

# Appendix A

## **Field Data Sheets & Documentation**

# EPA Method 1 Field Data Sheets



# EPA Method 1 Field Data Sheet

## Test Site and Traverse Point Selection

Project FHR\_FCC\_ICR  
Test Location FCC (SV019)  
Date \_\_\_\_\_ Test/Run T1 R

- ☐ New Sketch Created With Dimensions  
☒ File Drawing Verified and Attached  
☐ Cyclonic Flow Measured (See M-2 Sheet)

**Disturbance Type**

Before (B)	After (A)
<input checked="" type="checkbox"/> Elbow	<input type="checkbox"/>
<input type="checkbox"/> Conjunction	<input type="checkbox"/>
<input type="checkbox"/> Fan (cent)	<input type="checkbox"/>
<input type="checkbox"/> Axial Fan	<input type="checkbox"/>
<input type="checkbox"/> Transition	<input type="checkbox"/>
<input type="checkbox"/> Damper	<input type="checkbox"/>
<input type="checkbox"/> Exit	<input checked="" type="checkbox"/>
<input type="checkbox"/> Other	<input type="checkbox"/>

Flow Disturbance

### Duct Orientation

- ☒ Vertical  
☐ Horizontal  
☐ Diagonal

4 No. of Traverses

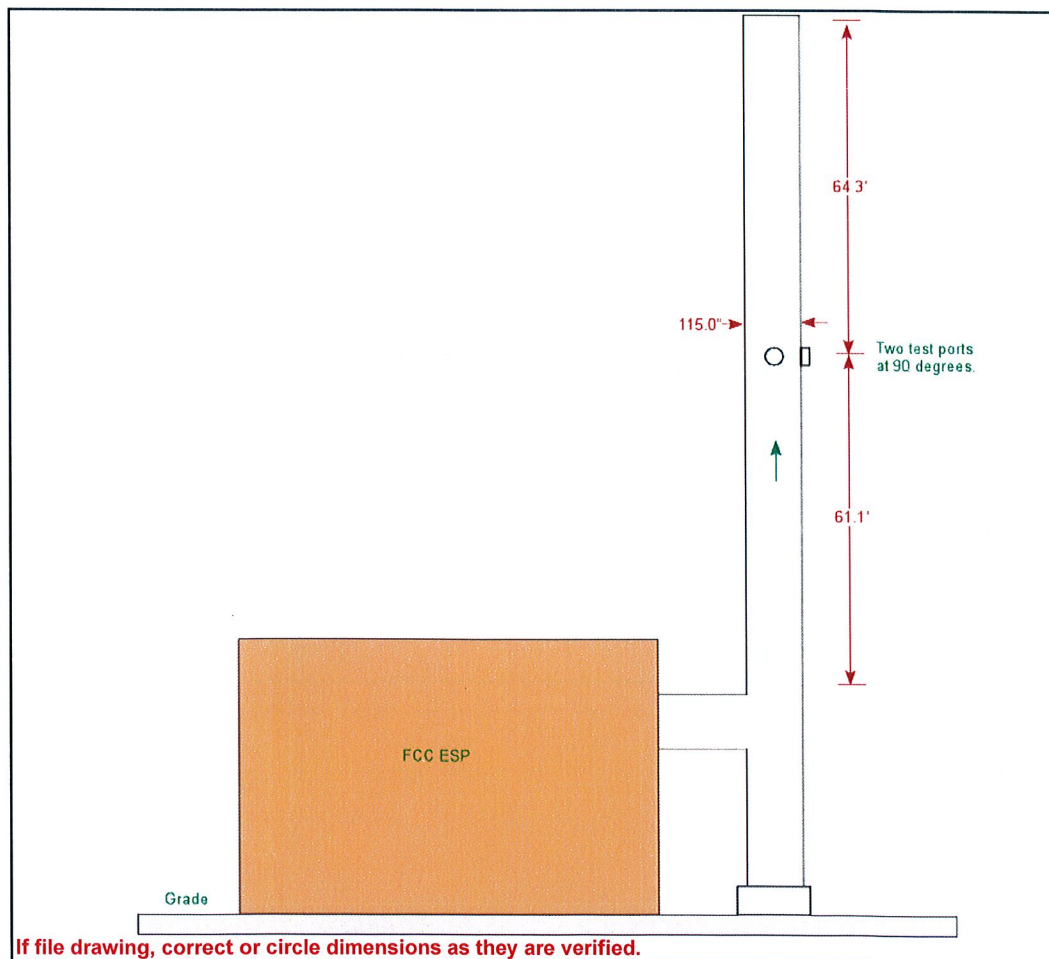
A= 6.7 Diameters to downstream  
B= 6.4 Diameters to upstream  
T<sub>R</sub>= 16 Min. Traverse Points (iso)  
T<sub>A</sub>= 16 Traverse Points Used

☒ Round  
☐ Rectangular

D= 115.0"  
=W  
D= \_\_\_\_\_  
=W  
(ports this side)

### Traverse Points (from wall)

- A 1 3.71"  
2 12.04"  
3 22.29"  
4 37.17"  
B 1 3.71"  
2 12.04"  
3 22.29"  
4 37.17"  
C 1 3.71"  
2 12.04"  
3 22.29"  
4 37.17"  
D 1 3.71"  
2 12.04"  
3 22.29"  
4 37.17"



If file drawing, correct or circle dimensions as they are verified.

# EPA Method 2 Field Data Sheets

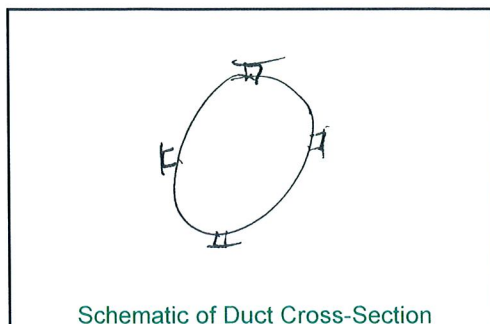
# EPA Method 2 Field Data Sheet

## Volumetric Airflow Determinations

Project FHR\_FCC\_ICR  
 Test Location FCC (SV019)  
 Date 7-27-11 Test/Run T1 RO  
 Duct Dimensions 115 x 115 Round Inches  
 Port Length 12" Inches  
 Pitot Leak Check - Pos OK Neg OK

Manometer Type and ID cm-1011  
 Barometer Type and ID DPA-5  
 Thermocouple Sensor ID cm-1 011  
 Pitot Tube No. 4-86 Cp 1.840  
 Technicians JJR / BDE / mam / ATR  
 Page 1 of 0 FSD PN: 1106-200

Traverse Point IDs			Cyclonic Flow °Yaw	Velocity Head - Inches H <sub>2</sub> O				Stack Temperature - °F			
Point No.	Inches From Wall	Inches From Port		Run 1 ΔP	Run 2 ΔP	Run 3 ΔP	Run 4 ΔP	Run 1 °F	Run 2 °F	Run 3 °F	Run 4 °F
A 1	3.71	15.71	0°	1.05				457			
2	12.04	24.04	0°	1.25				456			
3	22.29	34.29	0°	1.30				456			
4	32.14	44.14	0°	1.35				457			
B 1			0°	1.08				456			
2			0°	1.25				457			
3			0°	1.40				457			
4			0°	1.50				456			
C 1			0°								
2			0°								
3			0°								
4			0°								
D 1			0°								
2			0°								
3			0°								
4			0°								



	Run 1	Run 2	Run 3	Run 4	
Bar. Pressure	28.94				"Hg
Static Pressure	-.95				"H <sub>2</sub> O
Dry Bulb Temp.	457				°F
Wet Bulb Temp.	149				°F
Moisture Content	13.4				%v/v
320 P Oxygen	5				%v/v
Time of Meas.	730				(24 Hour)

# EPA Method 23 Field Data Sheets



# EPA Method 23 Field Data Sheet

## Isokinetic Dioxin Sampling

Project	FHR_FCC_ICR	Module ID	CM-2	Pitot No.	4-01	C <sub>p</sub>	0.840	Manometer ID	CM-1 Oil
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0060	Bar. Pres.	28.74	In. Hg		TC Sensor ID	CM-1 / TC-14
Date	7/27/2011	Test/Run	T1/R1	Orifice Coef. $\Delta H$ @	-0.95	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	JJE/JDT/TJB	Nozzle No.	SS	D <sub>n</sub>	0.224	%v/v		Scale ID	DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxyge n %v/v
A	4 5	935.45	1.40	1.77	939.20	3.75	6.3	460	251	253	46	51	80	81	4.4
	4 10	942.88	1.38	1.73	942.89	3.69	5.6	460	252	253	45	51	80	81	4.4
	3 15	946.65	1.43	1.79	946.65	3.76	5.6	461	253	254	46	52	86	82	4.3
	3 20	950.43	1.41	1.78	950.40	3.75	5.7	461	253	254	45	52	87	83	4.2
	2 25	954.05	1.30	1.65	954.02	3.62	5.5	457	254	251	44	52	87	83	4.3
B	2 30	957.70	1.31	1.65	957.65	3.63	5.5	461	254	251	44	53	87	83	4.4
	1 35	961.23	1.31	1.65	961.28	3.63	5.5	460	253	256	44	54	87	83	4.3
	1 40	964.45	0.96	1.21	964.38	3.11	5.0	458	247	255	43	55	86	83	4.3
	4 45	967.55	0.95	1.20	967.48	3.09	5.0	457	247	251	46	56	87	84	4.2
	4 50	971.30	1.45	1.83	971.29	3.82	5.7	461	248	247	47	57	87	84	4.3
C	3 55	975.14	1.45	1.83	975.11	3.82	5.4	461	248	248	48	58	87	85	4.3
	3 60	978.75	1.32	1.67	978.76	3.65	5.5	461	249	248	50	63	88	85	4.3
	2 65	982.26	1.20	1.52	982.24	3.48	5.3	459	251	251	51	64	88	85	4.3
	2 70	985.45	0.99	1.26	985.41	3.17	5.0	457	253	251	52	63	88	86	4.3
	1 75	988.53	0.92	1.17	988.46	3.06	4.7	457	253	252	54	62	87	86	4.2
	1 80	991.50	0.91	1.16	991.50	3.04	4.4	457	249	253	47	62	87	86	4.2
	4 85	995.41	1.50	1.90	995.39	3.89	4.3	459	251	252	44	61	86	86	4.2
	4 90	999.24	1.45	1.83	999.21	3.82	5.6	463	251	251	43	60	86	86	4.2
	3 95	1002.98	1.40	1.76	1002.96	3.75	5.5	464	253	250	42	59	87	86	4.3
	3 100	1006.65	1.37	1.73	1006.67	3.71	5.4	463	253	250	46	58	87	86	4.3
	2 105	1010.18	1.22	1.54	1010.18	3.51	5.2	462	252	253	47	60	87	86	4.3
	2 110	1013.65	1.20	1.52	1013.66	3.48	5.2	462	251	254	52	62	86	86	4.2
	1 115	1017.15	1.20	1.51	1017.13	3.47	5.3	462	253	253	53	63	88	85	4.4
	1 120	1020.50	1.10	1.39	1020.46	3.33	5.1	462	251	252	55	63	88	85	4.4
Tot/Avg		$\theta =$	$\sqrt{\Delta P} =$	$\Delta H =$				$t_s =$						$t_m =$	$O_2 =$

### Sampling Train Leak Checks:

Pretest \_\_\_ @ \_\_\_ "Hg  
 Posttest \_\_\_ @ \_\_\_ "Hg  
 Pitot - Pos \_\_\_ Neg \_\_\_

### Comments:

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume							
Difference							



Pace Analytica  
FSD 1108-200

Project	FHR_FCC_ICR	Module ID	CM-2	Pitot No.	4-01	C <sub>p</sub>	0.840	Manometer ID	CM-1 Oil
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0060	Bar. Pres.	28.74	In. Hg		TC Sensor ID	CM-1 / TC-14
Date	7/27/2011	Orifice Coef. $\Delta H @$	1.8890	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	JJE/JDT/TJB	Nozzle No.	SS	Est. Moist.	13	%v/v		Scale ID	DS-10

[illegible]

Samples Recovered:	Filter	: Quartz	X Probe Wash;	X Wet Catch;	X Solvent Rinse;	X Toluene Rinse;
						XAD

Item	Sampling	Train	Leak Checks	Comments:
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Pretest 0.00@ 15 "Hg

Posttest 0.00 @ 13 "F

Pitot - Pos. Ok Neg. OK

Verified By: Joey Erickson

Signed By: \_\_\_\_\_

Date: 7-27-11

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	330	99	99	0		1483	
Initial Volume	0	100	100	0		1446	
Difference	330	-1	-1	0		37	365





Pace Analytical  
FSD 1108-200

FSD PN: 1106-200

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# EPA Method 23 Field Data Sheet

## Isokinetic Dioxin Sampling

Project	FHR_FCC_ICR	Module ID	CM-2	Pitot No.	4-01	C <sub>p</sub>	0.840	Manometer ID	CM-1 Oil
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0060	Bar. Pres.	28.74	In. Hg		TC Sensor ID	CM-1 / TC-14
Date	7/27/2011	Orifice Coef. $\Delta H @$	1.8890	Static Pres.	-0.91	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	JJE/JDT/TJB	Nozzle No.	SS	Est. Moist.	13	%v/v		Scale ID	DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
B	4	5	1.38	1.74	52.40	3.73	5.8	461	258	247	45	59	88	88	3.9
	4	10	1.35	1.71	56.10	3.70	5.8	460	253	246	40	54	92	88	3.9
	3	15	1.35	1.72	59.82	3.72	6.1	460	247	245	41	54	93	88	4.0
	3	20	1.32	1.69	63.50	3.68	5.4	459	249	250	42	54	94	89	4.1
	2	25	1.24	1.59	67.07	3.58	5.3	457	257	257	42	55	94	89	4.3
	2	30	1.19	1.53	70.58	3.50	5.0	457	250	249	44	57	95	90	4.2
	1	35	0.95	1.22	73.72	3.14	4.5	456	250	246	45	59	97	97	4.3
	1	40	0.94	1.22	76.87	3.15	4.4	455	251	252	45	58	97	91	4.3
	4	45	1.50	1.92	80.81	3.94	7.2	461	252	252	44	57	94	92	4.1
	4	50	1.46	1.86	84.69	3.88	7.1	463	251	252	42	56	94	92	4.2
	3	55	1.39	1.77	88.47	3.79	7.0	463	252	251	43	56	96	94	3.8
	3	60	1.43	1.83	92.33	3.86	7.2	462	248	249	42	56	94	91	3.9
	2	65	1.43	1.82	96.16	3.84	7.2	463	247	251	41	56	97	92	4.0
	2	70	1.37	1.76	99.94	3.77	6.9	461	254	253	40	56	97	92	4.0
	1	75	0.94	1.20	103.06	3.12	4.5	462	253	254	42	56	97	92	4.1
D	1	80	0.99	1.27	106.27	3.21	4.5	458	253	254	43	57	97	94	4.1
	4	85	1.40	1.80	110.09	3.82	5.9	460	254	252	45	60	96	95	4.3
	4	90	1.33	1.71	113.81	3.72	5.8	463	252	251	45	55	100	98	4.2
	3	95	1.25	1.62	117.44	3.63	5.5	462	253	250	46	55	100	96	4.2
	3	100	1.20	1.55	120.99	3.55	5.5	462	254	255	45	56	99	97	4.3
	2	105	1.20	1.55	124.54	3.55	5.4	463	253	257	44	56	97	97	4.3
	2	110	1.25	1.60	128.15	3.61	5.5	465	253	253	44	56	97	97	4.2
	1	115	1.00	1.29	131.40	3.24	4.7	458	253	252	43	57	97	97	4.2
	1	120	1.00	1.29	134.64	3.24	4.6	458	254	251	45	58	97	98	4.2
Tot/Avg $\theta =$		$V_m$	$\sqrt{\Delta P} =$	$\Delta H =$				$t_s =$						$t_m =$	$O_2 =$

