Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

CALPINE

408.995.0505 (fax)

October 7, 1992

Scott Lutz
Supervising Air Quality Engineer
TAC Evaluation Section
BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street
San Francisco, California 94109

Subject: AB2588 Toxic Hot Spots Fee

Dear Mr. Lutz:

In anticipation of the adoption of regulations that would impose fees for emissions identified in Assembly Bill 2588, an emissions source test was conducted at the Agnews Cogeneration Facility, Plant #6044. As discussed in my July 30, 1992 letter to you, this test was conducted to determine the actual formaldehyde emissions. The test conducted by BEST ENVIRONMENTAL on September 15, 1992, showed the actual emissions of formaldehyde were only 17 percent of BAAQMD estimated levels. A copy of the test report is enclosed for your reference.

Enclosed is a copy of the BAAQMD Toxic Emissions Inventory dated September 3, 1992. I have corrected the inventory to include the actual emissions with a calculation showing how the number was determined. The toxic fee should be $500 based on the current schedule.

If you have any questions, please give me a call.

Sincerely,

CALPINE CORPORATION

R. Becker

Richard A. Becker
Project Manager

RABdcb/lcp
LET1092.18

Enclosure

cc: Tom Coonrod - COPS

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
TOXIC EMISSIONS INVENTORY
SEP 3, 1992

PLANT # 6044

O L S Energy-Agnews
50 W San Fernando St, 5th Flr
San Jose CA 95113

Attn: Richard Becker
Project Manager

SUMMARY OF FACILITY EMISSIONS AND WEIGHTED EMISSIONS
FOR CALCULATION OF 1991-1992 AB 2588 FEES

POLLUTANT NAME	POLLUTANT WEIGHTING FACTOR	POLLUTANT EMISSION (LB/YR)	WGTED POLL EMISSION (LB/YR)
SOURCE # 1; Gas Turbine Generator ; SOURCE CODE = C7120189			
SOURCE THROUGHPUT = 2.1141E7 THERMS/YEAR			
Benzene	2.90E+00	13.953	40.46
Formaldehyde	1.30E+00	~~2948.284~~ 512.493	~~3832.74~~ 666.24

EMISSIONS SUMMARY FOR PLANT # 6044

TOTAL EMISSIONS = 2962.22 526.45
WEIGHTED EMISSIONS = ~~3873.21~~ 706.70

IF THIS REGULATION IS ADOPTED
YOUR 1991-1992 AB 2588 FEE WILL BE $ ~~2000~~ $500 ← SCHEDULE N

```
*****************************************
*                                       *
*   THIS IS NOT AN INVOICE              *
*   INVOICES WILL BE SENT OUT AFTER     *
*   ADOPTION OF REGULATION IN OCT, 1992 *
*                                       *
*****************************************
```

FORMALDEHYDE 22.5 $\frac{\text{GRAMS}}{\text{HR}}$ × 8496 $\frac{\text{HRS}}{\text{YEAR}}$ × $\frac{1 \text{ lb}}{373 \text{ GRAMS}}$ = 512.5 lbs POLLUTANT

× 1.3 FACTOR

666 WGTED POLLUTANT EMISSION

FROM SOURCE TEST

PERMIT TO OPERATE LIMIT

CONVERSION FACTOR

BEST ENVIRONMENTAL, INC.
5890 Foothill Boulevard
San Leandro, California 94578
(510) 278-4011 FAX (510) 278-4018

October 2, 1992

CALPINE
50 W. San Fernando St. 5th Fl.
San Jose, CA 95113

Attn: Richard Becker:

Subject: **Source emission test report regarding formaldehyde emissions from the Agnews Cogeneration Facility, San Jose, CA.**

Test Date: September 15, 1992.

Sampling Location: Sampling was conducted at the outlet stack of the steam boiler/turbine, located at 3530 Zanker Road, San Jose, CA.

Sampling Personnel: Sampling was performed by Guy Worthington and Michael Wiley of BEST ENVIRONMENTAL INC.

Observing Personnel: No representatives from the Bay Area Air Quality Management District were present to witness the test on September 15, 1992.

Process Description: The natural gas fired turbine and steam turbine are used to supply power and steam to the Agnews Developmental Center. Exhaust from the gas fired turbine enters the boiler at approximately 1000°F, where steam is produced to drive a second power generating turbine.

Test Program: Triplicate 30 minute tests were performed for formaldehyde and acetaldehyde emissions. Two tests were conducted to determine the stack gas moisture and volumetric flowrate. A single integrated bag sample was collected for oxygen and carbon dioxide measurement and for molecular weight calculations. The Cogen was operated at the following conditions:

Gas Turbine 23.33 MW during test.

