ml)	Configuration		Weight (grams)	Inspection Comments
1	DI	100	Mod	Final	704.5	
				Initial	474.5	
				Wt. gain		Clear
2	DI	100	GS	Final	645.7	
				Initial	634.2	
				Wt. gain		Clear
3	Empty	—	Mod	Final	469.0	
				Initial	467.5	
				Wt. gain		
4	Silica	300g	Mod	Final	638.5	
				Initial	631.6	
				Wt. gain		
5				Final		
				Initial		
				Wt. gain		
6				Final		
				Initial		
				Wt. gain		
Flask				Final		
				Initial		
				Wt. gain		

TOTAL WEIGHT GAIN OF IMPINGERS (grams)

Train set up: Date:

Signature:

Train recovery: Date: 10-27-98

Signature: R Campbell

EER

PLANT
DATE 10/27/93
LOCATION
STACK I.D. 9"
PITOT NO./Cp 162 / .94 TC# 50
BAROMETRIC PRESSURE, In Hg 29.91
STATIC GAUGE PRESSURE, In H20
OPERATORS RE, JC
PITOT PRE TEST LEAK CHECK Good
PITOT POST TEST LEAK CHECK

SCHEMATIC OF TRAVERSE POINT LAYOUT

A

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	12:00 [redacted]	.64	974	
2	12:01	.72	988	
3	12:02	.785	993	
4	12:03	.78	995	
5	12:04	.83	995	
6	12:05	.79	992	
AVERAGE				

Pot Change

B

TRAVERSE POINT NUMBER	CLOCK 24 HR TIME	VELOCITY HEAD (Ps) In. H20	STACK TEMP (Ts)°F	SWIRL ANGLE
1	12:07	.70	988	
2	12:08	.770	988	
3	12:09	.815	992	
4	12:10	.810	992	
5	12:11	.645	977	
6	12:12	.635	972	
AVERAGE				

SWIRL ACCEPTANCE LIMITS

Average(abs. value) less than 10°
No points with reverse flow
No more than 4 points above 30°

ΔP MINIMUM LIMITS

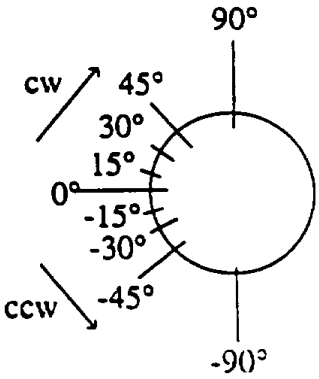
Conditions for more sensitive manometer
1. For 12 or more points on a velocity traverse: 10% of the points's Δp < 0.05"
2. For <12 points on a velocity traverse more than 1 point's Δp <0.05"

Rt Mean Avg Δp =

$$\left[\frac{\sum_{1}(\Delta p_{si})^{1/2}}{N}\right]^2$$

Rt Mean Avg Ts =

$$\left[\frac{\sum_{1}(Ts_i)^{1/2}}{N}\right]^2$$



E
E
R

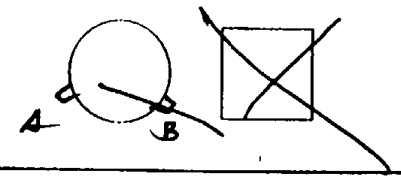
EPA METHOD 4

Plant
City
Location
Operators JK
Date 10/27/93
Run Number 4
Stack Diam. (in.) 9

Box Number Orange
Meter Box Number N5 0
Meter Calibration (Y) 1.0111
Meter dH @ 1.9032
Pitot Tube No. 162 Cp .84
Probe Length 4' Tc No. 50

Probe Liner Material S/S
Static Pressure (Ps) ±3.1 (in. H2O)
Barometric Pressure (Pb) 29.91 (in. Hg)
Ambient Temperature (°F) 106
Pretest Leak Rate 0.002 cfm @ 15 (in. Hg)
Post Test Leak Rate 0.00 cfm @ 15 (in. Hg)

Sheet 1 of 1



Sampling Time, (min)	Clock Time (24 h)	Vacuum (in. Hg)	Pressure Differential Across Orifice dH (in. H2O)	Gas Sample Volume, Vm (cf)	Dry Gas Meter Outlet Temp. Tm (°F)	Impinger Outlet Temp. (°F)	Comments
0	1241			979.150			
5	46	8	1.5	982.545	103	66	
10	51	10	1.9	986.450	105	60	
15	56	10	1.9	989.915	106	60	
20	1301	10	1.9	993.625	107	61	
25	06	10	1.9	997.335	108	60	
30	11	10	1.9	1001.035	109	60	
35	16	10	1.9	4.745	109	61	
40	21	10	1.9	8.450	110	60	
45	26	10	1.9	12.155	111	60	

IMPINGER WEIGHT SHEET

Plant/city:

Location

Train Set No. Orange

Run No.: 4

Operator: J.K.