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume							
Difference							

Comments:

Sampling Train Leak Checks:

Pretest \_\_\_ @ \_\_\_ "Hg  
Posttest \_\_\_ @ \_\_\_ "Hg  
Pitot - Pos. \_\_\_ Neg. \_\_\_

Verified By: Jody Erickson Signed By: [Signature] Date: 7/27/11



# EPA Method 23 Field Data Sheet

## Isokinetic Dioxin Sampling

Project	FHR_FCC_ICR	Module ID	CM-2	Pitot No.	4-01	C <sub>p</sub>	0.840	Manometer ID	CM-1 Oil
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0060	Bar. Pres.	28.74	In. Hg		TC Sensor ID	CM-1 / TC-14
Date	7/27/2011	Orifice Coef. $\Delta H @$	1.8890	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	JJE/JDT/TJB	Nozzle No.	SS	D <sub>n</sub>	0.224	%v/v		Scale ID	DS-10

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Velocity Head ΔP Inches H <sub>2</sub> O	Orifice Meter ΔH Inches H <sub>2</sub> O	Desired ΔV <sub>m</sub> Cubic Feet	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
A 4	125	138.42	1.40	1.81	138.47	3.83	5.8	461	251	248	46	58	99	98	3.9
	130	141.95	1.38	1.78	142.28	3.81	5.6	462	254	247	46	58	103	98	3.9
	135	145.64	1.30	1.69	146.00	3.71	5.6	461	255	247	46	59	105	99	4.0
	140	149.40	1.30	1.69	149.72	3.72	5.6	462	248	249	47	59	104	98	4.1
	145	152.90	1.15	1.49	153.22	3.50	5.3	460	289	251	47	59	104	99	4.3
2	150	156.51	1.20	1.56	156.80	3.58	5.4	459	251	252	48	60	104	100	4.2
1	155	159.68	0.96	1.25	160.00	3.20	5.1	459	252	254	48	61	104	100	4.3
1	160	162.85	0.97	1.27	163.23	3.23	5.1	456	252	255	48	62	104	100	4.3
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θ=160		V = 114.18	√ΔP= 1.1084	ΔH= 1.59				t <sub>s</sub> = 460.28						t <sub>m</sub> = 96.13	O <sub>2</sub> = 4.11

Samples Recovered:	Filter	: Quartz	X Probe Wash;	X Wet Catch;	X Solvent Rinse;	X Toluene Rinse; XAD

**Sampling Train Leak Checks:**

Pretest 0.00@ 15 "Hg

Posttest 0.00 @ 13 "H

Control	Pos.	Ok	Neg.	OK
Pitot - Pos.	Ok	Neg.	OK	

Verified By: Jay Erickson

Signed By:

1

Date: 7-2-11

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	325	99	100	0	0	1388	
Initial Volume	0	100	100	0	0	1359	
Difference	325	-1	0	0	0	29	353





# EPA Method 23 Field Data Sheet

## Isokinetic Dioxin Sampling

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FSD PN: 1106-200

Project	FHR_FCC_ICR	Module ID	CM-2	Pitot No.	4-01	Cp	0.840	Manometer ID	CM-1 Oil
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0060	Bar. Pres.	28.74	In. Hg		TC Sensor ID	CM-1 / TC-14
Date	7/27/2011	Orifice Coef. $\Delta H @$	1.8890	Static Pres.	-0.93	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	JJE/JDT/TJB	Nozzle No.	SS	Est. Moist.	13	%v/v		Scale ID	DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
C	4	163.72	1.40	1.81	167.56	3.84	5.1	461	253	245	44	60	98	98	4.0
	5	167.46	1.40	1.80	171.39	3.83	5.2	465	251	245	44	59	98	98	4.0
	10	171.32	1.40	1.74	175.15	3.76	5.3	463	252	253	44	58	99	98	4.0
	15	175.06	1.35	1.68	178.85	3.70	5.3	462	251	251	44	58	101	98	4.1
	20	178.83	1.30	1.68	182.55	3.71	5.4	462	251	252	45	58	101	98	4.0
D	2	182.52	1.30	1.55	186.12	3.56	5.1	461	253	256	45	58	101	98	4.0
	3	186.12	1.20	1.27	189.34	3.22	4.6	461	249	253	46	59	101	98	4.0
	1	189.28	0.98	1.32	192.63	3.29	4.6	458	248	250	46	59	102	98	4.0
	1	192.62	1.02	1.81	196.47	3.84	5.6	465	251	251	44	57	102	98	4.2
	4	196.43	1.40	1.81	200.31	3.84	5.6	465	252	250	44	57	102	98	4.2
A	4	200.37	1.40	1.66	203.99	3.68	5.4	463	251	252	45	56	104	99	4.1
	3	204.07	1.28	1.49	207.49	3.50	5.2	462	251	253	45	56	103	99	4.1
	3	207.54	1.15	1.56	211.06	3.57	5.1	460	252	253	45	58	100	99	4.0
	2	211.11	1.20	1.56	214.63	3.56	4.9	460	251	253	45	58	102	99	4.0
	2	214.65	1.20	1.29	217.87	3.25	4.9	458	251	254	46	58	102	98	3.9
A	1	217.96	0.99	1.29	221.12	3.24	4.9	458	251	255	47	58	102	99	3.9
	1	221.14	0.99	1.87	225.03	3.91	5.8	466	252	255	48	58	101	99	3.9
	4	225.04	1.45	1.82	228.88	3.85	5.6	466	251	253	48	58	102	99	3.8
	4	228.94	1.41	1.94	232.86	3.98	5.8	465	251	248	48	59	102	99	4.1
	3	232.85	1.50	1.81	236.71	3.85	5.9	465	253	249	48	60	101	99	3.9
A	3	236.65	1.40	1.88	240.62	3.91	5.8	463	251	251	52	63	101	99	3.8
	2	240.65	1.45	1.61	244.25	3.62	5.8	462	252	253	53	63	100	99	3.9
	2	244.20	1.24	1.35	247.56	3.32	4.8	461	251	253	53	63	100	99	4.1
	1	247.50	1.04	1.36	250.89	3.33	4.8	461	251	250	53	63	100	98	4.1
	1	250.90	1.05												
Tot/Avg		$\theta =$	$V_m$	$\Delta H =$	$\Delta P =$			$t_g =$					$t_m =$		$O_2 =$

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume							
Difference							

Sampling Train Leak Checks:

Pretest \_\_\_ @ \_\_\_ "Hg

Posttest \_\_\_ @ \_\_\_ "Hg

Pitot - Pos. \_\_\_ Neg. \_\_\_

Verified By: Tory Erickson Signed By: [Signature] Date: 7-27-11



Project	FHR_FCC_ICR	Module ID	CM-2	Pitot No.	4-01	C <sub>p</sub>	0.840	Manometer ID	CM-1 Oil
Sample Location	FCC(SV019)	Meter Coef. $\gamma$	1.0060	Bar. Pres.	28.74	In. Hg		TC Sensor ID	CM-1 / TC-14
Date	7/27/2011	Orifice Coef. $\Delta H @$	1.8890	Static Pres.	-0.915	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	JJE/JDT/TJB	Nozzle No.	SS	D <sub>n</sub>	0.22	%v/v		Scale ID	DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. $^{\circ}F$	Filter Temp. $^{\circ}F$	Probe Temp. $^{\circ}F$	Sample Temp. $^{\circ}F$	Impinger Temp. $^{\circ}F$	Meter In Temp. $^{\circ}F$	Mtr Out Temp. $^{\circ}F$	320P Oxygen %v/v
B 4	125	254.85	1.45	1.88	254.81	3.91	5.6	461	252	253	50	65	100	99	4.1
	130	258.78	1.45	1.88	258.72	3.92	5.6	461	251	252	47	64	100	93	4.0
	135	262.70	1.46	1.88	262.63	3.90	5.6	463	252	251	46	63	102	98	4.1
	140	266.46	1.35	1.75	266.40	3.78	5.5	463	252	250	48	64	102	98	4.0
	145	270.06	1.25	1.62	270.04	3.64	5.2	460	247	255	52	64	102	98	3.9
	150	273.73	1.25	1.62	273.69	3.64	5.2	460	249	249	49	64	102	98	3.9
	155	277.07	1.03	1.34	276.99	3.30	4.8	460	251	248	46	63	102	98	3.9
	160	280.30	1.01	1.31	280.27	3.28	4.8	458	252	249	44	61	102	98	4.1
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tot/Avg	$\theta=160$	$V_m=116.58$	$\sqrt{\Delta P}=1.1204$	$\Delta H=1.63$				$t_s=461.84$						$t_m=99.70$	$O_2=4.01$

Samples Recovered:	Filter		Quartz		X Probe Wash;	X Wet Catch;	X Solvent Rinse;	X Toluene Rinse;	XAD
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### Sampling Train Leak Checks:

Pretest 0.00@ 14 "Hg

Posttest 0.00 @ 7 "Hg

Pitot - Pos. Ok Neg. OK

Verified By: Jody Erickson Signed By: \_\_\_\_\_

Date: 7-27-11

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	336			0		1494	
Initial Volume	0	100	100	0		1434	
Difference	336	-1	-7	0		60	395

# EPA Method 5/29 Field Data Sheets





# EPA Method 29 Field Data Sheet

## Isokinetic Metals Sampling

FSD PN: 1106-200

Project FHR\_FCC\_ICR Module ID CM-12 Pitot No. 4-02 Cp 0.34 Manometer ID CM-12  
Sample Location FCC (SV019) Meter Coef.  $\gamma$  1.0053 Bar. Pres. 28.88 In. Hg CM-12  
Date 7/28/11 Test/Run T1 R1 Orifice Coef.  $\Delta H$  @ 7.603 Static Pres. -0.95 In. H<sub>2</sub>O DB-5  
Operators/Techs ATR/MBW/BDE Nozzle No. Glass D<sub>no</sub> 0.257 Est. Moist. 13 %v/v DS-10 Scale ID

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches $H_2O$	Orifice Meter $\Delta H$ Inches $H_2O$	Desired $\Delta V_m$ Cubic Feet	Incr- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. $^{\circ}F$	Filter Temp. $^{\circ}F$	Probe Temp. $^{\circ}F$	Sample Temp. $^{\circ}F$	Impinger Temp. $^{\circ}F$	Meter In Temp. $^{\circ}F$	Mtr Out Temp. $^{\circ}F$	320P Oxygen %v/v
	(6710)	702.77													
1	5	707.75	1.45	2.68	5.01	707.78	3.5	462	240	274	NA	53	86	87	4.2
1	10	712.56	1.40	2.58	4.91	712.69	3.5	467	243	273		54	83	87	4.3
2	15	717.32	1.30	2.39	4.72	717.41	3.5	467	246	271		54	84	87	4.3
2	20	722.03	1.30	2.39	4.73	722.14	3.4	467	247	271		55	85	87	4.3
3	25	726.70	1.20	2.21	4.54	726.68	3.2	467	247	255		56	86	87	4.1
3	30	731.21	1.20	2.21	4.55	731.23	3.2	466	247	251		56	87	87	4.3
4	35	735.53	1.10	2.03	4.36	735.60	3.0	465	250	253		57	87	87	4.4
4	40	739.96	1.10	2.03	4.36	739.16	3.0	465	250	245		56	87	87	4.2
1	45	744.82	1.40	2.58	4.92	744.86	3.8	467	248	237		53	87	80	4.0
1	50	749.88	1.45	2.67	5.00	749.88	4.0	467	250	250		55	86	87	4.0
2	55	754.70	1.35	2.49	4.82	754.70	3.9	467	248	261		56	87	87	4.0
2	60	759.51	1.35	2.49	4.83	759.53	3.9	467	247	247		57	87	88	4.1
3	65	764.25	1.30	2.40	4.74	764.27	3.8	463	247	247		57	87	88	4.1
3	70	768.99	1.30	2.40	4.74	769.01	3.8	467	249	246		58	87	88	4.0
4	75	773.53	1.20	2.21	4.56	773.54	3.7	467	251	253		55	89	88	4.0
4	80	778.14	1.20	2.22	4.57	778.14	3.7	466	249	245		56	90	88	4.0



# EPA Method 29 Field Data Sheet

## Isokinetic Metals Sampling

FSD PN: 1106-200

Pace Analytical  
FSD 1108-200

FHR Pine Bend LLC  
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Project FHR FCC ICR

Sample Location	FCC (SV019)
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Date	Test/Run	T1	R1
7/28/11			

Operators/Techs ATR / mrv / BDE

Module ID CM-12

Meter Coef.  $\gamma$  1.0053Orifice Coef.  $\Delta H @ 1.603$ 

Nozzle No. 6155  
Dn 025

Pitot No.

Bar. Pres.

Static Pres.

Est. Moist.

500

28, 28

5620

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82

19

 $\text{I}_2\text{O}$ 

1

Manometer ID

TC Sensor ID

Barometer ID

Scale ID

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incr- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. $^{\circ}F$	Filter Temp. $^{\circ}F$	Probe Temp. $^{\circ}F$	Impinger Temp. $^{\circ}F$	Meter In Temp. $^{\circ}F$	Mtr Out Temp. $^{\circ}F$	320P Oxygen %v/v
(0835G)		778.14												
1	85	782.95	1.40	2.59	4.94	783.07	4.1	467	249	258	35	90	90	4.0
1	90	787.81	1.35	2.51	4.86	787.93	4.1	465	257	253	57	91	91	4.1
2	95	792.62	1.30	2.42	4.78	792.71	4.1	464	251	257	59	92	91	4.1
2	100	797.44	1.30	2.42	4.78	797.50	4.1	465	247	247	61	93	93	4.0
3	105	802.08	1.20	2.24	4.61	802.16	4.0	465	248	247	63	92	94	4.1
3	110	806.70	1.20	2.24	4.61	806.71	4.0	465	251	251	64	92	94	4.1
4	115	811.13	1.10	2.06	4.41	811.13	3.9	464	250	251	63	92	95	4.0
4	120	815.40	1.05	1.95	4.28	815.40	3.8	464	251	247	62	92	95	4.1
1	125	820.44	1.45	2.71	5.07	820.47	4.9	466	249	265	66	92	94	4.2
1	130	825.46	1.40	2.61	4.98	825.45	4.8	465	256	271	64	90	94	4.1
2	135	830.36	1.35	2.52	4.88	830.32	4.6	465	250	270	62	92	94	4.0
2	140	835.21	1.35	2.52	4.89	835.21	4.6	465	248	266	64	93	95	4.2
3	145	839.94	1.25	2.34	4.71	839.92	4.4	465	248	257	64	92	94	4.1
3	150	844.71	1.30	2.43	4.80	844.72	4.5	465	249	250	63	93	94	4.1
4	155	849.20	1.15	2.15	4.52	849.24	4.1	464	251	244	64	92	93	4.1
4	160	853.75	1.15	2.15	4.51	853.75	4.1	463	249	246	63	92	94	4.1
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Samples Recovered: Filter \_\_\_\_\_

☒ PW; ☒ FR; ☒ HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>; ☒ Dry Impinger;; ☒ KMnO<sub>4</sub>/H<sub>2</sub>SO<sub>4</sub>; ☒ HCl Rinse

RC 7/25/11 ATR

Sampling Train Leak Checks:		Comments:					
Pretest	0.0 @ 0.0 "Hg						
Posttest	0.0 @ 0.5 "Hg						
Pitot - Pos.	✓ Neg. ✓						