Steam Turbine7.27 MW during test.

Natural gas consumption rate 11,400 lbs/hr

Sampling and Analysis Methods: The following California Air Resources Board (CARB) sampling and analytical methods were used:

CARB Method 430	Formaldehyde and Acetaldehyde
CARB Method 1,2,3,4	Volumetric Flowrate, Moisture, Molecular Weight

Instrumentation: The following emission analyzers were used:

O_2/CO_2	Fyrite wet chemical analyzer

Test Results: Emission results are contained in Table 1. Formaldehyde was only detected in Test #1, and the average value is based upon including the detection limit for Test #2 and #3. Acetaldehyde was detected in Tests #1 and #2. The average includes the detection limit of Test #3. The average values of the stack gas moisture and flowrate tests were used to calculate the emission rates. The average emissions were as follows:

Formaldehyde	22.5 gm/hr
Acetaldehyde	26.2 gm/hr

Stack gas volumetric flowrate and moisture calculations, field data sheets, calculations, QAQC data, laboratory results and sample custody records are appended to this report.

If you have any questions regarding this report, or if BEST ENVIRONMENTAL can be of any further assistance, please call.

Prepared by

Guy Worthington
Project Manager

Reviewed by

Regan Best
Manager

RECEIVED OCT 0 6 1992

CALPINE

Source Test Report
Agnews Cogeneration Facility
Test Date: September 15, 1992

TABLE 1

Calpine - Agnews

Formaldehyde and Acetaldehyde Emission Results

CARB METHOD 430

Plant: Agnews
Source: Nat. Gas Cogen
Operating Condition: Gas Turbine @23.3MW, Steam Turbine @ 7.27MW

TEST #	1	2	3	AVERAGE*
Date	9/15/92	9/15/92	9/15/92	
Time	1254-1324	1339-1409	1422-1452	
Stack Gas Flowrate, (sdcfm)	127,143	127,143	127,143	127,143
Oxygen, %	14.5	14.5	14.5	14.5
Carbon Dioxide, %	3.6	3.6	3.6	3.6
Moisture Content, %	9.9	9.9	9.9	9.9
Sample Volume, (dscf)	0.478	0.465	0.453	0.465
Sample Volume, (dscm)	0.014	0.013	0.013	0.013
Formaldehyde, ug/sample	0.88	<0.50	<0.50	0.6
Formaldehyde, ug/dscm	65.0	<38.0	<39.0	47.3
Formaldehyde, ppb	52.3	<30.5	<31.4	38.1
Formaldehyde, gm/hr	31.0	<18.1	<18.6	22.5
Acetaldehyde, ug/sample	1.19	0.50	<0.50	0.7
Acetaldehyde, ug/dscm	87.9	38.0	<39.0	55.0
Acetaldehyde, ppb	48.1	20.8	<21.3	30.1
Acetaldehyde, gm/hr	41.9	18.1	<18.6	26.2

WHERE,

Formaldehyde Molecular Weight. = 30.0
Acetaldehyde Molecular Wt. = 44.1
sdcfm = Standard Dry Cubic Feet per Minute
dscf = Dry Standard Cubic Feet
ppb = Parts per Billion
M.W. = Molecular Weight
ug/dscm = Micrograms per Dry Standard Cubic Meter
gm/hr = Grams per Hour Emission Rate

CALCULATIONS,

gm/hr = sdcfm*60*(ug/sample)/(dscf*453600)
ppb = (ug/dscm)*(24.134/MW)

APPENDICES

CALCULATIONS

BEST ENVIRONMENTAL
ALDEHYDE SAMPLING DATA CALCULATIONS
CARB METHOD 430

Plant: Calpine - Agnews

Source: Cogen

TEST #	1	2	3
Date	9/15/92	9/15/92	9/15/92
Time	1254-1324	1339-1409	1422-1452
Meter Volume (Vm), ft^3	0.474	0.454	0.438
Meter Volume (liters)	13.42	12.86	12.40
Sample Rate (Lpm)	0.447	0.429	0.413
Meter Factor, (Yd)	1.0763	1.0763	1.0763
Barometric Pressure (Pb), "Hg	29.80	29.80	29.80
Meter Pressure (dH), "H2O	0.1	0.1	0.1
Meter Temperature (tm), °F	104.1	94.80	89.40
Temperature Std (tstd), °F	70	70	70
Stack Gas Moisture, %	9.9	9.9	9.9
Sample Volume Std. (Vmstd), ft^3	**0.478**	**0.465**	**0.453**