Run Time:

Impinger No.	Solution Used	Solution (ml)	Configuration		Weight (grams)	Inspection Comments
1	DI	100+	Mod	Final	866.6	
				Initial	808.5	
				Wt. gain		Clear
2	DI	100+	GS	Final	706.2	
				Initial	685.7	
				Wt. gain		Clear
3	EMPTY	—	Mod	Final	487.5	
				Initial	486.3	
				Wt. gain		Some Moisture
4	Silica	300G	Mod	Final	722.0	
				Initial	718.8	
				Wt. gain		3/4 Spent
5				Final		
				Initial		
				Wt. gain		
6				Final		
				Initial		
				Wt. gain		
Flask				Final		
				Initial		
				Wt. gain		

TOTAL WEIGHT GAIN OF IMPINGERS (grams)

Train set up: Date:

Signature:

Train recovery: Date: 10-27-93

Signature: R. Campbell

EER

Appendix E.3. Tedlar Bag Analyses

Energy and
Environmental
Research Corporation

FIELD SAMPLE TRACKING REPORT

PROJECT NO. 6373 – PAGE 1

PLANT/PROJECT

UNIT #

SAMPLE NO.	RUN NO.	PROCESS STREAM/ LOCATION	SAMPLE DATA				SENT TO:	
			DESCRIPTION	DATE	TIME	SAMPLER	LABORATORY	DATE
154601	1	Stack	Diluted	10-27-93	09:45 / 10:15	R. Campbell		
154602	1	Stack	Undiluted	10-27-93	09:45 / 10:15	R. Campbell		
154603	1	Stack	Condensate	10-27-93	09:45 / 10:15	R. Campbell		
154604	2	Stack	Diluted	10-27-93	10:15 / 10:45	R. Campbell		
154605	2	Stack	Undiluted	10-27-93	10:15 / 10:45	R. Campbell		
154606	2	Stack	Condensate	10-27-93	10:15 / 10:45	R. Campbell		
154607	3	Stack	Diluted	10-27-93	10:56 / 11:26	R. Campbell		
154608	3	Stack	Undiluted	10-27-93	10:56 / 11:26	R. Campbell		
154609	3	Stack	Condensate	10-27-93	10:56 / 11:26	R. Campbell		
154610	4	through System	Blank	10-27-93	11:26	R. Campbell		

Energy and
Environmental
Research Corporation

CHAIN OF CUSTODY

Plant
Unit
Location

Page 1 of

Project No. 6373-020

P.O No.

Sample No.	Test No.	Test Date	Description Bag sample
154601	1	10-27-93	Diluted
154602	1	10-27-93	Undiluted
154604	2	10-27-93	Diluted
154605	2	10-27-93	Undiluted
154607	3	10-27-93	Diluted
154608	3	10-27-93	Undiluted
154610	4	10-27-93	Blank

Sampling system prepared by R. Campbell
Test operator R. Campbell
Sample recovery by R. Campbell in field filled bags

Relinquished By	Recieved By	Time	Date	Reason

4566

Laboratory analysis by

Date

Applied P & Ch Laboratory
4000 E. Mission Blvd., Pomona, CA 91766
Tel: (909) 622-5148 Fax: (909) 622-3199

APCL Analytical Report

Submitted to:
Energy and Environmental Research Corporation
Attention: Dave Hansell
8001 Irvine Blvd.
Santa Ana, CA 92706
Tel: (714)552-1803 Fax: (714)857-1943

Service ID #: 801-934566
Collected by: R. Campbell
Collected on: 10/27/93
Sample description:
Air Bag Samples from
Project 6373-020