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	553	100	0			1444	
Initial Volume	100	100	0			1405	
Difference	453	0	0			38	491



ESD PN: 1106-200

Pace Analytical  
FSD 1108-200

FHR Pine Bend LLC  
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Project FHR_FCC_ICR		Module ID	Cm-12	Pitot No.	C <sub>p</sub> 0.84	Manometer ID	Cm-12
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0053	Bar. Pres.	28.88	TC Sensor ID	Cm-2
Date	7/28/11	Orifice Coef. $\Delta H @$	1.603	Static Pres.	-0.95	Barometer ID	DB-5
Operators/Techs	ATE / msw / RDE	Nozzle No. $G_{455}$	D <sub>n</sub> 0.257	Est. Moist.	13	Scale ID	DS-10
Test/Run							

[illegible]

	PW:	/	ER:	HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> :	Dry Impinger::	KMnO <sub>4</sub> /H <sub>2</sub> SO <sub>4</sub> :	HCl Rinse
Samples Recovered:	Filtror						

	1	2	3	4	5	Desiccant	Total
Impinger No.							
Final Volume							
Initial Volume	100	100	0				
Difference							

**Comments:**

ments:  
A RE 728/11 BR

Page 1 of 1

### Sampling Train Leak Checks:

Pretest c/ @ 10 "Hg

Posttest, 41 @ 5.5 "Hg

$\frac{500}{3000} \text{ Neg. } \frac{00}{2300}$   
 $\frac{400}{3000} \text{ H}_2\text{O}$   
 $\frac{100}{3000} \text{ H}_2\text{O}$





# EPA Method 29 Field Data Sheet

## Isokinetic Metals Sampling

FSD PN: 1106-200

Field Services Division

Project	FHR_FCC_ICR	Module ID	Chm-12	Pitot No.	4-02	Cp	0.84	Manometer ID	Chm-12
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	10033	Bar. Pres.	28.83	In. Hg		TC Sensor ID	Chm-12
Date	7/28/11	Orifice Coef. $\Delta H @$	1.663	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	ATR/MBW/BDE	Nozzle No.	Chm-35	Est. Moist.	13	%v/v		Scale ID	DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
1	85	930.77	1.45	2.71	5.06	935.33	3.8	465	249	253	62	93	95	4.1
1	90	940.91	1.45	2.71	5.08	940.91	3.8	464	250	262	62	91	95	4.0
2	95	945.89	1.40	2.42	4.98	945.89	3.8	464	250	263	57	93	95	4.0
2	100	950.88	1.40	2.42	4.99	950.88	3.8	464	249	265	58	94	96	3.5
3	105	955.60	1.25	2.34	4.70	955.60	3.7	465	249	249	60	94	96	4.0
3	110	960.38	1.25	2.34	4.72	960.38	3.7	465	250	250	61	95	97	4.0
4	115	964.95	1.15	2.16	4.51	964.95	3.4	464	244	249	60	93	97	4.0
4	120	969.38	1.15	2.16	4.53	969.38	3.4	464	248	249	60	95	97	4.0
1	125	974.34	1.40	2.63	5.00	974.34	3.9	465	247	260	62	96	98	4.0
1	130	979.35	1.40	2.64	5.02	979.35	3.9	464	252	263	59	95	99	4.0
2	135	984.24	1.30	2.45	4.84	984.24	3.8	463	252	262	61	96	99	4.1
2	140	989.20	1.35	2.55	4.93	989.20	4.0	463	250	258	62	95	99	4.0
3	145	993.80	1.20	2.26	4.65	993.81	3.6	463	249	251	59	96	99	3.9
3	150	998.40	1.20	2.26	4.65	998.46	3.6	463	250	246	59	96	100	4.0
4	155	1003.00	1.15	2.17	4.56	1003.02	3.5	462	250	250	57	96	100	4.0
4	160	1007.48	1.10	2.08	4.46	1007.48	3.4	462	250	248	58	97	100	4.1
(1335)														
7/28/11 ATR														
Tot/Avg	0=160	$V_m = 153.08$	$\Delta P = 1.1349$	$\Delta H = 2.42$				$t_s = 463.7$					$t_m = 94$	$O_2 = 4.1$

Samples Recovered: Filter ; PW; FR; ☒ HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>; ☒ Dry Impinger;; ☒ KMnO<sub>4</sub>/H<sub>2</sub>SO<sub>4</sub>; ☒ HCl Rinse

## Sampling Train Leak Checks:

Pretest 101 @ 10 "Hg

Posttest 201 @ 5.5 "Hg

Pitot - Pos. 0.0 Neg. 0.0

(23.0) H<sub>2</sub>O @ 3.0" H<sub>2</sub>O

## Comments:

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	549	100	0			1456	
Initial Volume	100	100	0			1417	
Difference	449	0	0			39	488

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FSD AN: 1106-200

**tical**  
**Field Services Division**

Page Analytical  
FSD 1108-200

Project FAR - FCC - TCP  
 Sample Location FCC (SVO19)  
 Date 7/23/11 Test 1 Run 3  
 Technicians ATR / WRW / BDE

Module ID CM-12  
 Meter Coef.  $\gamma$  10053  
 Orifice Coef.  $\Delta H@$  1603  
 Nozzle No.  $D_{base}$  0.257

Pitot Tube No. 402  $C_p$  0.84  
Bar. Pres. 28.58 In. Hg  
Static Pres. -0.75 In. H<sub>2</sub>O  
Est. Moisture 13 %v/v

Manometer ID CM-12  
 TC Sensor ID CM-12  
 Barometer ID DB-5  
 Scale ID PS-10

[illegible]

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Samples Recovered: Filter No. 11; ☒ PW; ☐ FR; ☒  $\text{HNO}_3/\text{H}_2\text{O}_2$ ; ☐ Dry Impinger; ☒  $\text{KMnO}_4/\text{H}_2\text{SO}_4$ ; ☒ HCl Rinse

**Sampling Train Leak Checks:**

Pretest 0.01 @ 10 In. Hg  
Posttest 0.01 @ 3.5 In. Hg  
Pitot - Pos. 0.0 Neg. 4.0  
3/30/2004

Box No. \_\_\_\_\_ Bag Material \_\_\_\_\_  
 Bag No. \_\_\_\_\_ Leak Check \_\_\_\_\_ cc/min @ 25"Hg  
 Bag Vol. \_\_\_\_\_ ltr. \_\_\_\_\_ Posttest O<sub>2</sub> Rdg \_\_\_\_\_ 320P No. \_\_\_\_\_  
 \*RE 7/25/11 ATR

### Moisture Recovery Data (ml-g):

Impinger No.	1	2	3	4	5	6	Desiccant	Total
Final Volume	522	100	0	✓	✓	✓	1432	
Initial Volume	100	100	0	✓	✓	✓	1392	
Difference	422	0	0	✓	✓	✓	40	462



FSD PN: 1146-200  
Page 2 of 2

# EPA Method 29 Field Data Sheet

## Isokinetic Metals Sampling

Pace Analytica  
FSD 1108-200

Module ID CM-12  
 Meter Coef.  $\gamma$  1.6053  
 Orifice Coef.  $\Delta H @$  1.603  
 Nozzle No. 01485  $D_n$  0.2557

Pitot Tube No. 4-02 C<sub>p</sub> 0.54  
Bar. Pres. 28.88 In. Hg  
Static Pres. -0.95 In. H<sub>2</sub>O  
Est. Moisture 13 %v/v

Manometer ID LM-12  
 T/C Sensor ID LM-12  
 Barometer ID DB-5  
 Scale ID DS-16

[illegible]

Page A-19 of 86

Samples Recovered: Filter No. \_\_\_\_\_; ☐ PW; ☒ FR; ☐ HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>; ☒ Dry Impinger; ☒ KMnO<sub>4</sub>/H<sub>2</sub>SO<sub>4</sub>; ☒ HCl Rinse

### Sampling Train Leak Checks:

Pretest @ 16 In. Hg  
Posttest @ 35 In. Hg  
Pitot - Pos. 0.0 Neg. 0.0  
3/30/2004 03.02 H<sub>2</sub>O

**Integrated Gas Sampling Data:**

Bag Material \_\_\_\_\_  
 Box No. \_\_\_\_\_  
 Bag No. \_\_\_\_\_  
 Bag Vol. \_\_\_\_\_ ltr.  
 Leak Check \_\_\_\_\_ cc/min @ 25" Hg  
 Posttest O<sub>2</sub> Rdg \_\_\_\_\_ 320P No. \_\_\_\_\_

### Moisture Recovery Data (ml-g):

Moisture Recovery Data (m-g):								
Impinger No.	1	2	3	4	5	6	Desiccant	Total
Final Volume								
Initial Volume	100	100	0					
Difference								

for copy R

# Ontario Hydro Method Field Data Sheets



# Ontario Hydro Method Field Data Sheet

## Isokinetic Mercury Sampling

FSD PN: 1106-200

## INDUSTRIAL SAFETY

Pace Analytical  
FSD 1108-200

Project	FHR_FCC_ICR	Module ID	cm-12	Pitot No.	4-02	C <sub>p</sub>	0.840	Manometer ID	cm-12
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0053	Bar. Pres.	28.73	In. Hg		TC Sensor ID	cm-12
Date	7/27/11	Orifice Coef. $\Delta H @$	1.603	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	B-5
Operators/Techs	man/AR	Nozzle No. 6.465	D <sub>n</sub> 0.257	Est. Moist.	13	%v/v		Scale ID	DS-10

[illegible]

Samples Recovered: Filter

### Sampling Train Leak Checks:

Sampling Train Leak Checks:										
Impinger No.	1	2	3	4	5	6	7	8	Desiccant	Total
Pretest 0.00 @ 11.00 "Hg	935	864	799	774	640	741	697		1433	
Posttest 0.00 @ 10.00 "Hg	620	644	744	785	710	768	704	638	771	707
Pitot - Pos. 0.00 Neg. 0.00	185	100	14	6	7	1	0		46	354

Q3" H<sub>2</sub>O

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# Ontario Hydro Method Field Data Sheet

## Isokinetic Mercury Sampling

FSD PN: 1106-200

Field Services Division

Pace Analytical  
FSD 1108-200

Project	FHR_FCC_ICR	Module ID	cm-12	Pitot No.	4-02	C <sub>p</sub>	0.840	Manometer ID	cm-12
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0053	Bar. Pres.	28.73	In. Hg		TC Sensor ID	cm-12
Date	7/27/11	Orifice Coef. $\Delta H @$	1.603	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	B-5
Operators/Techs	mm/AJR	Nozzle No. base	D <sub>n</sub> 0.257	Est. Moist.	13	%v/v		Scale ID	DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mitr Out Temp. °F	320P Oxygen %v/v
(11215)		478.93													
1	7.5	486.27	1.40	2.59	7.39	486.32	12.0	463	255	340	N/A	65	86	85	4.2
2	15	493.41	1.30	2.40	7.13	493.45	12.0	463	290	347		50	85	87	4.0
3	22.5	500.39	1.20	2.22	6.86	500.31	11.8	462	308	382		49	86	87	4.0
4	30	506.36	0.93	1.73	6.05	506.56	9.7	460	326	364		48	86	87	4.3
1	37.5	513.70	1.35	2.51	7.29	513.64	12.2	461	342	363		57	89	91	4.2
2	45	520.62	1.20	2.23	6.89	520.54	10.8	466	349	395		49	88	91	4.1
3	52.5	527.10	1.10	2.04	6.60	527.14	10.0	465	356	372		48	88	91	4.0
4	60	532.37	0.95	1.77	6.14	533.28	9.5	462	362	377		49	89	91	4.1
* 1	67.5	540.60	1.35	2.52	7.33	540.61	12.0	462	356	370		60	92	93	4.3
2	75	547.70	1.25	2.33	7.06	549.67	11.7	467	367	395		52	89	93	4.2
3	82.5	554.40	1.15	2.14	6.76	554.43	11.3	467	371	394		51	89	93	4.4
4	90	560.65	0.97	1.81	6.21	560.64	10.3	465	374	395		52	90	93	4.4
1	97.5	567.85	1.30	2.42	7.20	567.84	12.0	465	374	406		59	91	93	4.2
2	105	574.91	1.20	2.24	6.92	574.86	11.8	467	375	400		56	91	93	4.0
3	112.5	581.40	1.10	2.05	6.62	581.38	11.0	467	375	385		56	92	94	4.0
4	120	587.50	0.95	1.78	6.17	587.55	10.2	465	376	394		55	91	93	3.9
(1455)		.	.	.			.								
		.	.	.			.								
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		.	.	.			.								
Total/Avg	$\theta = 170$	$V_m = 108.67$	$\sqrt{\Delta P} = 1.0288$	$\Delta H = 2.17$				$t_s = 464.7$						$t_m = 89.9$	$O_2 = 4.1$

Samples Recovered: Filter	3692
---------------------------	------

Further volume 758 775 729 704 721 726 716

## Sampling Train Leak Checks:

Impinger No.	1	2	3	4	5	6	7	8	Desiccant	Total
Final Volume	936	845	750	713	729	722	716		1060	
Initial Volume	<del>678</del>	<del>789</del>	<del>777</del>	<del>730</del>	<del>673</del>	<del>693</del>	<del>664</del>		1037	
Difference	178	110	21	29	8	1	0		23	350

$$\frac{0.314 \text{ g}}{0.001 \text{ mol}} = 314 \text{ g/mol}$$



# Ontario Hydro Method Field Data Sheet

## Isokinetic Mercury Sampling

FSD PN: 1106-200

**Field Services Division**

Pace Analytical  
FSD 1108-200

Project	FHR_FCC_ICR	Module ID	Cm-12	Pitot No.	4-02	C <sub>p</sub>	0.840	Manometer ID	Cm-12
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0053	Bar. Pres.	28.73	In. Hg		TC Sensor ID	Cm-12
Date	2/27/11	Orifice Coef. $\Delta H @$	1.603	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	B-5
Operators/Techs	mm/AB	Nozzle No.	4055	D <sub>n</sub>	0.257	%v/v	13	Scale ID	D5-10

[illegible]

Samples Recovered: Filter 3693

### Sampling Train Leak Checks:

	Pretest	Posttest	Pitot - Pos.	Neg.	Total
"Hg @ 12.5"	867	857	801	775	642
"Hg @ 8.5"	754	765	781	764	640
Difference	208	92	20	11	2
					4
					0
					26
					363

03" 647

# EPA Method 0061 Field Data Sheets





Page 1 of 2

# EPA Method 0061 Field Data Sheet

## Isokinetic Hexavalent Chromium Sampling

Project FHR\_FCC\_ICR Module ID CM-4 Pitot No. 10125/10 C<sub>p</sub> .84 Manometer ID CM-4  
Sample Location FCC (SV019) Meter Coef. γ .9495 Bar. Pres. 22.73 In. Hg CM-4  
Date 7/27/11 Test/Run T1 R1 Office Coef. ΔH@ 1.704 Static Pres. -0.95 In. H<sub>2</sub>O DB-5  
Operators/Techs m3d/ATR Nozzle No. C2032 D<sub>n</sub> 2.43 Est. Moist. 13 %v/v DS-10 Scale ID