WHERE,

Tstd = tstd + 460°R

Pm = Pb + (dH/13.6)

Tm = tm + 460°R

CALCULATIONS,

Vmstd = (Vm*Yd*Tstd*Pm)/(Tm*29.92)

BEST ENVIRONMENTAL
STACK MOISTURE DETERMINATION

Calpine - Agnews
Cogen

Date: 9/15/92
Time: 1230-1300

1. Uncorrected Meter Volume (Vm)	30.04	ft^3
2. Meter Factor (Yd)	0.9710	
3. Barometric Pressure (Pb)	29.80	"Hg
4. Meter Pressure (^H)	0.1	"H^2O
5. Meter Temperature (tm)	81.6	°F
6. Std. Temperature (tstd)	70.0	°F
7. Impinger H^20 Gain (VwH^20)	40.0	ml
8. Silica Gel Wt. Gain (Vwsg)	23.0	gm
9. Moisture Vapor (Vw std)	2.98	ft^3
Std. Meter Volume (Vm std)	**28.437**	**ft^3**
Percent of H^2O in Stack (% H^2O)	**9.5**	**%**

WHERE,

ft^3 = Cubic Feet
Hg = Mercury
°F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent

CALCULATIONS,

Moisture Vapor = 0.00267 x (VwH20 + Vwsg) x (460 + tstd) / 29.92
Std. Meter Vol.= Vm xYd x (tstd + 460) x(Pb + ^H/13.6) / (tm − 460) x 29.92
Stack Moisture = Moisture Vapor / Moisture Vapor + Vm std

BEST ENVIRONMENTAL
STACK MOISTURE DETERMINATION

Calpine - Agnews
Cogen

Date: 9/15/92
Time: 1340-1410

1. Uncorrected Meter Volume (Vm)	17.857	ft^3
2. Meter Factor (Yd)	0.9710	
3. Barometric Pressure (Pb)	29.80	"Hg
4. Meter Pressure (^H)	0.1	"H^2O
5. Meter Temperature (tm)	77.1	°F
6. Std. Temperature (tstd)	70.0	°F
7. Impinger H^20 Gain (VwH^20)	34.0	ml
8. Silica Gel Wt. Gain (Vwsg)	7.0	gm
9. Moisture Vapor (Vw std)	1.94	ft^3
Std. Meter Volume (Vm std)	**17.046**	**ft^3**
Percent of H^2O in Stack (% H^2O)	**10.2**	**%**

WHERE,

ft^3 = Cubic Feet
Hg = Mercury
°F = Degrees Fahrenheit
ml = milliliters
gm = grams
% = Percent

CALCULATIONS,

Moisture Vapor = 0.00267 x (VwH20 + Vwsg) x (460 + tstd) / 29.92
Std. Meter Vol.= Vm xYd x (tstd + 460) x(Pb + ^H/13.6) / (tm + 460) x 29.92
Stack Moisture = Moisture Vapor / Moisture Vapor + Vm std

BEST ENVIRONMENTAL
STACK VOLUMETRIC FLOW RATE DETERMINATION

Calpine - Agnews
Cogen

Date: 9/15/92
Time: 1356

1. Avg. (SQRT ^P)	1.017 H^2O
2. Pitot Coefficient (Cp)	0.84
3. Temperature of Stack (ts)	323.0 °F
4. Barometric Pressure (Pb)	29.80 "Hg
5. Static Pressure (Pstatic)	-0.7 H^2O
6. Stack Pressure (Ps)	29.75 "Hg
7. Percent of H^2O in Stack (%)	9.9 %
8. Molecular Weight of Stack Gas (MWs)	28.06 lb/lb-mole
A. Percent O2	14.5 %
B. Percent CO2	3.6 %
C. Percent CO	0.0 %
9. Area of Stack ft^2 (As)	49.224 ft^2

STACK GAS VELOCITY , Actual (Vs)	**70.7 ft/sec**
STACK GAS VOL. FLOWRATE, (Qactual)	**208,915 ACFM**
STACK GAS VOL. FLOWRATE (Qstd)	**126,273 SDCFM**

WHERE,

Vs = Velocity of the stack gas, actual (ft/sec)
Qstd = Volumetric flowrate at standard conditions
MWs = Molecular Wt. Stack Gas, wet basis
MWd = Molecular Wt. Stack Gas, dry basis
Ps = Stack pressure
^ P = Differential pressure measured by the pitot
ACFM = Actual Cubic Feet Per Minute
SDCFM = Standard Dry Cubic Feet Per Minute
Bws = %H20 / 100