Received : 10/28/93
Tested : 10/29/93
Reported : 11/17/93

Analysis of VOCs in Air

801-934566 Page 1 of 3

Component Analyzed	Method	Unit	PQL	Concentration 154601 Diluted 93-4566-01	154602 Undiluted 93-4566-02	154604 Diluted 93-4566-03	154605 Undiluted 93-4566-04	154607 Diluted 93-4566-05	154608 Undiluted 93-4566-06	154610 Blank 93-4566-07
Chlorinated Hydrocarbons										
Chloromethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Bromomethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Methylene Chloride	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-1,2-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chloroform	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,1-Trichloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Carbon Tetrachloride	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2-Dichloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Trichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2-Dichloropropane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-1,3-Dichloropropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-1,3-Dichloropropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,2-Trichloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Tetrachloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethylene Dibromide	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethylene Dichloride	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,2,2-Tetrachloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3-Dichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,4-Dichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Chlorotoluene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2-Dichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2,4-Trichlorobenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Hexachlorobutadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-1,2-Dichloroethene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,1,1,2-Tetrachloroethane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Carbon Disulfide	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.

CADHS ELAP CERTIFICATION NUMBER 1431

Applied P & Ch Laboratory
4086 E. Mission Blvd., Pomona, CA 91766
Tel: (909) 622-5148 Fax: (909) 622-3199

APCL Analytical Report

Analysis of VOCs in Air

Component Analyzed	Method	Unit	PQL	Concentration 154601 Diluted 93-4506-01	154602 Undiluted 93-4506-02	154604 Diluted 93-4506-03	154605 Undiluted 93-4506-04	154607 Diluted 93-4506-05	154608 Undiluted 93-4506-06	154610 Blank 93-4506-07
Paraffins (C4-C6)										
n-Butane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Isobutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
n-Pentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Isopentane [2-methylbutane]*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Neopetane [2,2-dimethylpropane]*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
n-Hexane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Methylpentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
3-Methylpentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2,2-Dimethylbutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2,3-Dimethylbutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Aromatics										
Benzene	TO-14	ppbV	5	7	–	8	–	7	–	N.D.
Toluene	TO-14	ppbV	5	15	–	17	–	17	–	N.D.
Ethyl Benzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
m,p-Xylenes	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
o-Xylene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Styrene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3,5-Trimethylbenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,2,4-Trimethylbenzene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Phenol	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Naphthalene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Naphthenes										
Cyclopropane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclobutane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclopentane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Cyclohexane	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ketones										
Acetone	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Butanone	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1,3-Butadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Propadiene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Olefins										
1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Methylpropene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
cis-2-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
trans-2-Pentene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-methyl-2-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-methyl-1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
3-methyl-1-Butene	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.

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APCL Analytical Report

Analysis of VOCs in Air

Component Analyzed	Method	Unit	PQL	Concentration 154601 Diluted 93-4566-01	154602 Undiluted 93-4566-02	154604 Diluted 93-4566-03	154605 Undiluted 93-4566-04	154607 Diluted 93-4566-05	154608 Undiluted 93-4566-06	154610 Blank 93-4566-07
Acetylenes (C4-C5)										
1-Butyne*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Butyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
1-Pentyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
2-Pentyne	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethers										
MTBE	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Dimethyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethyl Methyl Ether*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Diethyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Ethyl Propyl Ether*	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
Dipropyl Ether	TO-14	ppbV	5	N.D.	–	N.D.	–	N.D.	–	N.D.
VOCs by GC/FIDs										
Methane	TO-14/FID	ppbV	500	–	1,090,000	–	1,070,000	–	1,020,000	–
Ethane	TO-14/FID	ppbV	500	–	39,900	–	38,700	–	36,000	–
Propane	TO-14/FID	ppbV	500	–	5,560	–	5,630	–	5,680	–
Ethene	TO-14/FID	ppbV	500	–	23,600	–	26,400	–	25,500	–
Propene	TO-14/FID	ppbV	500	–	1,870	–	1,740	–	1,960	–
Ethyne	TO-14/FID	ppbV	500	–	9,050	–	8,980	–	8,770	–
Propyne*	TO-14/FID	ppbV	500	–	N.D.	–	N.D.	–	N.D.	–

PQL : Practical Quantitation Limit
N.D. : Not Detected or Less Than The Quantitation Limit.
* Standards not available

Respectfully submitted,

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