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Velocity Head ΔP Inches H <sub>2</sub> O	Orifice Meter ΔH Inches H <sub>2</sub> O	Desired ΔV <sub>m</sub> Cubic Feet	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
1	(220)	11.40			4.5	15.90	4.4	460	460		60	78	78	4.3
1	5	15.78	1.45	2.26	4.5	15.90	5.1	462	462		60	78	78	4.1
2	10	20.31	1.50	2.33	4.5	20.15	5.0	462	462		60	78	78	4.1
2	15	24.75	1.45	2.25	4.48	19.92	5.0	467	467		58	86	86	4.1
2	20	29.39	1.45	2.24	4.47	19.9	5.0	467	467		57	86	86	4.1
3	25	33.71	1.35	2.08	4.31	17.0	5.0	470	470		57	86	86	4.0
3	30	37.91	1.35	2.08	4.31	17.0	5.0	468	468		56	82	82	4.0
4	35	42.02	1.15	1.78	3.98	19.9	5.0	468	468		57	82	82	4.3
4	40	46.05	1.20	1.86	4.08	16.6	4.8	468	468		61	80	80	4.1
1	45	50.47	1.40	2.16	4.40	14.6	5.2	469	469		59	82	82	4.1
1	50	54.86	1.40	2.16	4.39	14.8	5.2	470	470		58	82	82	4.1
2	55	59.04	1.40	2.16	4.39	14.8	5.2	470	470		57	82	82	4.1
2	60	63.60	1.45	2.24	4.48	13.3	5.2	468	468		56	81	81	4.3
3	65	67.86	1.30	2.01	4.25	16.97	5.2	468	468		59	82	82	4.1
3	70	72.07	1.25	1.94	4.16	17.13	5.0	465	465		59	82	82	4.1
4	75	75.82	1.00	1.55	3.72	17.86	4.5	469	469		61	80	80	4.1
4	80	79.94	1.20	1.87	4.09	17.94	4.4	465	465					4.1
Tot/Avg	θ= 160	V <sub>m</sub> = 136.35	ΔP= 1.14	ΔH= 2.03				t <sub>s</sub> = 467.3					t <sub>m</sub> = 80.9	O <sub>2</sub> = 4.6

Method 0061  
ATR 7/27/11

ATR 7/27/11

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	—	—	763	—	—	1399	
Initial Volume	116	70	70+150	—	—	1291	
Difference	—	313	150	—	—	108	421

Sampling Train Leak Checks:  
Pretest 0.00 @ 0.5 "Hg  
Posttest 0.00 @ 0.5 "Hg  
Pitot - Pos. 0.00 Neg. 0.00  
3.0" H<sub>2</sub>O 3.0" H<sub>2</sub>O

Comments:

Page 1 of 2



Page 2 of 2

# EPA Method 0061 Field Data Sheet

0158101

Project	FHR_FCC_ICR	Module ID	CM-4	Pitot No.	4-4	C <sub>p</sub>	0.84	Manometer ID	CM-4
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	0.9949	Bar. Pres.	28.73	In. Hg		TC Sensor ID	CM-4
Date	7/27/11	Orifice Coef. $\Delta H @$	1.704	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	MRW/ATB	Nozzle No.	Glass	Est. Moist.	D <sub>10.343</sub>	%v/v		Scale ID	DS-10

mathad 0061  
ATR 7/27/11

[illegible]

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	—	—	763			1399	
Initial Volume	160	70	70+150			1291	
Difference		313	<del>150</del>			108	481

**Comments:**

### Sampling Train Leak Checks:

Pretest 2.00 @ 8 "Hg

Posttest 0.00 @ 6.5 "Hg

Pitot - Pos. ✓ Neg. ✓

Page 2 of 2





FSD PN: 1106-200

Project FHR\_FCC\_ICR

Sample Location FCC (SV019)

Date 7/27/11 Test/Run T1 R 2

Operators/Techs W333/ATP

Module ID CM-4

Meter Coef. γ

Office Coef. ΔH@

Nozzle No. 6155 Dn 243

Pitot No. 4-4

Bar. Pres. 78.73

Static Pres. 55

Est. Moist. 13

Manometer ID CM-4

TC Sensor ID CM-4

Barometer ID DB-5

Scale ID DS-10

# EPA Method 0061 Field Data Sheet

## Isokinetic Hexavalent Chromium Sampling

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Velocity Head ΔP Inches H <sub>2</sub> O	Orifice Meter ΔH Inches H <sub>2</sub> O	Desired ΔV <sub>m</sub> Cubic Feet	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
1	5	152.03	1.20	1.86	409	199	4.2	469	N/A	N/A	67	82	4.1
1	10	156.05	1.20	1.86	409	608	4.2	468			65	82	3.9
2	15	160.23	1.30	2.02	426	634	4.2	468			60	82	4.0
2	20	164.52	1.30	2.02	426	460	4.2	467			56	82	4.0
3	25	168.59	1.15	1.79	401	860	4.0	469			55	82	4.1
3	30	172.15	1.20	1.87	409	270	4.0	468			56	82	3.9
4	35	176.41	1.00	1.56	374	644	3.6	467			56	84	3.9
4	40	180.24	1.05	1.64	384	828	3.6	467			56	84	4.0
1	45	184.74	1.45	2.26	452	486	4.4	469			60	84	3.8
1	50	189.22	1.45	2.26	452	932	4.4	469			58	85	3.8
2	55	193.71	1.45	2.27	452	193.84	4.6	469			57	85	3.9
2	60	198.15	1.40	2.19	445	198.29	4.3	468			56	86	3.9
3	65	202.59	1.35	2.12	438	202.67	4.3	467			56	86	4.0
3	70	206.85	1.25	1.96	421	206.88	4.2	469			58	87	3.9
4	75	211.00	1.20	1.88	413	211.02	4.2	468			59	87	3.8
4	80	215.07	1.15	1.81	405	215.07	4.2	467			60	87	3.8
Tot/Avg		θ=160 V <sub>m</sub> =137.27	ΔP=1.1365	ΔH=2.03				t <sub>s</sub> =468.6				t <sub>m</sub> =88.9	O <sub>2</sub> =3.8

Method 0061  
AIR 7/27/11

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	150	100	100			1770	
Initial Volume						1453	
Difference			87			317	404

Comments:

Sampling Train Leak Checks:

Pretest 0.00 @ 16 "Hg  
Posttest 0.00 @ 6.0 "Hg  
Pitot - Pos. ✓ Neg. ✓





FSD PN: 1106-200

Project FHR\_FCC\_ICR

Sample Location FCC (SV019)

Date 7/27/11 Test/Run T1 R2

Operators/Techs MSW/ATR

Module ID CM-4

Meter Coef.  $\gamma$  0.9944

Orifice Coef.  $\Delta H$  1.704

Nozzle No. G103

Pitot No. 7-4

Bar. Pres. 28.73

Static Pres. -0.95

Est. Moist. 13

$C_p$  0.84

In. Hg 28.73

In. H<sub>2</sub>O 28.73

%v/v 13

Manometer ID 2m-4

TC Sensor ID CM-4

Barometer ID DB-5

Scale ID DS-10

# EPA Method 0061 Field Data Sheet

## Isokinetic Hexavalent Chromium Sampling

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incr- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. $^{\circ}F$	Probe Temp. $^{\circ}F$	Impinger Temp. $^{\circ}F$	Meter In Temp. $^{\circ}F$	Mtr Out Temp. $^{\circ}F$	320P Oxygen %v/v
	(1553)	215.07											
1	85	219.53	1.50	2.35	4.62	219.69	5.0	470	5.4	61	90	89	3.9
1	90	224.25	1.50	2.36	4.63	224.33	5.0	469		66	90	89	3.8
2	95	228.79	1.46	2.20	4.47	228.79	4.9	470		58	91	89	3.8
2	100	233.23	1.35	2.12	4.39	233.19	4.8	470		57	92	90	3.8
3	105	237.54	1.25	1.97	4.24	237.43	4.8	468		56	92	90	3.7
3	110	241.68	1.20	1.89	4.15	241.58	4.7	468		56	93	91	3.8
4	115	245.73	1.15	1.82	4.07	245.65	4.5	467		58	93	91	3.8
4	120	249.73	1.15	1.82	4.08	249.73	4.5	466		59	94	92	3.9
1	125	254.20	1.50	2.37	4.65	254.39	5.0	471		60	93	93	4.0
1	130	259.06	1.50	2.37	4.65	259.04	5.0	472		58	94	93	3.8
2	135	263.51	1.45	2.29	4.58	263.62	5.0	472		56	94	93	4.0
2	140	268.03	1.40	2.21	4.50	268.12	4.9	471		56	94	93	3.8
3	145	272.48	1.35	2.14	4.42	272.54	4.9	469		57	94	94	3.9
3	150	276.91	1.30	2.06	4.35	276.89	4.8	469		59	94	94	3.7
4	155	281.09	1.20	1.91	4.18	281.07	4.7	467		60	95	94	3.7
4	160	285.17	1.15	1.83	4.10	285.17	4.7	465			97	95	3.7
	(1518)												
At 2/27/11													

Method 0061  
7/27/11 ATR

2.56  
11-27-11

ATR 7/27/11

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	256	100	100			1770	
Initial Volume						1453	
Difference			87			317	404

### Sampling Train Leak Checks:

Pretest 0.0 @ 10 "Hg

Posttest 0.0 @ 65 "Hg

Pitot - Pos. ✓ Neg. ✓

### Comments:









# EPA Method 0011 Field Data Sheets





FSD PN: 1106-200

## EPA Method 0011 Field Data Sheet

Aldehyde Sampling

Project FHR\_FCC\_ICR Module ID CM-12 Pitot No. 4-02 Cp 0.840 Manometer ID CM-12  
Sample Location FCC (SV019) Meter Coef. 1.0053 Bar. Pres. 28.94 In. Hg TC-24/CM-12  
Date 7/26/11 Test/Run T1 R1 Office Coef. ΔH@ 1.603 Static Pres. -0.95 In. H<sub>2</sub>O B-5  
Operators/Techs MBW/TJE/nan/TJB Nozzle No. 64552 D<sub>n</sub> 0.252 Est. Moist. 13 %v/v D5-10 Scale ID

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Velocity Head ΔP Inches H <sub>2</sub> O	Orifice Meter ΔH Inches H <sub>2</sub> O	Desired ΔV <sub>m</sub> Cubic Feet	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Bypass Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
1	4	131.81	1.20	2.27	3.72	135.53	2.0	461	235	235	NA	68	92	4.4
2	8	139.60	1.50	2.83	4.14	139.67	2.5	466	240	241		63	92	4.4
3	12	143.42	1.30	2.44	3.84	143.51	2.5	466	243	257		58	92	4.4
4	16	146.80	1.00	1.82	3.31	146.81	2.2	466	246	248		55	92	4.4
5	20	150.77	1.45	2.66	4.01	150.83	2.2	460	248	247		52	92	4.4
6	24	154.62	1.30	2.38	3.80	154.62	2.2	463	248	268		51	92	4.5
7	28	158.22	1.15	2.10	3.56	158.19	2.1	465	247	269		51	96	4.7
8	32	161.65	1.10	2.01	3.48	161.67	2.1	465	249	260		53	97	4.5
9	36	165.60	1.40	2.58	3.95	165.62	2.4	460	250	261		53	97	4.6
10	40	169.40	1.30	2.39	3.80	169.42	2.3	463	250	252		52	95	4.5
11	44	173.25	1.30	2.38	3.79	173.21	2.3	463	249	249		53	95	4.6
12	48	176.70	1.10	2.01	3.43	176.69	2.2	463	249	253		54	95	4.6
13	52	180.70	1.45	2.65	4.00	180.69	2.8	463	250	245		56	95	4.6
14	56	184.54	1.35	2.46	3.85	184.54	2.8	465	252	266		55	95	4.1
15	60	188.18	1.20	2.19	3.63	188.17	2.8	465	250	260		57	95	4.4
16	64	191.50	1.00	1.82	3.32	191.49	2.5	463	249	246		57	95	4.4
(1320)														
Total/Avg														
0= 64		V <sub>m</sub> = 59.69	ΔP = 1.187	ΔH = 2.31	t <sub>s</sub> = 463.8		t <sub>m</sub> = 92.2		O <sub>2</sub> = 4.5					

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	200	100	547	-	-	1418	
Initial Volume	-	-	100	0	-	1400	
Difference	-	-	147	-	-	18	165

Comments:

Sampling Train Leak Checks:  
Pretest 0.00 @ 13.0 "Hg  
Posttest 0.00 @ 5.0 "Hg  
Pitot - Pos. 0.00 Neg. 0.00  
0.3 H<sub>2</sub>O

\*nan RE







# EPA Method 0011 Field Data Sheet

## Aldehyde Sampling

FSD PN: 1106-200

## INSISTANT SAGIARAC NIEN

Pace Analytical  
FSD 1108-200

FHR Pine Bend LLC  
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Project	FHR_FCC_ICR	Module ID	cm-12	Pitot No.	4-02	C <sub>p</sub>	0.840	Manometer ID	cm-12
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0053	Bar. Pres.	28.94	In. Hg		TC Sensor ID	cm-12/TC-24
Date	2/26/11	Orifice Coef. $\Delta H @$	1.603	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	B-5
Operators/Techs	man/TJB / MBW SSE	Nozzle No.	6855	Est. Moist.	13.14	%v/v		Scale ID	DS-10

[illegible]

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	—	—	551	—	—	1433	
Initial Volume	200	100	100	0	—	1418	
Difference	—	—	151	—	—	15	166

**Comments:**

### Sampling Train Leak Checks:

Pretest 0.00 @ 9.5 "Hg

Posttest 1.00 @ 6.5 "Hg

Page 1 of 1

Pitot - Pos. 0.00 Neg. 0.00 @ 3" dia



# EPA Method 0011 Field Data Sheet

## Aldehyde Sampling

FSD PN: 1106-200

## Field Services Division

Pace Analytical  
FSD 1108-200

FHR Pine Bend LLC  
Page A-35 of 86

Project	FHR_FCC_ICR	Module ID	Can-12	Pitot No.	4-02	C <sub>p</sub>	0.840	Manometer ID	Can-12
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0053	Bar. Pres.	28.94	In. Hg		TC Sensor ID	<del>Can-12</del>
Date	7/26/11	Orifice Coef. $\Delta H @$	1.6003	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	B-5
Operators/Techs	nam/TJB/ATR/BDE	Nozzle No.	6655	Est. Moist.	D <sub>10</sub> 0.257	%v/v		Scale ID	D5-10

[illegible]

### Sampling Train Leak Checks:

Pretest 2.00 @ 7.5 "Hg  
Posttest 0.00 @ 7.0 "Hg  
Pitot - Pos. 0.00 Neg 0.00  
@ 3" H<sub>2</sub>O

**Comments:**

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Page 1 of 1

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	—	—	593	—	—	1375	—
Initial Volume	200	100	100	0	—	1362	—
Difference	—	—	163	—	—	13	1740

\*Knoten RE 13

# EPA Method 201A/202 Field Data Sheets



## EPA Method 201A/202 Field Data Sheet

### 2.5 $\mu\text{m}$ and 10 $\mu\text{m}$ Particulate Sampling (CSR)

Pace Analytica  
FSD 1108-200

Project	FHR_FCC_ICR	Module ID	CM-1	Pitot No.		C <sub>p</sub>	4.02	0.24	Manometer ID	CM-1
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.006	Bar. Pres.		In. Hg	28.88		TC Sensor ID	CM-1/TC-14
Date	7/28/11	Orifice Coef. $\Delta H @$	1.289	Static Pres.		In. H <sub>2</sub> O	<del>16.5</del>		Barometer ID	5
Operators/Techs	MBZ / MBN	Nozzle No.		Est. Moist.		%v/v	13		Scale ID	10

[illegible]

FHR Pine Bend LLC  
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Condensibles	Train Purge:	Start:	Stop:	Purge Duration:
		12:10	13:10	60 min