CALCULATIONS,

MWs = (MWd) x (1-Bws) + 18 (Bws)
MWd = .44 (%CO2) + .32 (%O2) + .28 (%CO + %N2)
Ps = Pb + (Pstatic /13.6)
Vs = 85.49 x Cp x SQRT ^P x SQRT((ts + 460) / (Ps x MWs))
Qactual = 60 x Vs x As
Qstd = 60 x Vs x As x 528/(ts + 460) x Ps/29.92 x (1-Bws)

BEST ENVIRONMENTAL
STACK VOLUMETRIC FLOW RATE DETERMINATION

Calpine - Agnews
Cogen

Date: 9/15/92
Time: 1433

1. Avg. (SQRT ^P)	1.031 H^2O
2. Pitot Coefficient (Cp)	0.84
3. Temperature of Stack (ts)	323.0 °F
4. Barometric Pressure (Pb)	29.80 "Hg
5. Static Pressure (Pstatic)	-0.7 H^2O
6. Stack Pressure (Ps)	29.75 "Hg
7. Percent of H^2O in Stack (%)	9.9 %
8. Molecular Weight of Stack Gas (MWs)	28.06 lb/lb-mole
A. Percent O2	14.5 %
B. Percent CO2	3.6 %
C. Percent CO	0.0 %
9. Area of Stack ft^2 (As)	49.224 ft^2

STACK GAS VELOCITY , Actual (Vs)	**71.7 ft/sec**
STACK GAS VOL. FLOWRATE, (Qactual)	**211,791 ACFM**
STACK GAS VOL. FLOWRATE (Qstd)	**128,012 SDCFM**

WHERE,
Vs = Velocity of the stack gas, actual (ft/sec)
Qstd = Volumetric flowrate at standard conditions
MWs = Molecular Wt. Stack Gas, wet basis
MWd = Molecular Wt. Stack Gas, dry basis
Ps = Stack pressure
^ P = Differential pressure measured by the pitot
ACFM = Actual Cubic Feet Per Minute
SDCFM = Standard Dry Cubic Feet Per Minute
Bws = %H20 / 100

CALCULATIONS,

MWs = (MWd) x (1-Bws) + 18 (Bws)
MWd = .44 (%CO2) + .32 (%O2) + .28 (%CO + %N2)
Ps = Pb + (Pstatic /13.6)
Vs = 85.49 x Cp x SQRT ^P x SQRT((ts + 460) / (Ps x MWs))
Qactual = 60 x Vs x As
Qstd = 60 x Vs x As x 528/(ts + 460) x Ps/29.92 x (1-Bws)

FIELD DATA SHEETS

BEST ENVIRONMENTAL
Stack Gas Volumetric Flowrate Determination

Client: ALPINE	Location: AGNEWS COGEN (BOILER-TURBINE)
Date: 9-15-92 Time: 1356	Run#: 1
Pitot Factor (Cp): 0.84 ID# 22	Operators: GW, MW
Assumed %O2: 14.5 Actual 14.5	Barometric (Pb): 29.80
Assumed %CO2: 3.6 Actual ?3.6	Static Pressure (Pstatic): -0.70
Assumed %CO: Actual	Stack Diameter, in: 7'11" (95")
Assumed %H²O: 5.5 Actual 9.85%	Stack Area, ft² (As): 49.224

Port ID & Point#	Point Location, inches	Delta P, (ˆP)	Stack Temp °F, (ts)	SQRT ˆP
South 1	2.0	1.4 ~~0.90~~	323	1.183
2	6.4	1.4 ~~0.73~~	323	1.183
3	11.2	1.00	323	1.000
4	16.8	0.95	323	0.975
5	23.8	0.86	323	0.927
6	33.8	0.76	323	0.872
7	61.2	0.94	323	0.970
8	71.3	1.00	323	1.000
9	78.2	1.2	323	1.095
10	83.8	1.4	323	1.183
11	88.6	0.95	323	0.975
12	93.0	0.70	323	0.837
AVG			323	1.007

CALCULATIONS

Stack Gas Velocity, actual feet per sec (Vs)

Vs = 85.49*Cp*(SQRT ˆP)avg*SQRT[(ts+460)/Ps*MWs]

Vs =

Molecular Weight of Stack Gas, g/g.mole (MWs)

MWs = MWd*(1-Bwo) + 18(Bwo)

MWs =

Molecular Weight of Dry Gas, g/g.mole (MWd)

MWd = 0.44(%CO2) + 0.32(%O2) + 0.28(%CO+N2)

MWd =

Stack Gas Volumetric Flow Rate, standard dry cubic feet/min (SDCFM)

SDCFM = 60(1-Bwo)*Vs*As*528/(ts+460)*Ps/29.92

SDCFM =

WHERE:

Stack Pressure, "Hg (Ps)

Ps = Pb + (Pstatic/13.6)

Water Vapor Fraction, (Bwo)

Bwo = %H²O/100

Stack Area, ft² (As)

As = (Diameter/24)² * 3.1416

Comments: west port not accessible due to obstruction in line ~~with~~ of pitot, about 5' from port.

FORMDCFI.XLS

BEST ENVIRONMENTAL
Stack Gas Volumetric Flowrate Determination

Client: CALPINE - AGNEWS	Location: COGEN
Date: 9-15-92 Time: 1433	Run#: 2
Pitot Factor (Cp): 0.84	Operators: GW, MW
Assumed %O2: Actual 14.5	Barometric (Pb): 29.80
Assumed %CO2: Actual 3.6	Static Pressure (Pstatic): -0.80
Assumed %CO: Actual	Stack Diameter, in: 95"
Assumed %H²O: Actual 9.85%	Stack Area , ft² (As): 49.724

Port ID & Point#	Point Location, Inches	Delta P, (^P)	Stack Temp °F, (ts)	SQRT ^P
1		1.4	323	1.183
2		1.3	324	1.140
3		1.1	324	1.049
4		0.93	324	0.964
5		0.85	324	0.922
6		0.88	324	0.938
7		0.90	324	0.949
8		0.98	324	0.990
9		1.10	324	1.049
10		1.30	324	1.140
11		1.20	324	1.095
outer. 12		0.90	324	0.949
AVG				

CALCULATIONS

Stack Gas Velocity, actual feet per sec (Vs)

Vs = 85.49*Cp*(SQRT ^P)avg*SQRT[(ts+460)/Ps*MWs]

Vs =

Molecular Weight of Stack Gas, g/g.mole (MWs)

MWs = MWd*(1-Bwo) + 18(Bwo)

MWs =

Molecular Weight of Dry Gas, g/g.mole (MWd)

MWd = 0.44(%CO2) + 0.32(%O2) + 0.28(%CO + N2)

MWd =

Stack Gas Volumetric Flow Rate, standard dry cubic feet/min (SDCFM)

SDCFM = 60(1-Bwo)*Vs*As*528/(ts+460)*Ps/29.92

SDCFM =

WHERE;

Stack Pressure, "Hg (Ps)

Ps = Pb + (Pstatic/13.6)

Water Vapor Fraction, (Bwo)

Bwo = %H²O/100

Stack Area, ft² (As)

As = (Diameter/24)² * 3.1416

Comments:

FDWDCFI.XLS

BEST ENVIRONMENTAL Particulate Field Data Sheet

Run # 1,2 Method # 4

Plant	CALPINE - AGNEWS	ΔH@	2.385	%H2O Assum.	6.5	Filter #	F.H. Wt. (mg)
Date	9-15-92	Meter Yd	0.9710	Pitot Cp	0.84	Pitot #	E.H. Wt. (mg)
Location	BOILER/TURBINE	PBar.	29.80	Noz. Diam.		Net Imp Vol	40 ml.	Gel Wt. (mg)
Port Dim.	"	Stat Press		Noz I.D.		Tot Imp Vol	%CO2 Actual
Stack I.D.	95"	%O2 Assum	14.5	Meter #	8811	Sample Time	30	%O2 Actual
Stack Area	ft2	%CO2 Assum	3.6	Probe #		Sqrt ΔP Ave	Tot. Moisture
Personnel	GW, MW	Pre leak ck	<0.01 cfm 24 "Hg			Post leak ck	<0.01 cfm 15 "Hg	Std Vm
			<0.01 14				<0.01 4	

	Sample Point	Clock Time	Vel. ΔP	K.R. cfm	Orif. ΔH	Gas Meter Volume ft2	Gas Meter In	Gas Meter Out	Temperatures F Stack	Imp.	Filter	Probe	Pump Vac.	Comments
1	START	1230		~1.0	0.1	274.820	79	78		<68			14	
2		1235				279.8	81	82					15	
3		1240				283.3	81	82					14	
4		1245				288.8	82	83					13	
5		1250				293.5	82	83					13	
6		1255				299.1	83	83					13	
7	STOP	1300				304.860								
8		~~1305~~												
9						<30.040>	<81.0>							
10														
11	START	1340		~0.5	0.1	305.250	77	78		<68			2	
12		1345				308.4	76	78					2	
13		1350				311.7	76	78					2	
14		1355				314.0	76	78					2	
15		1400				317.4	76	78					2	
16		1405				320.2	76	78					2	
17	STOP	1410				323.107	—	—						
18														
19						17.857	<77.1>							
20														
21														
22														
23														
24														
25														
26														
27														
28	Average													