$\Delta P_{\min}$  763  $\Delta P_{\max}$  2.174  
Samples Recovered: Filter

☐ FH Rinse;   ☐ PM-10 Cyclone;   ☒ PM-2.5 Cyclone;   ☐ Other \_\_\_\_\_  
☒ CPM Solvent Rinse;   ☒ CPM Condensate;   ☒ CPM Filter No. \_\_\_\_\_

### Sampling Train Leak Checks:

Impinging Train Leak Checks:		Comments:								
Pretest	@	7	"Hg	1	2	3	4	5	Desiccant	Total
Posttest	300	@	5	"Hg	280				1002	
					0	100			1002	
					280	1			20	361



Scale ID

[illegible]



# EPA Method 201A/202 Field Data Sheet

## 2.5 µm and 10 µm Particulate Sampling (CSR)

Project FHR\_FCC\_ICR Module ID CM-1 Pitot No. 21-02  $C_p$  0.27 Manometer ID CM-1  
 Sample Location FCC (SV019) Meter Coef.  $\gamma$  1.006 Bar. Pres. 29.03 In. Hg CM-1  
 Date 7/25/11 Test/Run T1 R 3 Orifice Coef.  $\Delta H @$  1.289 Static Pres. -0.95 In. H<sub>2</sub>O 5  
 Operators/Techs M3W M3N Nozzle No. Dn 156 Est. Moist. 13.5 %v/v 10 Scale ID

Trav. Point No.	Dwell Time	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Incremental $V_m$	Train Vacuum Inches Hg	Stack Temp. $^{\circ}F$	Sampling Train Temperatures - $^{\circ}F$					320P Oxygen %v/v	
									Meter Inlet	Meter Outlet	Dry Filter	Probe	CPM Filter		Impinger Outlet
		( 725 )	( 462.60 )	$\Delta P_{avg} = 1.34$	$\Delta H = 4.41 @$										
1	20.8	20.8	470.02	1.45	1.437	7.42	4.8	454	87	89	INSTR	243	83	67	4.1
2	19.7	40.5	477.32	1.30	1.444	7.30	4.9	455	98	93		257	76	59	4.3
3	18.5	59.0	454.29	1.15	1.446	6.97	4.9	452	101	96		254	75	61	4.2
1	21.2	80.2	492.17	1.50	1.448	7.88	4.9	455	102	100		242	83	66	4.1
2	20.1	100.2	474.54	1.35	1.452	7.37	4.9	454	107	104		256	80	64	4.3
3	18.1	118.3	506.22	1.10	1.453	6.68	4.9	452	110	105		246	80	63	4.1
1	21.2	139.5	514.11	1.50	1.454	7.89	5.0	455	109	107		250	83	64	4.0
2	20.4	159.9	521.76	1.40	1.456	7.65	5.0	455	112	109		251	77	55	4.1
3	18.5	178.5	528.59	1.15	(.457) 4.57	6.83	5.0	455	113	110		250	76	57	3.9
1	21.2	199.6	536.48	1.50	1.457	7.89	5.6	456	112	111		247	81	62	4.2
2	19.7	219.3	543.86	1.30	1.459	7.38	5.0	457	115	112		249	76	62	4.0
3	18.9	238.2	551.04	1.20	1.459	7.18	5.0	457	115	113		247	76	62	4.1
		(1133)													



# EPA Method 26A\_CTM 27 Field Data Sheets



# EPA Method 26A & CTM-27 Field Data Sheet

## Isokinetic Halide/Halogen & Ammonia Sampling

FSD PN: 1106-200

Project	FHR_FCC_ICR	Module ID	cm-4	Pitot No.	4-01	C <sub>p</sub>	0.8(0)	Manometer ID	cm-4
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	0.9949	Bar. Pres.	28.88	In. Hg		TC Sensor ID	cm-4
Date	7/28/11	Orifice Coef. $\Delta H @$	1.704	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	B-5
Operators/Techs	man/BDE	Nozzle No.	6.655	Est. Moist.	13	%v/v		Scale ID	DS-10

[illegible]

Samples Recovered: Filter : ☒ Probe Wash; ☒ Acid Catch; ☒ Alkaline Catch; ☐ Other

### Sampling Train Leak Checks:

Pretest 0.00 @ 120 "Hg

Posttest 0.00 @ 6.0 "Hg

Pitot - Pos. 0.00 Neg. 0.00

024470

**Comments:**

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	285	161	112	100		1461	
Initial Volume	100	100	100	100		1437	
Difference	185	61	12	0		24	282

~~See page 2~~ RE 7/29/11 ATR





# EPA Method 26A & CTM-27 Field Data Sheet

## Isokinetic Halide/Halogen & Ammonia Sampling

Project FHR\_FCC\_ICR Module ID cm-4 Pitot No. 4-01 Cp 0.840 Manometer ID cm-4  
Sample Location FCC (SV019) Meter Coef. 0.9949 Bar. Pres. 28.88 In. Hg TC Sensor ID cm-4  
Date 7/28/11 Test/Run T1 RZ Orifice Coef. ΔH@ 1.704 Static Pres. -0.95 In. H<sub>2</sub>O Barometer ID B-5  
Operators/Techs man/BDE Nozzle No. GLASS D<sub>0.250</sub> Est. Moist. 13 %v/v Scale ID DS-10

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Velocity Head ΔP Inches H <sub>2</sub> O	Orifice Meter ΔH Inches H <sub>2</sub> O	Desired ΔV <sub>m</sub> Cubic Feet	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
(1045)		512.53													
1	6	518.20	1.40	2.49	569	518.22	3.5	462	247	248	24	67	87	87	4.3
2	12	523.90	1.40	2.48	568	523.91	3.5	462	235	251		63	88	87	4.1
3	18	529.33	1.25	2.21	537	529.27	3.3	462	252	250		56	89	88	4.1
4	24	534.42	1.15	2.04	515	534.42	3.1	461	245	250		55	89	89	4.2
1	30	540.04	1.40	2.49	569	540.11	3.5	460	256	249		57	90	89	4.1
2	36	545.96	1.40	2.48	569	545.80	3.6	463	252	248		54	90	89	4.1
3	42	551.17	1.30	2.30	548	551.27	3.7	463	247	250		52	90	89	4.1
4	48	556.10	1.00	1.78	481	556.09	3.7	460	254	247		53	90	89	4.1
1	54	561.80	1.40	2.48	569	561.72	3.8	463	252	237		58	90	90	4.1
2	60	567.50	1.35	2.40	559	567.37	3.8	461	254	246		53	90	90	4.1
3	66	572.91	1.30	2.31	549	572.86	3.7	460	258	249		53	90	90	4.0
4	72	577.68	1.00	1.78	482	577.68	3.0	459	245	250		54	90	89	4.1
1	78	583.42	1.40	2.49	569	583.37	4.0	461	250	249		66	92	92	4.1
2	84	588.99	1.35	2.41	562	588.99	3.9	460	250	248		59	92	92	4.1
3	90	594.50	1.30	2.32	551	594.50	3.8	460	251	251		55	94	93	4.0
4	96	599.80	1.20	2.15	531	599.81	4.0	459	250	250		56	95	93	4.0
U320X															





# EPA Method 26A & CTM-27 Field Data Sheet

## Isokinetic Halide/Halogen & Ammonia Sampling

Project FHR\_FCC\_ICR Module ID CM-4 Pitot No. 4-01 C<sub>p</sub> 0.840 Manometer ID CM-4  
Sample Location FCC (SV019) Meter Coef. 0.9949 Bar. Pres. 28.88 In. Hg TC Sensor ID CM-4  
Date 7/28/11 Test/Run T1 R3 Orifice Coef. 1.704 Static Pres. -0.95 In. H<sub>2</sub>O Barometer ID B-5  
Operators/Techs mpm/BDC Nozzle No. 6455 D<sub>n</sub> 0.250 Est. Moist. 13 %v/v Scale ID DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. V <sub>m</sub> Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
(1340)		600.00			570.00										
1	6	605.79	1.40	2.52	570.00	605.79	3.7	458	234	235	NA	66	94	94	3.8
2	12	611.50	1.35	2.42	564	611.50	3.7	460	251	246		64	92	92	4.3
3	18	616.74	1.20	2.15	530	616.74	3.5	454	249	249		61	92	92	4.3
4	24	621.38	1.15	2.06	519	621.38	3.1	459	247	250		62	93	92	4.2
1	30	627.62	1.40	2.51	573	627.62	3.6	460	250	251		63	94	93	4.1
2	36	633.35	1.40	2.51	573	633.35	3.6	461	249	254		59	93	93	4.0
3	42	638.68	1.20	2.15	530	638.68	3.4	461	250	251		59	93	93	4.0
4	48	643.49	1.00	1.79	484	643.49	3.1	460	247	248		61	94	93	4.1
1	54	649.20	1.40	2.51	574	649.20	3.7	460	245	254		64	94	92	4.1
2	60	654.92	1.40	2.50	573	654.92	3.7	461	255	251		57	94	92	4.3
3	66	660.30	1.20	2.15	531	660.30	3.8	460	248	251		55	95	93	4.3
4	72	665.35	1.10	1.97	509	665.35	3.4	460	250	250		55	94	92	4.2
1	78	671.08	1.40	2.51	573	671.08	3.7	459	250	253		59	95	93	4.2
2	84	676.41	1.40	2.50	573	676.41	3.7	462	251	253		57	96	94	4.1
3	90	682.40	1.30	2.33	554	682.40	3.5	461	249	251		57	95	93	4.1
4	96	687.40	1.05	1.88	497	687.40	3.2	460	249	248	✓	55	96	94	4.0
(1537)															
Tot/Avg	0= 94	V <sub>m</sub> =87.40	$\Delta P=1.1261$	$\Delta H=2.720$				t <sub>s</sub> =460.1						t <sub>m</sub> =93.4	O <sub>2</sub> =4.1

Samples Recovered: Filter ☒ Probe Wash; ☒ Acid Catch; ☒ Alkaline Catch; ☐ Other

### Sampling Train Leak Checks:

Pretest 0.00 @ 10.0 "Hg  
Posttest 0.00 @ 10.0 "Hg  
Pitot - Pos. 0.00 Neg. 0.00  
0.3" H<sub>2</sub>O

### Comments:

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	295	154	108	100			1483
Initial Volume	100	100	100	100			1461
Difference	195	54	8	0			279



# EPA Other Test Method 29 Field Data Sheets





FSD PN: 1106-200

EPA OTM-29 Field Data Sheet  
Isokinetic Hydrogen Cyanide Sampling

Project FHR\_FCC\_ICR Module ID em-7 Pitot No. 4-06 C<sub>p</sub> .340 Manometer ID CM-7  
Sample Location FCC (SV019) Meter Coef.  $\gamma$  1.0033 Bar. Pres. 28.81 TC Sensor ID CM-7  
Date 7/28/11 Test/Run T1 R1 Office Coef.  $\Delta H$  @ 1.715 Static Pres. -95 Barometer ID B-5  
Operators/Techs TJB Nozzle No. gus D<sub>n</sub> .250 Est. Moist. 13 %v/v Scale ID DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. V <sub>m</sub> Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Mtr Out Temp. °F	Carbon Dioxide %v/v
1	4	310.25	1.40	2.43	345	364	5.5	463	252	255		81	86	11.6
2	8	317.81	1.30	2.26	313	382	5.2	461	250	250		85	86	11.4
3	12	316.70	1.20	2.00	398	672	5.2	461	250	250		86	86	11.6
4	16	320.45	1.05	1.83	314	950	5.0	460	249	252		86	86	11.7
5	20	323.76	1.30	2.26	349	373	5.9	463	251	247		86	86	11.8
6	24	327.21	1.30	2.26	350	724	5.8	463	251	260		87	86	12.0
7	28	330.70	1.20	2.04	350	861	5.8	462	251	269		88	87	12.2
8	32	333.66	1.10	1.92	329	345	5.8	461	250	248		88	87	12.8
9	36	333.84	1.40	.	.	.	.	461	.	.	.	.	.	.
10	40	.	.	.	.	.	.	.	.	.	.	.	.	.
11	44	.	.	.	.	.	.	.	.	.	.	.	.	.
12	48	.	.	.	.	.	.	.	.	.	.	.	.	.
13	52	.	.	.	.	.	.	.	.	.	.	.	.	.
14	56	.	.	.	.	.	.	.	.	.	.	.	.	.
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100	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Total/Avg	$\theta = 810$	V <sub>m</sub> = 37.03	$\Delta P = 1.1143$	$\Delta H = 2.16$	.	.	.	t <sub>s</sub> =	.	.	.	.	t <sub>m</sub> =	O <sub>2</sub> =

Samples Recovered: Filter       ; ☐ Probe Wash; ☒ Wet Catch; ☐ M-202; ☒ Other OTM 29

## Sampling Train Leak Checks:

Pretest 0.00 @ 10 "Hg  
Posttest 0.00 @ 15 "Hg  
Pitot - Pos. 0.00 Neg. 0.00

## Comments:

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	157	163	100			1392	
Initial Volume	100	160	100			1379	
Difference	57	3	0			13	83

, NOAA





FSD PN: 1106-200

EPA OTM-29 Field Data Sheet  
Isokinetic Hydrogen Cyanide Sampling

Project FHR\_FCC\_ICR Module ID CM-7 Pitot No. 400 C<sub>p</sub> .87 Manometer ID CM-7  
Sample Location FCC (SV019) Meter Coef. 1.0033 Bar. Pres. 28.88 In. Hg CM-7  
Date 7/28/11 Test/Run T1 R2 Office Coef. ΔH@ 1.715 Static Pres. 5  
Operators/Techs TJB Nozzle No. gives D<sub>n</sub> 226 Est. Moist. 13 %v/v 10 Scale ID 10

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Velocity Head ΔP Inches H <sub>2</sub> O	Orifice Meter ΔH Inches H <sub>2</sub> O	Desired ΔV <sub>m</sub> Cubic Feet	Incremental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Sample Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	Carbon Dioxide %v/v
	(1005)	337.80		1.67											
1	4	340.69	1.40	1.55	308	080	4.0	463	243	260		65	90	90	11.5
2	8	343.75	1.30	1.55	289	370	4.1	461	244	255		63	90	90	11.4
3	12	346.66	1.15	1.37	271	641	4.0	461	250	254		62	90	90	10.9
4	16	349.06	1.10	1.32	273	435	3.5	459	250	249		63	92	90	10.9
5	20	352.37	1.40	1.67	302	207	3.9	464	251	255		65	95	90	11.9
6	24	354.58	1.35	1.61	297	506	3.5	463	251	252		66	95	91	12.0
7	28	357.73	1.35	1.38	282	781	3.5	462	250	255		67	95	91	12.4
8	32	360.49	1.10	1.32	274	052	3.5	462	244	255		66	95	91	12.4
9	36	363.61	1.45	1.74	311	363	4.0	462	250	254		65	94	92	12.5
10	40	366.52	1.30	1.55	299	457	3.6	463	250	254		64	94	92	12.6
11	44	369.40	1.20	1.44	283	941	3.6	463	253	252		62	94	92	12.6
12	48	372.02	1.05	1.26	266	207		461	251	251		62	94	92	12.9
13	52														
14	56														
15	60														
16	64														
Final Run Both Impinger 2+3 are sealed.															



# EPA OTM-29 Field Data Sheet

## Isokinetic Hydrogen Cyanide Sampling

FSD PN: 1106-200

Pace Analytical  
FSD 1108-200

Project	FHR_FCC_ICR	Module ID	CM-7	Pitot No.		Cp	u006	Manometer ID	CM-7 0.1
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	1.0033	Bar. Pres.		In. Hg	28.88	TC Sensor ID	CM-7
Date	7/20/11	Orifice Coef. $\Delta H @$	1.715	Static Pres.		In. H <sub>2</sub> O	-.95	Barometer ID	6
Operators/Techs	JY	Nozzle No. $q_{loss}$	Dn 189	Est. Moist.		%v/v	13	Scale ID	60

[illegible]☐ Probe Wash; ☐ Wet Catch; ☐ M-202; ☐ Other.