R1

R2

Notes:

		Run 1	Run 2
	ml.	40	34
Ms =	mg.	23	7
Ave. Vs =			
Sample I.D. # =		63	41

	#1	#2
Final Imp Vol =		
Initial Imp Vol =		

FIGURE 4: (A) RECORDING AND REPORTING - SAMPLING RUN DATA RECORD

(Note: Only one sampling run per data sheet.)

Run #: 1 Project #: Cal Pine

Location: Outlet Source Name: Cascade

Date Sampled: 9-15-92 Operator: MV

Meter Yd 1.0763 Pbar 29.80

	Clock Time	~~Rotameter~~ Meter Reading	Flow Rate, Q mL/min	Impinger Temp. °F	Stack Temp. °F	Meter temp (°F) In	Out	COMMENTS
0	12:54	145.499				100	106	
1	5 min	145.592	.0930/527			102	107	
2	10 min	145.659	.0640/362			103	107	
3	15 min	145.745	.0860/487			103	107	
4	20 min	145.816	.0710/402			102	106	
5	25 min	145.884	0.680/385			102	106	
6	30 min	145.973	0.890/504			101	106	Avg 104.1

(474) = 13.4 L flow rate = 0.447 L/min

Chain of Custody Record Numbers, Sample Id. Numbers, Tare Masses, and Final Masses

Suggested Codes:

I&V w/ id. # ≡ Impinger, Transport, & Extraction Vial (all)

IMP w/ id. # ≡ Impinger (only)

E&T w/ id. # ≡ Extraction and Transport Vial (both)

C.O.C. #	S. Id. #	m_{tare} (tare mass)	m_{final} (final mass)
	1A (R-1 Impi)	31 gr	
	1B (R-1 Imp2)	31 gr	

FIGURE 4: (A) RECORDING AND REPORTING - SAMPLING RUN DATA RECORD

(Note: Only one sampling run per data sheet.)

Run #: 2 Project #:

Location: outlet Source Name: Calpine Cogen

Date Sampled: 9-15-92 Operator: MW

	Clock Time	Meter ~~Rotameter~~ Reading	Flow Rate, Q mL/min	Impinger Temp. °F	Stack Temp. °F	COMMENTS Meter Temp In Out
0	13:39	146.996	CF			98 101
1	5 min	146.066	.014 .070			98 100
2	10 min	146.134	.0136 .068			96 100
3	15 min	146.224	.0150 .075			92 96
4	20 min	146.286	—			90 93
5	25 min	—	—			90 98
6	30 min	146.450	—			89 92 Avg 94.8

<.454> = 12.86 L Flow rate = .429 L/min

Chain of Custody Record Numbers, Sample Id. Numbers, Tare Masses, and Final Masses

Suggested Codes:

I&V w/ id. # ≡ Impinger, Transport, & Extraction Vial (all)

IMP w/ id. # ≡ Impinger (only)

E&T w/ id. # ≡ Extraction and Transport Vial (both)

C.O.C. #	S. Id. #	m_{tare} (tare mass)	m_{final} (final mass)
	2A (R-2 Imp 1)	31	33
	2B (R-2 Imp 2)	30	30

FIGURE 4: (A) RECORDING AND REPORTING - SAMPLING RUN DATA RECORD

(Note: Only one sampling run per data sheet.)

Run #: 3 Project #:

Location: outlet Source Name: CalPine Cogen

Date Sampled: 9-15-92 Operator: MW

	Clock Time	Meter ~~Rotameter~~ Reading	Flow Rate, Q mL/min	Impinger Temp. °F	Stack Temp. °F	Meter temp IN	Meter temp OUT	COMMENTS
0	14:22	146.477	~~515~~			89	91	
1	5 min	146.538	.0182 / .041 / 515			88	90	
2	10 min	146.622	.0169 / .059 / 474			88	90	
3	15 min	146.688	.0132 / .066 / 314			88	90	
4	20 min	146.763	.0150 / .075 / 425			88	90	
5	25 min	146.890	.0174 / .087 / 494			89	92	
6	30 min	146.915	.065 / 368			88	91	Avg 89.4

⟨.438⟩ 12.4 L = 0.413 L/min

Chain of Custody Record Numbers, Sample Id. Numbers, Tare Masses, and Final Masses

Suggested Codes:

I&V w/ id. # ≡ Impinger, Transport, & Extraction Vial (all)

IMP w/ id. # ≡ Impinger (only)

E&T w/ id. # ≡ Extraction and Transport Vial (both)

C.O.C. #	S. Id. #	m_{tare} (tare mass)	m_{final} (final mass)
	~~3~~A (R~~3~~ Imp 1)	30 gr	33 gr
	~~3~~B (R~~3~~ Imp 2)	31 gr	30 gr.

LAB REPORTS

AIR TOXICS LTD.

Stationary Source Test Method - Formaldehyde

(CARB Method 430)

High Pressure Liquid Chromatography

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Total Volume (mL)	Dilution Factor	MDL (uG)	Amount (uG)
Run-1 UMP 1	9209082-01A	4091802	9/15/92	Formaldehyde	12.2	1.0	0.50	0.88
				Acetaldehyde			0.50	0.50
Run-1 UMP 1 Duplicate	9209082-01AA	4091803	9/15/92	Formaldehyde	12.2	1.0	0.50	0.84
				Acetaldehyde			0.50	0.50
R1IMP2	9209082-01B	4091804	9/15/92	Formaldehyde	9.0	1.0	0.50	Not Detected
				Acetaldehyde			0.50	0.69
R2IMP1	9209082-02A	4091806	9/15/92	Formaldehyde	12.0	1.0	0.50	Not Detected
				Acetaldehyde			0.50	Not Detected
R2IMP2	9209082-02B	4091807	9/15/92	Formaldehyde	9.2	1.0	0.50	Not Detected
				Acetaldehyde			0.50	0.50
R3IMP1	9209082-03A	4091808	9/15/92	Formaldehyde	12.6	1.0	0.50	Not Detected
				Acetaldehyde			0.50	Not Detected
R3IMP2	9209082-03B	4091809	9/15/92	Formaldehyde	9.0	1.0	0.50	Not Detected
				Acetaldehyde			0.50	Not Detected
R4IMP1	9209082-04A	4091810	9/15/92	Formaldehyde	12.8	1.0	0.50	Not Detected
				Acetaldehyde			0.50	Not Detected
R4IMP2	9209082-04B	4091811	9/15/92	Formaldehyde	7.4	1.0	0.50	Not Detected
				Acetaldehyde			0.50	Not Detected
Trip Blank	9209082-05A	4091814	9/15/92	Formaldehyde	10.0	1.0	0.50	Not Detected
				Acetaldehyde			0.50	Not Detected
Lab Blank	9209082-07A	4091816	NA	Formaldehyde	10.0	1.0	0.50	Not Detected
				Acetaldehyde			0.50	Not Detected
Spiked Samples								**% Recovery**
R1IMP2 Matrix Spike	9209082-01B-MS	4091805	9/15/92	Formaldehyde	9.0	1.0	0.50	104
				Acetaldehyde			0.50	98
Trip Spike	9209082-06A	4091815	9/15/92	Formaldehyde	11.0	1.0	0.50	87
				Acetaldehyde			0.50	89
Lab Spike	9209082-08A	4091817	NA	Formaldehyde	11.0	1.0	0.50	101
				Acetaldehyde			0.50	95

Extraction Date: 9/17/92

Analysis Date: 9/18/92

COMMENTS: NA=Not Applicable

BEST ENVIRONMENTAL
18890 Foothill Boulevard
San Leandro, CA 94578
Phone (510) 278-4011 Fax (510) 278-4018

P.O. # = GW91592

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST Pg. 1 of 1

Project Manager: GUY WORTHINGTON

Lab Name: AIR TOXICS

Client: CALPINE

location:

I attest that the proper field sampling procedures were used during the collection of these samples.

Sampler Name (Print): MIKE WILEY

ANALYSIS REQUEST

Field Sample ID	Volume	# CONTAINERS	Matrix: WATER	Matrix: DNPH	Matrix: AIR	Matrix: OTHER	Method Preserved: HCl	Method Preserved: HNO_3	Method Preserved: H_2SO_4	Method Preserved: ICE	Method Preserved: NONE	Method Preserved: OTHER	Sampling: DATE	Sampling: TIME	CARB 429 (PAH's)	CARB 428 (Dioxins)	CARB 410A 410B (Benzene)	CARB 430 (Aldehydes)	CARB 421 (HCl)	CARB 425 (Cr & Cr 6)	CARB 422 (Halog. Org's)	CARB 106 (Vinyl Chloride)	EPA 6010 (Fdset metals, chlorides)	CARB 426 (Cyanide)	CARB 423 (Arsenic)	CARB 427 (Asbestos)	CARB 436
RUN-1 IMP1		1		X									9/15					X									
R-1 IMP2		1		X														X									
R-2 IMP1		1		X														X									
R-2 IMP2		1		X														X									
R-3 IMP1		1		X														X									
R-3 IMP2		1		X														X									
R-4 IMP1		1		X														X									
R-4 IMP2		1		X														X									

CUSTODY RECORD

Relinquished by Sampler:	Relinquished by:	Relinquished by:
GW.		