### Sampling Train Leak Checks:

**Comments:**

Pretest 0.00 @ 10.00 "Hg

Posttest 0.00 @ 7 "Hg

Pitot - Pos. 20 Neg. 6003

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume	100	150	100				
Difference							



# EPA Method 29 Field Data Sheet

## Isokinetic Metals Sampling

Manometer ID cm-701  
 TC Sensor ID cm-7  
 Barometer ID 5  
 Scale ID 10

Pitot Tube No. 4-06 C<sub>p</sub> 0.90  
Bar. Pres. 28.88 In. Hg  
Static Pres. -95 In. H<sub>2</sub>O  
Est. Moisture 13 %v/v

Module ID Can-7  
 Meter Coef.  $\gamma$  1.0033  
 Orifice Coef.  $\Delta H@$  1.715  
 Nozzle No. Class D<sub>n</sub> 189

Project FHE-ICR  
Sample Location FCC Shack  
Date 7/28/11 Test 1 Run 4  
Technicians TJD

[illegible]

Samples Recovered: Filter No. \_\_\_\_\_; ☐ PW; ☐ FR; ☐ HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>; ☐ Dry Impinger; ☐ KMnO<sub>4</sub>/H<sub>2</sub>SO<sub>4</sub>; ☐ HCl Rinse

### Moisture Recovery Data (ml-g):

	1	2	3	4	5	6	Desiccant	Total
Impinger No.								
Final Volume								
Initial Volume								
Difference								

### Integrated Gas Sampling Data:

Bag Material \_\_\_\_\_  
 Box No. \_\_\_\_\_  
 Bag No. \_\_\_\_\_  
 Bag Vol. \_\_\_\_\_  
 Leak Check \_\_\_\_\_  
 Posttest O<sub>2</sub> Rdg \_\_\_\_\_  
 cc/min @ 25"Hg \_\_\_\_\_  
 320P No. \_\_\_\_\_

### Sampling Train Leak Checks:

Pretest 0.20 @ W.2 In. Hg  
Posttest 0.22 @ 1 In. Hg  
Pilot - Pos. 0.2 Neg. 0.2-3



# EPA Method 18 Field Data Sheets



# Method 18 (Spiked Tubes) Field Data Sheet

## Constant Rate Volatil Organic HAPs Sampling

Project FHR FCC ICR      Module ID MM-3      Bar. Pres. 28.94      In. Hg      TC Sensor ID TC-2  
 Sample Location FCC (SV019)      Meter Coef. 0.9904      Static Pres. -0.95      In. H<sub>2</sub>O      Barometer ID B-5  
 Date 7/26/11      Test/Run T1 R1      Office Coef. ΔH @ 114.286      Est. Moist. 13      %v/v      Scale ID DS-10  
 Operators/Techs MM/AR      ROT. RATE X

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Sample Rate CC/Min	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F		
	(0900)	505.535	250	0.025	22.0	453	468	70	70		
1	5	505.600		0.060		457		71	70		
1	10	505.620		0.042		457		73	71		
1	15	505.662		0.023		453		74	72		
1	20	505.685		0.040		457		77	74		
1	25	505.725		0.047		457		81	77		
1	30	505.770		0.038		458		82	78		
1	35	505.810		0.038		459		83	79		
1	40	505.848		0.066		458		84	81		
1	45	505.914		0.041		460		85	82		
1	50	505.955		0.050		460		86	83		
1	55	506.005		0.055		460		86	83		
1	60	506.060									
	(1700)										
Tot/Avg	θ= 6.9	V <sub>m</sub> = .535	ΔH= 250.0			t <sub>s</sub> =			tm=78.0		Tot/Avg

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume	20						
Difference							

Comments:

Sampling Train Leak Checks:  
 Pretest 0.00 @ 5.0 "Hg  
 Posttest 0.00 @ 5.0 "Hg

spiked

\*MM



# Method 18 (Spiked Tubes) Field Data Sheet

## Constant Rate Volatil Organic HAPs Sampling

FSD PN: 1106-200



Project FHR FCC ICR Module ID MM-3 Bar. Pres. 28.94 In. Hg TC Sensor ID  
 Sample Location FCC (SV019) Meter Coef. γ 0.9904 Static Pres. -0.95 In. H<sub>2</sub>O Barometer ID  
 Date 7/26/11 Test/Run T1 R2 Office Coef. ΔH @ 114.286 Est. Moist. 13 %v/v Scale ID  
 Operators/Techs ATR/TJB Rot. Rate

Pace Analytical  
FSD 1108-200

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Sample Rate CC/Min	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F		
	(1040)	506.107									
1	5	506.167	2500	0.060	2.0	458	468	84	83		
1	10	506.214		0.047		456		85	83		
1	15	506.265		0.051		446		86	83		
1	20	506.312		0.047		448		87	84		
1	25	506.355		0.043		452		88	85		
1	30	506.405		0.050		452		89	86		
1	35	506.447		0.042		454		90	87		
1	40	506.496		0.039		451		92	88		
1	45	506.548		0.042		451		92	87		
1	50	506.584		0.036		455		93	89		
1	55	506.635		0.051		457		94	90		
1	60	506.683		0.048		460		94	90		
	(1146)										
Tot/Avg	θ = 60	V <sub>m</sub> = 0.576	ΔH = 2500			t <sub>s</sub> =			tm = 87.9		Tot/Avg

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume	20						
Difference							

Comments:

Sampling Train Leak Checks:

Pretest 0.00 @ 5.0 "Hg  
 Posttest 0.00 @ 5.0 "Hg

Page 1 of 1

★ATR







# Method 18 (Un-Spiked Tubes) Field Data Sheet

## Constant Rate Volatile Organic HAPs Sampling

Pace Analytical  
FSD 1108-200

Project FHR\_FCC\_ICR  
 Sample Location FCC (SV019)  
 Date 7/26/11 Test/Run T1 R1  
 Operators/Techs nan/ark

Module ID man-2  
 Meter Coef. γ 0.9985  
 Office Coef. ΔH@ 114.952  
 RAR. RATE \*

Bar. Pres.	<u>28.94</u>	In. Hg	TC Sensor ID
Static Pres.	<u>-0.95</u>	In. H <sub>2</sub> O	Barometer ID
Est. Moist.	13	%v/v	Scale ID

7C-2
B-5
D5-10

[illegible]

### Sampling Train Leak Checks:

Pretest 1.01 @ 5.0 "Hg  
Posttest 0.00 @ 5.0 "Hg

**Comments:**

Bugs Collected from 0900  
End 0948

	1	2	3	4	5	Desiccant	Total
Impinger No.							
Final Volume		—	—	—	—		
Initial Volume	20	—	—	—	—		
Difference		—	—	—	—		

~~16~~ 17



Pace Analytical  
FSD 1108-200

Project FHR\_FCC\_ICR  
 Sample Location FCC (SV019)  
 Date 7/26/11 Test/Run T1 R2  
 Operators/Techs ATR/TJB

Module ID MM-2  
Meter Coef. γ 0.9985  
Office Coef. ΔH@ 114.952  
Rot. Rate PA

Bar. Pres.	28.94	In. Hg	TC Sensor ID	TS
Static Pres.	-0.95	In. H <sub>2</sub> O	Barometer ID	DB-5
Est. Moist.	13	%v/v	Scale ID	DS-10

TC Sensor ID	In. Hg
Barometer ID	In. H <sub>2</sub> O
Scale ID	%v/v

TS	DIS	DS
----	-----	----

[illegible]

### Sampling Train Leak Checks:

Pretest 0.00 @ 5.0 "Hg  
Posttest 0.00 @ 5.0 "Hg

**Comments:**

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume							
Difference							

[illegible]



# Method 18 (Un-Spiked Tubes) Field Data Sheet

FSD PN: 1106-200

Constant Rate Volatile Organic HAPs Sampling

Project FHR FCC\_ICR Module ID MM-2 Bar. Pres. 28.94 In. Hg T-8  
 Sample Location FCC (SV019) Meter Coef. 0.9985 Static Pres. -0.95 In. H<sub>2</sub>O D3-5  
 Date 7/26/11 Office Coef. 114.952 Est. Moist. 13 %v/v D5-10  
 Operators/Techs DB/ATR Rot. Rate 114.952

Pace Analytical  
FSD 1108-200

Trav. Point No.	Time AT	Meter Vol. V <sub>m</sub>	Sample Rate CC/Min	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	Tot/Avg
1	5	796.566	250	0.051	22	462	468	87	85	
1	10	796.617		0.045		462		88	86	
1	15	796.662		0.044		463		88	86	
1	20	796.706		0.054		455		89	86	
1	25	796.760		0.040		459		90	88	
1	30	796.800		0.045		462		91	88	
1	35	796.845		0.050		462		93	90	
1	40	796.895		0.040		461		95	91	
1	45	796.935		0.050		460		96	92	
1	50	796.985		0.052		460		97	93	
1	55	797.037		0.042		458		98	94	
1	60	797.089		0.047		456		98	94	
1	(1350)	797.126								
Tot/Avg	60	V <sub>m</sub> = 560	ΔH = 2500		t <sub>s</sub> =				tm = 91.0	

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume	15	XAD	XAD	XAD	XAD		
Difference							

Comments: bag sample 1250  
END 1331  
 Page 1 of 1

Sampling Train Leak Checks:  
 Pretest 0.00 @ 5 "Hg  
 Posttest 0.00 @ 5 "Hg



# EPA Method 308 Field Data Sheets





Field Services Division

FSD PN: 1106-200

## Method 308 Field Data Sheet

Constant Rate Methanol HAPs Sampling

Project FHR\_FCC\_ICR Module ID MM-1 Bar. Pres. 28.94 In. Hg TC-2  
Sample Location FCC (SV019) Meter Coef. 0.9995 Static Pres. -0.95 In. H<sub>2</sub>O DB-5  
Date 7/26/11 Test/Run T1 R1 Office Coef. ΔH@ 105.974 Est. Moist. 13 %v/v DS-10  
Operators/Techs ATR/MAM *ROT. RATE*

TC Sensor ID  
Barometer ID  
Scale ID

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Sample Rate CC/Min	Incre- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F		
1	(0900)	709.205	250	0.045	1.0	453	268	70	70		
1	5	709.250		0.050	1.0	457		71	71		
1	10	709.300		0.060	1.0	457		72	72		
1	15	709.360		0.038	1.0	453		74	73		
1	20	709.398		0.062	1.0	457		75	75		
1	25	709.460		0.040	1.0	457		76	76		
1	30	709.500		0.050	1.0	459		77	77		
1	35	709.550		0.046	1.0	459		79	77		
1	40	709.610		0.040	1.0	460		79	79		
1	45	709.650		0.068	1.0	460		83	81		
1	50	709.718		0.047	1.0	460		83	82		
1	55	709.751		0.049	1.0	460		83	82		
1	60	709.810									
(1000)											
Tot/Avg	θ= 60	V <sub>m</sub> =0.605	ΔH= 250cc			t <sub>s</sub> =			tm=76.5		Tot/Avg

## Sampling Train Leak Checks:

Pretest 0.00 @ 5.0 "Hg  
Posttest 0.00 @ 5.0 "Hg

## Comments:

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume	0	20	SILICA GEL				
Difference							

Page 1 of 1

\* MAM



# Method 308 Field Data Sheet

## Constant Rate Methanol HAPs Sampling

Pace Analytical  
FSD 1108-200

Project FHR\_FCC\_ICR  
 Sample Location FCC (SV019)  
 Date 7/26/14 Test/Run T1 R2  
 Operators/Techs man/TJB

Module ID mm-1  
Meter Coef. γ 0.9995  
Office Coef. ΔH@ 105.974  
\*

Bar. Pres.	28.94	In. Hg	TC Sensor ID	7C-8
Static Pres.	-0.95	In. H <sub>2</sub> O	Barometer ID	B-5
Est. Moist.	13	%v/v	Scale ID	D5-10

Bar. Pres.	<u>28.94</u>	In. Hg	TC Sensor ID
Static Pres.	<u>-0.95</u>	In. H <sub>2</sub> O	Barometer ID
Est. Moist.	13	%v/v	Scale ID

TC-8  
B-5  
DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Sample Rate CC/Min	Incre- mental Vm	Train Vacuum Inches Hg	Stack Temp. $^{\circ}F$	Impinger Temp. $^{\circ}F$	Meter In Temp. $^{\circ}F$	Mtr Out Temp. $^{\circ}F$	Tot/Avg
	(1040)	709.910								
1	5	709.976	250cc	0.066	1.0	458	68	80	80	
1	10	710.015		0.041	1.0	456		81	80	
1	15	710.068		0.053	1.0	446		82	81	
1	20	710.125		0.054	1.0	448		82	81	
1	25	710.170		0.045	1.0	452		83	82	
1	30	710.220		0.050	1.0	452		84	82	
1	35	710.270		0.050	1.0	454		85	83	
1	40	710.315		0.045	1.0	451		86	84	
1	45	710.365		0.050	1.0	451		86	84	
1	50	710.415		0.050	1.0	455		87	85	
1	55	710.467		0.052	1.0	457		87	85	
1	60	710.522		0.055	1.0	460		87	86	
	(1140)									
Tot/Avg	$\theta = 60$	$V_m = 0.612$	$\Delta H = 250cc$			$t_s =$			$t_m = 83$	Tot/Avg

### Sampling Train Leak Checks:

Pretest	1.00	@ 5.0	"Hg
Posttest	0.00	@ 5.0	"Hg

**Comments:**

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Page 1 of 1

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume	0	20	SILICAGE				
Difference							

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# Method 308 Field Data Sheet

## Constant Rate Methanol HAPs Sampling

Project	FHR_FCC_ICR	Module ID	mm-1	Bar. Pres.	28.94	In. Hg	TC Sensor ID	7C-Z4
Sample Location	FCC (SV019)	Meter Coef. $\gamma$	0.9995	Static Pres.	-0.95	In. H <sub>2</sub> O	Barometer ID	B-5
Test/R/un	T1 R3	Orifice Coef. AH@	105.574	Est. Moist.	13	%v/v	Scale ID	D5-10

[illegible]

### Sampling Train Leak Checks:

Pretest 0.0 @ 5.0 "Hg  
Posttest 0.07 @ 6 "Hg

**Comments:**

Impinging No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume	0	220	SILICA GEL				
Difference							

Page 1 of 1



# EPA Method 0010 Field Data Sheets



EPA Method 0010 Field Data Sheet

Project	FHR_FCC_ICR	Page 1 of 2	Module ID	CM-1	Pitot No.	4-	C <sub>p</sub>	CM-1 011	Manometer ID
Sample Location	FCC (SV019)		Meter Coef. γ	1.006	Bar. Pres.	28.94	In. Hg	TC-14/CM-1	TC Sensor ID
Date	7-26-11	Test/Run	Orifice Coef. ΔH@	1.889	Static Pres.	-9.5	In. H <sub>2</sub> O	DB-5	Barometer ID
Operators/Techs	JTE/SDT/TTB/MAM/ATR/BUE	T1 R2	Nozzle No.	55	Est. Moist.	13	%v/v	DS-10	Scale ID

[illegible]

~~Samples Recovered: Filter~~

**Sampling Train Leak Checks:**

Pretest @ <sup>199</sup>Hg

Posttest @ "Hg

Pitot - Pos.	Neg.
--------------	------

\* Recording Error  
7-26-11  
ME

11-78-11

~~USFF~~ PAGE 2 of 2 FOR DFR INFORMATION

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume							
Difference							









# EPA Method 0010 Field Data Sheet

## Isokinetic Semi-Volatile Organics Sampling

FSD PN: 1106-200

Project FHR\_FCC\_ICR Page 1 of 2 Module ID CM-1 Pitot No. 4-06 C<sub>p</sub> -840 Manometer ID CM-1 011

Sample Location FCC (SV019) Meter Coef. 1.006 Bar. Pres. 28.94 TC Sensor ID CM-11

Date 7-26-11 Test/Run T1 R1 Office Coef. 1.889 Static Pres. -95 Barometer ID D3-5

Operators/Techs JTB/JDI/TJB/AM/ATR/BDE/mthv Nozzle No. SS D<sub>n</sub> 245 Est. Moist. 13 %v/v Scale ID D5-10

Trav. Point No.	Time ΔT	Meter Vol. V <sub>m</sub> Cubic Feet	Velocity Head ΔP Inches H <sub>2</sub> O	Orifice Meter ΔH Inches H <sub>2</sub> O	Desired ΔV <sub>m</sub> Cubic Feet	Incr- mental V <sub>m</sub>	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Resin Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
(0755)		485.24													
1	5.5	490.02	1.30	2.35	490.64	4.75	6.8	457	250	255	50	53	85	85	4.8
1	11	494.77	1.30	2.35	494.79	4.74	7.8	458	253	250	41	53	87	85	4.6
2	16.5	499.42	1.25	2.27	499.44	4.66	7.4	458	251	253	42	56	88	85	4.5
2	22	504.05	1.24	2.25	504.09	4.65	7.9	459	252	253	43	58	89	85	4.5
3	27.5	508.57	1.12	2.04	508.51	4.42	7.8	457	251	250	45	57	91	85	4.6
3	33	513.05	1.20	2.19	513.09	4.58	7.9	459	249	251	46	52	92	86	4.6
4	38.5	517.53	1.08	1.98	517.46	4.36	7.3	454	251	255	45	52	94	86	4.6
4	44	521.77	1.05	1.93	521.77	4.31	7.2	454	251	254	47	53	95	87	4.8
1	49.5	526.73	1.40	2.57	526.75	4.98	9.3	456	246	249	45	54	94	88	4.8
1	55	531.74	1.42	2.61	531.77	5.02	8.2	455	253	255	47	53	96	87	4.6
2	60.5	536.43	1.20	2.21	536.39	4.62	8.7	455	251	252	49	53	95	89	4.6
2	66	540.94	1.20	2.21	541.12	4.73	8.2	451	253	246	50	55	96	91	4.6
3	71.5	545.75	1.15	2.12	545.66	4.53	8.2	457	251	240	51	56	96	92	4.6
3	77	550.03	1.10	2.03	550.09	4.44	7.8	457	244	245	54	59	97	93	4.6
4	82.5	554.25	0.93	1.72	554.14	4.04	7.2	454	253	245	55	61	97	93	4.7
4	88	458.22	0.88	1.63	558.18	3.99	7.0	452	251	245	56	62	97	93	4.7
Run continued to page #2															



# EPA Method 0010 Field Data Sheet

## Isokinetic Semi-Volatile Organics Sampling

Project FHR\_FCC\_ICR Page 2 of 2 Module ID Cm-1 Pitot No. 4-06 Cp .840 Manometer ID CM-1 031  
 Sample Location FCC (SV019) Meter Coef. 1.006 Bar. Pres. 28.95 In. Hg CM-1/TC-14  
 Date 7-26-11 Test/Run T1 R2 Office Coef. 1.889 Static Pres. -.95 In. H<sub>2</sub>O DB-5  
 Operators/Techs JJE/JDI/TJB/MAW/ATR/BDE/MBW/MBN Nozzle No. SS Dn .845 Est. Moist. 14.5 %v/v Scale ID DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. $^{\circ}F$	Filter Temp. $^{\circ}F$	Probe Temp. $^{\circ}F$	Impinger Temp. $^{\circ}F$	Meter In Temp. $^{\circ}F$	Mtr Out Temp. $^{\circ}F$	320P Oxygen %v/v	Residual Temp			
1	93.5	711.35	1.41	2.54	711.32	4.99	10.3	459	248	247	64	99	99	4.6	36			
1	99	716.22	1.33	2.39	716.16	4.84	10.0	463	251	248	54	98	98	4.5	36			
2	104.5	720.85	1.20	2.15	720.75	4.59	9.0	462	250	250	55	99	98	4.4	36			
2	110	725.32	1.15	2.07	725.25	4.50	8.6	461	247	243	56	99	98	4.4	37			
3	115.5	729.61	1.05	1.89	729.55	4.30	8.5	461	242	245	56	99	98	4.5	39			
3	121	733.81	1.05	1.89	733.85	4.30	8.4	461	251	250	56	99	98	4.5	41			
4	126.5	737.90	0.90	1.62	737.83	3.98	8.0	461	251	252	56	99	99	4.6	42			
4	132	741.93	0.95	1.72	741.93	4.10	7.9	457	252	255	55	99	99	4.6	43			
1	137.5	746.71	1.35	2.43	746.81	4.88	9.9	460	251	253	59	99	98	4.5	42			
1	143	751.60	1.32	2.38	751.64	4.82	9.8	460	251	252	53	98	98	4.3	42			
2	148.5	756.50	1.40	2.52	756.60	4.96	10.2	460	252	251	55	98	98	4.6	42			
2	154	761.45	1.30	2.34	761.39	4.79	10.2	459	251	252	55	98	98	4.6	43			
3	159.5	766.35	1.26	2.27	766.10	4.71	10.2	459	251	257	57	99	99	4.6	44			
3	165	770.66	1.15	2.07	770.61	4.51	10.2	459	251	253	58	99	99	4.5	44			
4	170.5	774.85	1.00	1.87	774.81	4.31	8.0	458	252	251	59	99	99	4.4	48			
4	176	779.03	1.03	1.86	779.09	4.27	8.1	457	251	252	59	99	99	4.5	48			
(1430)																		
								$t_s = 459.4$								$t_m = 98.2$	$O_2 = 4.1$	Tot/Avg
Tot/Avg $\theta = 176$																		





Field Services Division

FSD PN: 1106-200

# EPA Method 5 Field Data Sheet

3.0.0 02/01/2019

## Isokinetic Particulate Sampling

Project	FHR_FCC_ICR	Module ID	CM-1	Pitot No.	4-01	C <sub>p</sub>	0.84	Manometer ID	CM-1 Oil
Sample Location	FCC SV019	Meter Coef. $\gamma$	1.006	Bar. Pres.	28.94	In. Hg		TC Sensor ID	CM-1 / TC-14
Date	7/26/2011	Test/Run	T1/R3	Orifice Coef. $\Delta H$	-0.9	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	JJE/MAM/JDT/TJB/ATR/BDE/MBN/MBW	Nozzle No.	SS	D <sub>n</sub>	0.245	%v/v		Scale ID	DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Resin Temp °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
D 1	(1517)	779.26													
	5.5	784.21	1.35	2.43	784.14	4.88	8.2	462	252	256	57	66	98	98	4.1
	11	789.04	1.35	2.42	789.00	4.87	8.0	463	259	248	40	65	99	99	4.2
	16.5	793.75	1.27	2.28	793.73	4.73	7.9	462	247	258	37	63	99	99	4.2
	22	798.55	1.35	2.43	798.61	4.88	7.8	461	250	255	37	63	100	99	4.4
	27.5	803.35	1.30	2.34	803.41	4.79	7.8	461	251	254	38	62	100	98	4.4
	33	807.90	1.15	2.07	807.92	4.51	7.8	459	249	254	38	61	100	98	4.4
	38.5	812.01	0.91	1.64	811.93	4.01	6.0	460	256	251	39	61	101	99	4.1
C 1	44	816.00	0.88	1.60	815.89	3.96	5.9	455	251	252	41	62	101	99	4.6
	49.5	820.88	1.38	2.49	820.83	4.94	8.2	462	251	253	47	62	98	99	4.6
	55	825.86	1.39	2.50	825.77	4.95	8.3	461	253	255	47	63	100	98	4.6
	60.5	830.60	1.30	2.35	830.57	4.79	8.2	459	254	254	48	61	98	98	5
	66	835.33	1.32	2.38	835.39	4.82	8.4	459	250	254	45	60	99	98	5.1
	71.5	840.01	1.20	2.16	839.99	4.60	8.2	459	249	251	44	60	101	99	5.1
	77	844.59	1.17	2.11	844.55	4.56	6.7	459	250	250	43	59	100	99	5
	82.5	848.69	0.98	1.77	848.71	4.17	6.2	459	252	247	45	60	101	98	4.9
B 1	88	852.85	0.96	1.74	852.84	4.13	6.2	456	248	245	46	61	101	99	5
	93.5	857.91	1.40	2.53	857.83	4.98	8.2	459	252	248	45	60	101	99	5
	99	862.90	1.40	2.52	862.80	4.97	8.2	464	249	246	44	56	101	99	4.8
	104.5	867.72	1.35	2.43	867.68	4.88	8.1	463	251	250	38	55	98	98	4.8
	110	872.72	1.38	2.48	872.61	4.93	8.1	461	252	249	39	54	100	98	4.7
	115.5	877.58	1.40	2.52	877.58	4.97	8.2	461	255	247	40	54	100	98	4.5
	121	882.61	1.40	2.52	882.55	4.97	8.3	460	251	248	40	55	99	98	4.6
	126.5	887.02	1.14	2.05	887.03	4.48	7.3	460	253	251	41	55	99	98	4.7
	132	891.51	1.13	2.03	891.50	4.46	7.3	460	252	255	41	56	99	98	4.8
								460.2						99.1	
Tot/Avg $\theta =$		150.57	1.12	2.2				460.2							
		$V_m = 150.57$	$\Delta P = 1.12$	$\Delta H = 2.2$				$t_s = 460.2$						$t_m = 99.1$	$O_2 =$

Samples Recovered: Filter ☐ Non Tared ☐ X Probe Wash; ☒ X Wet Catch; ☒ X M-202; ☐ Other \_\_\_\_\_

### Sampling Train Leak Checks:

Pretest 0.00 @ 15.0 "Hg  
Posttest 0.00 @ 12.0 "Hg  
Pitot - Pos\_OK\_Neg\_OK\_

### Comments:

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume							
Initial Volume							
Difference							





Field Services Division

FSD PN: 1106-200

# EPA Method 5 Field Data Sheet

Isokinetic Particulate Sampling

Project	FHR_FCC_ICR	Module ID	CM-1	Pitot No.	4-01	C <sub>p</sub>	0.84	Manometer ID	CM-1 Oil
Sample Location	FCC SV019	Meter Coef. $\gamma$	1.006	Bar. Pres.	28.94	In. Hg		TC Sensor ID	CM-1 / TC-14
Date	7/26/2011	Test/Run	T1/R3	Static Pres.	-0.95	In. H <sub>2</sub> O		Barometer ID	DB-5
Operators/Techs	JJE/JDT/TJB/MAM/ATR/BDE/MBW/MBN	Nozzle No.	SS	Est. Moist.	14.5	%v/v		Scale ID	DS-10

Trav. Point No.	Time $\Delta T$	Meter Vol. $V_m$ Cubic Feet	Velocity Head $\Delta P$ Inches H <sub>2</sub> O	Orifice Meter $\Delta H$ Inches H <sub>2</sub> O	Desired $\Delta V_m$ Cubic Feet	Incre- mental $V_m$	Train Vacuum Inches Hg	Stack Temp. °F	Filter Temp. °F	Probe Temp. °F	Resin Temp. °F	Impinger Temp. °F	Meter In Temp. °F	Mtr Out Temp. °F	320P Oxygen %v/v
D 1	148.5	896.37	1.32	2.38	896.32	2.38	8.4	459	252	254	49	58	99	97	4.5
1	154	901.42	1.45	2.59	901.36	2.59	8.7	465	251	247	49	57	99	98	4.5
2	159.5	906.40	1.45	2.60	906.40	2.60	8.7	465	254	278	48	57	99	97	4.5
2	165	911.35	1.40	2.50	911.35	2.50	8.2	465	255	245	48	56	99	97	4.5
3	170.5	916.36	1.40	2.50	916.30	2.50	8.2	465	254	246	47	56	99	97	4.4
3	176	921.23	1.40	2.50	921.25	2.50	8.2	465	257	247	46	55	99	99	4.5
4	181.5	925.53	1.05	1.88	925.55	1.88	7.1	463	253	248	46	54	99	97	4.5
4	187	929.83	1.05	1.88	929.84	1.88	7.1	0	252	248	45	55	99	97	4.4
(1826)															

1375  
143  
148.5  
154  
159.5  
165  
170.5  
176  
181.5  
187

Samples Recovered: Filter Non Tared ; X Probe Wash; X Wet Catch; X M-202; ☐ Other

## Sampling Train Leak Checks:

Pretest\_0.00\_@\_15.0\_"Hg  
Posttest\_0.00\_@\_12.0\_"Hg  
Pitot - Pos\_OK\_Neg\_OK\_

## Comments:

Impinger No.	1	2	3	4	5	Desiccant	Total
Final Volume	406	98	98	0	-----	1489	
Initial Volume	0	100	100	0	-----	1451	
Difference	406	-2	0	0		38	442



# Gas Monitoring Field Data Sheets



Project FHR FCC ICR  
Test Location FCC (SV019)  
Test Date 7/25-7/26/11 Test No. 1

Recording Device 1 P-DAQ-6  
Sample Flow Rate 1.7 lpm +/- 10%  
Operators BDE

Analyzer ID and Initial Calibration	Constituent	<u>Propane</u>	Range	<u>0-100</u>	Constituent	<u>Propane</u>	Range	<u>0-100</u>
	Analyzer ID	<u>FIA-5</u>	Site	<u>SV019</u>	Analyzer ID	<u>FIA-5</u>	Site	<u>SV019</u>
	DAQ Channel:	<u>1A</u>	Point (s)		DAQ Channel:	<u>2</u>	Point (s)	
	Gas Conc.	Cylinder No.	Exp. Date		Gas Conc.	Cylinder No.	Exp. Date	
	<u>98.1</u>	<u>CC 164335</u>	<u>1/19/14</u>		<u>98.1</u>	<u>CC 164335</u>	<u>1/19/14</u>	
	<u>50.2</u>	<u>SX 2064+20621</u>	<u>7/30/12</u>		<u>50.2</u>	<u>SX 20621</u>	<u>7/30/12</u>	
	<u>29.7</u>	<u>CC 163035</u>	<u>2/20/14</u>		<u>29.7</u>	<u>CC 163035</u>	<u>2/20/14</u>	
	<u>0</u>	<u>CC 343912</u>	<u>N/A</u>		<u>0</u>	<u>CC 343912</u>	<u>N/A</u>	
	Target Value	Analyzer Response	Absolute Difference	Cal. Error % of Gas	Target Value	Analyzer Response	Absolute Difference	Cal. Error % of Gas
	<u>0.0</u> Zero	<u>0.0</u>	<u>0</u>	<u>0</u> N/A	<u>0.0</u> Zero	<u>0.0</u>	<u>0</u>	<u>0</u> N/A
	<u>50.2</u> Mid	<u>50.2</u>	<u>0.0</u>	<u>0</u> <5%	<u>50.2</u> Mid	<u>50.1</u>	<u>0.1</u>	<u>0.1</u> <5%
	<u>98.1</u> High	<u>99.0</u>	<u>0.9</u>	<u>0.9%</u> <5%	<u>98.1</u> High	<u>97.9</u>	<u>0.2</u>	<u>0.2%</u> <5%
	<u>29.7</u> Low	<u>29.4</u>	<u>0.3</u>	<u>0.3%</u> <5%	<u>29.7</u> Low	<u>29.7</u>	<u>0.0</u>	<u>0.0%</u> <5%