Date	Time	Received by:	Received by:	Received by Laboratory:
9/16/92		Express H. Owners		Express
9/17/92	09:35	Alexis Theyndt		Way bill # I162025

SPECIAL HANDLING

24 HOURS ☐
EXPEDITED 48 Hours ☐
NTAT ☒
OTHER _____ (#) BUSINESS DAYS

Return tedlars ____
Return cooler ____
Return bottles

SPECIAL DETECTION LIMITS (Specify)

SPECIAL REPORTING REQUIREMENTS

Air samples- total qty. to be reported

REMARKS:

FORMALDEHYDE ONLY.

EQUIPMENT CALIBRATION RECORDS

METER BOX FULL TEST CALIBRATION

DATE: 6/10/92

OPERATOR: MW

METER BOX Yd: 1.0763

METER BOX ΔH@: —

ΔH@: _____

METER ~~BOX~~: 033501

BAROMETRIC PRESSURE (Pb): 29.91

Q	1 ΔH	2 ΔP	3 Yds	Standard Meter Gas Volume (ft³) Initial	Final	4 (Vds) Net	Meter Box Gas Volume (ft³) Initial	Final	5 (Vd) Net	Standard Meter Temperature In	Out	6 Tds Avg	Meter Box Temperature In	Out	07 Td Avg	Time (Min.) 08 θ	ΔH@	Yd
.035			1.0000			.5297	106.596	107.093	.498			73.4	76.2	75.6	76.1	14.99		1.0689
.035			1.0000			.5297	107.093	107.591	.497			72.2	76.1	76.0	76.1	14.92		1.0660
.024			1.000			.5297	108.377	108.875	.498			72.6			76	21.81		1.070
.024			1.000			.5297	108.875	109.372	.497			72.6			76	21.95		1.072
.014			1.0000			.4237	109.474	109.868	.394			73.1			76	30.85		1.0812
.013			1.0000			.4237	109.868	110.255	.387			73.5			76	31.37		1.0994

Q = Flow Rate (cfm)
ΔH - Orifice Pressure Differential (in. H O)
ΔP - Inlet Pressure Differential Standard Meter (in. H O)
Yds - Standard Meter Correction Factor (Unitless)
Yd - Meter Box Correction Factor (Unitless)
ΔH@ - Orifice Pressure Differential that gives 0.75 cfm of air at 70°F and 29.92" Hg (in. H O)

$$Yd = (Yds)\left(\frac{Vds}{Vd}\right)\left(\frac{Td + 460}{Tds + 460}\right)\left(\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right)$$

$$\Delta H@ = \frac{0.0317\ \Delta H}{Pb\ (Td + 460)}\left[\frac{(Tds + 460)\ \theta}{Vds \cdot Yds}\right]^2$$

$$Q = \frac{17.64 \cdot Vds \cdot Pb}{(Tds + 460)\ \theta}$$

Date: 3-9-92 Pitot Number: 22

TYPE S PITOT TUBE INSPECTION DATA

Pitot tube assembly level? _____ yes ✓ no

Pitot tube openings damaged? _____ yes (explain below) ✓ no

α_1 = 0° (<10°), α_2 = 0.5° (< 10°), β_1 = 1.5° (< 5°)

β_2 = 1.5° (< 5°)

Y = 1.5°, θ = 0.75°, A = ~~1.167~~ 1.082 cm (in.)

Z = A sin Y = ~~0.31~~ 0.03 ~~cm~~ (in.); < 0.32 cm (< 1/8 in.),

W = A sin θ = 0.01 cm (in.); < 0.08 cm (< 1/32 in.)

P_a 0.375 ~~cm~~ (in.) P_b 0.375 cm (in.)

D_t = 1.082 ~~cm~~ (in.) $\frac{P}{D_t} = \frac{1.44}{P_a = P_b = P}$ (≥1.05 and≤1.50)

COMMENTS: 8' S-Type Pitot Tube

Calibration required? _____ yes ✓ no

Calibrated by: MW