Run Specific Drift Record

Response Time to Span ~30 min:sec  
Response Time to Span ~28 min:sec  
Response Time to Span ~28 min:sec  
Average Response Time to Span 28 min:sec  
Upscale Gas Concentration 29.7

Response Time to Span ~30 min:sec  
Response Time to Span ~29 min:sec  
Response Time to Span ~29 min:sec  
Average Response Time to Span 29 min:sec  
Upscale Gas Concentration 29.7

Run No.	Time	Pre-Run Response	Post-Run Response	Drift % Range
1	0900 Start	-0.04 Zero	0.50 Zero	0.57 <3%
	1000 End	29.4 Span	29.2 Span	8.2 <3%
2	1040 Start	0.50 Zero	0.16 Zero	0.2 <3%
	1140 End	29.1 Span	29.78 Span	0.6 <3%
3	1250 Start	0.16 Zero	-0.07 Zero	0.2 <3%
	1350 End	29.78 Span	29.75 Span	0.0 <3%
4	Start	Zero	Zero	<3%
	End	Span	Span	<3%
5	Start	Zero	Zero	<3%
	End	Span	Span	<3%
6	Start	Zero	Zero	<3%
	End	Span	Span	<3%
7	Start	Zero	Zero	<3%
	End	Span	Span	<3%
8	Start	Zero	Zero	<3%
	End	Span	Span	<3%
9	Start	Zero	Zero	<3%
	End	Span	Span	<3%

Run No.	Time	Pre-Run Response	Post-Run Response	Drift % Range
1	0900 Start	-0.04 Zero	0.28 Zero	0.37 <3%
	1000 End	29.3 Span	29.1 Span	-0.2 <3%
2	1040 Start	0.28 Zero	0.28 Zero	0.0 <3%
	1140 End	29.1 Span	29.72 Span	0.6 <3%
	1250 Start	0.28 Zero	0.04 Zero	-0.17 <3%
	1350 End	29.72 Span	29.41 Span	-0.2 <3%
	Start	Zero	Zero	<3%
	End	Span	Span	<3%
	Start	Zero	Zero	<3%
	End	Span	Span	<3%
	Start	Zero	Zero	<3%
	End	Span	Span	<3%
	Start	Zero	Zero	<3%
	End	Span	Span	<3%
	Start	Zero	Zero	<3%
	End	Span	Span	<3%
	Start	Zero	Zero	<3%
	End	Span	Span	<3%



# Field Computer Summary & Notes



M-23

# Field Calculation Summary

Computer Initialization and Run Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7-27-11

Initialization Parameters						
Parameter	Initial	Run 1	Run 2	Run 3	Run 4	Run 5
Meter Coefficient - $\gamma$	1.006					
Orifice Coefficient - $\Delta H@$	1.889					
Pitot Coefficient - $C_p$	.840					
Nozzle Diameter - $D_n$	.841					
Barometric Pressure - $P_b$	28.73	28.73	28.73	28.73		
Static Pressure - $P_g$	-.91	-.91	-.91	-.91		
Oxygen Estimate - %O <sub>2</sub>	5	5	5	5		
No. of Traverse Points	20 (16x2)					
Point Duration - $\Delta T$	10 (5.5)					
Meter Start Temp, °F - $t_m$	83	85	86	98		
Initial Meter Volume - $V_i$	935.30	935.45	48.67	163.72		
Round Duct Diameter, Inches	11.5					
Rect. Duct Width, Inches	—					
Rect. Duct Depth, Inches	—					
Final Volume - $V_f$		1048.11	162.85	280.30		
Total Run Time - $\theta$		160	160	160		
Condensate Volume, ml (g)		367	353	395		
End of Run Summary						
Parameter		Run 1	Run 2	Run 3	Run 4	Run 5
Average Sq. Rt. of the $\Delta P$	$\sqrt{\Delta P}$	1.1091	1.1084	1.1204		
Average Orifice Meter	$\Delta H$	1.57	1.59	1.63		
Average Stack Temperature	$t_s$	459.7	460.3	461.8		
Average Meter Temperature	$t_m$	86.2	96.1	99.7		
Sample Volume, Actual	$V_m$	112.66	114.18	116.6		
Sample Volume, Dry Standard	$V_{std}$	105.63	105.14	106.88		
Moisture Content	MC	14.06	13.65	14.84		
Average Gas Velocity	$V_s$	83.84	83.74	84.94		
Isokinetic Variation	%I	101.5	100.8	102.4		
Volumetric Airflow, Actual	ACFM	362,850	362,460	367,610		
Volumetric Airflow, Standard	SCFM	199540	199180	201690		
Volumetric Airflow, Dry Std.	DSCFM	171490	172000	171760		

Note: The data on this form is preliminary and includes estimates. It may not match final results.





# Equipment Use Summary

Equipment and Calibration Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7-27-11

## EPA Method 2

Pitot Tube Number: 4-06 Coef.: .840 Calibration Date: 10-23-11

Measurements: ☒ Preliminary ☒ With Isokinetic Runs ☐ Separate

## EPA Method 3

☐ Integrated Bag

☐ Glass Bulb

☐ Bag/Bulb

☒ Oxygen Analyzer

1 No. Per Run

☐ Multipoint

☒ With Iso Train

☐ Single Point

## EPA Method 4

☐ Back Half Iso-train

☐ Separate

☒ Wet/Dry Bulb

☐ Not Measured

☒ Impingers/Dry Column ☐ Condenser/Dry Column

☐ Midget Impinger (approx)

## Isokinetic Train (M-5, 8, 17, 23, 26A, 29, 0010, etc.)

Nozzle Material: ☐ Stainless Steel ☐ Quartz ☒ Glass ☐ Other

Nozzle Calibration: .223 .224 .224 .223 .224 Avg. = .224

Probe: 4 Feet Effective

Material:

☒ Glass

☐ Stainless Steel

☐ Teflon

☐ Other

Control Module No.: cm-1 Cal. Date 6/14/11

$\gamma$  1.006

$\Delta H@$  1.889

Filter Type: ☐ 2 1/2" Round ☒ 4" Round

☐ Thimble

☐ Other

Filter Media: ☐ Glass Fiber ☒ Quartz

☐ Paper

☐ Teflon

☐ Stainless Steel ☐ Cellulose

☐ Other

Solid Sorbent: ☐ None

☒ XAD-2

☐ Other

Wet Catch Analyses:

Organic

EPA 8

EPA 29

Inorganic

EPA 23

Semi-vols

EPA 202

EPA 26

Other

## Constant Rate Train(s)

Midget Module No.:                      Cal. Date                       $\gamma$                      

Midget Module No.:                      Cal. Date                       $\gamma$                      

Bag Sampler Nos.:                                                               

## Gas Analyzers

☐ NOx

☐ SO2

☐ CO

☐ THC

☒ O2

☐ CO2

☐ FTIR

☐ Other



# Field Calculation Summary

Computer Initialization and Run Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7/28/11

Initialization Parameters						
Parameter	Initial	Run 1	Run 2	Run 3	Run 4	Run 5
Meter Coefficient - $\gamma$	1.0053					
Orifice Coefficient - $\Delta H@$	1.603					
Pitot Coefficient - $C_p$	0.840					
Nozzle Diameter - $D_n$	0.257					
Barometric Pressure - $P_b$	28.88	→				
Static Pressure - $P_g$	-0.95					
Oxygen Estimate - %O <sub>2</sub>	4.0					
No. of Traverse Points	16					
Point Duration - $\Delta T$ 10/PT	5/data					
Meter Start Temp, °F - $t_m$	86	86	92	95		
Initial Meter Volume - $V_i$	702.77	702.77	854.4	774		
Round Duct Diameter, Inches	115					
Rect. Duct Width, Inches	—					
Rect. Duct Depth, Inches	—					
Final Volume - $V_f$		853.75	1007.48	158.83		
Total Run Time - $\theta$		160	160	160		
Condensate Volume, ml (g)		491	488	462		
End of Run Summary						
Parameter		Run 1	Run 2	Run 3	Run 4	Run 5
Average Sq. Rt. of the $\Delta P$	$\sqrt{\Delta P}$	1.1295	1.1349	1.1133		
Average Orifice Meter	$\Delta H$	2.37	2.42	2.34		
Average Stack Temperature	$t_s$	465.6	463.7	462.8		
Average Meter Temperature	$t_m$	89.6	94.0	97		
Sample Volume, Actual	$V_m$	150.98	153.08	151.09		
Sample Volume, Dry Standard	$V_{std}$	141.59	142.43	139.80		
Moisture Content	MC	14.03	13.89	13.46		
Average Gas Velocity	$V_s$	85.28	85.57	83.82		
Isokinetic Variation	%I	101.7	101.6	101.2		
Volumetric Airflow, Actual	ACFM	369060	370340	362760		
Volumetric Airflow, Standard	SCFM	202720	203640	199860		
Volumetric Airflow, Dry Std.	DSCFM	174270	175530	172960		

Note: The data on this form is preliminary and includes estimates. It may not match final results.





# Equipment Use Summary

Equipment and Calibration Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7/28/11

## EPA Method 2

Pitot Tube Number: 4-02 Coef.: 0.84 Calibration Date: 10/13/10

Measurements: ☒ Preliminary ☒ With Isokinetic Runs ☐ Separate

## EPA Method 3

☒ Integrated Bag ☐ Glass Bulb ☐ Bag/Bulb ☐ Oxygen Analyzer  
1 No. Per Run ☒ Multipoint ☒ With Iso Train ☐ Single Point

## EPA Method 4

☒ Back Half Iso-train ☐ Separate ☐ Wet/Dry Bulb ☐ Not Measured  
☒ Impingers/Dry Column ☒ Condenser/Dry Column ☐ Midget Impinger (approx)  
*RC 7/28/11 ATR*

## Isokinetic Train (M-5, 8, 17, 23, 26A, 29, 0010, etc.)

Nozzle Material: ☐ Stainless Steel ☐ Quartz ☒ Glass ☐ Other

Nozzle Calibration: 

<u>0.257</u>	<u>0.257</u>	<u>0.257</u>	<u>0.257</u>	<u>0.257</u>
--------------	--------------	--------------	--------------	--------------

 Avg. = 0.257

Probe: 4' Feet Effective Material: ☒ Glass ☐ Stainless Steel  
☐ Teflon ☐ Other

Control Module No.: CM-12 Cal. Date 6/30/11  $\gamma$  1.6053  $\Delta H@$  1.603

Filter Type: ☐ 2 1/2" Round ☒ 4" Round ☐ Thimble ☐ Other  
Filter Media: ☐ Glass Fiber ☒ Quartz ☐ Paper ☐ Teflon  
☐ Stainless Steel ☐ Cellulose ☐ Other

Solid Sorbent: ☒ None ☐ XAD-2 ☐ Other

Wet Catch Analyses: Organic EPA 8 EPA 29 Inorganic EPA 23 Semi-vols EPA 202 EPA 26 Other

## Constant Rate Train(s)

Midget Module No.: 7/28/11 Cal. Date APR  $\gamma$          
Midget Module No.:        Cal. Date         $\gamma$          
Bag Sampler Nos.:                     

## Gas Analyzers

☐ NOx ☐ SO2 ☐ CO ☐ THC  
☒ O2 ☒ CO2 ☐ FTIR ☐ Other



# Field Calculation Summary

Computer Initialization and Run Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 2/27/11

Initialization Parameters						
Parameter	Initial	Run 1	Run 2	Run 3	Run 4	Run 5
Meter Coefficient - $\gamma$	1.0053					
Orifice Coefficient - $\Delta H @$	1.603					
Pitot Coefficient - $C_p$	0.840					
Nozzle Diameter - $D_n$	0.257					
Barometric Pressure - $P_b$	28.73	→				
Static Pressure - $P_g$	-0.95	→				
Oxygen Estimate - %O <sub>2</sub>	4.5	→				
No. of Traverse Points	16					
Point Duration - $\Delta T$	7.5					
Meter Start Temp, °F - $t_m$	80	80	85	95		
Initial Meter Volume - $V_i$	367.50	367.74	478.93	589.51		
Round Duct Diameter, Inches	115					
Rect. Duct Width, Inches	—					
Rect. Duct Depth, Inches	—					
Final Volume - $V_f$		478.35	587.50	701.60		
Total Run Time - $\theta$		120	120	120		
Condensate Volume, ml (g)		354	350	363		
End of Run Summary						
Parameter		Run 1	Run 2	Run 3	Run 4	Run 5
Average Sq. Rt. of the $\Delta P$	$\sqrt{\Delta P}$	1.1163	1.0788	1.1039		
Average Orifice Meter	$\Delta H$	2.29	2.17	2.29		
Average Stack Temperature	$t_s$	464.8	464.2	465.6		
Average Meter Temperature	$t_m$	80.5	89.9	94.4		
Sample Volume, Actual	$V_m$	110.61	108.57	112.09		
Sample Volume, Dry Standard	$V_{std}$	104.91	101.19	103.66		
Moisture Content	MC	13.71	14.00	14.15		
Average Gas Velocity	$V_s$	84.55	81.67	83.66		
Isokinetic Variation	%I	101.4	101.6	101.9		
Volumetric Airflow, Actual	ACFM	365940	353440	362070		
Volumetric Airflow, Standard	SCFM	200140	193420	197840		
Volumetric Airflow, Dry Std.	DSCFM	172710	166340	169340		

Note: The data on this form is preliminary and includes estimates. It may not match final results.





method 0061  
ATR 7/27/11

# Field Calculation Summary

Computer Initialization and Run Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7/27/11

Initialization Parameters						
Parameter	Initial	Run 1	Run 2	Run 3	Run 4	Run 5
Meter Coefficient - $\gamma$	<del>0.9949</del> 1.704					
Orifice Coefficient - $\Delta H@$	1.704					
Pitot Coefficient - $C_p$	0.840					
Nozzle Diameter - $D_n$	0.243					
Barometric Pressure - $P_b$	28.73					
Static Pressure - $P_g$	-0.95					
Oxygen Estimate - %O <sub>2</sub>	4.5					
No. of Traverse Points	32					
Point Duration - $\Delta T$	5					
Meter Start Temp, °F - $t_m$	90					
Initial Meter Volume - $V_i$	—	11.40	147.90	206.19		
Round Duct Diameter, Inches	115					
Rect. Duct Width, Inches	—					
Rect. Duct Depth, Inches	—					
Final Volume - $V_f$		147.75	285.17	355.37		
Total Run Time - $\theta$		160	160	160		
Condensate Volume, ml (g)		421	404	404		
End of Run Summary						
Parameter		Run 1	Run 2	Run 3	Run 4	Run 5
Average Sq. Rt. of the $\Delta P$	$\sqrt{\Delta P}$	1.1442	1.1365	1.1323		
Average Orifice Meter	$\Delta H$	2.03	2.03	2.07		
Average Stack Temperature	$t_s$	467.2	468.6	469.9		
Average Meter Temperature	$t_m$	80.9	88.9	94.6		
Sample Volume, Actual	$V_m$	136.35	137.27	138.18		
Sample Volume, Dry Standard	$V_{std}$	127.82	126.81	126.52		
Moisture Content	MC	13.42	13.04	13.08		
Average Gas Velocity	$V_s$	86.65	86.06	85.81		
Isokinetic Variation	%I	101.1	100.7	100.8		
Volumetric Airflow, Actual	ACFM	375000	372440	371340		
Volumetric Airflow, Standard	SCFM	204560	202850	201980		
Volumetric Airflow, Dry Std.	DSCFM	177100	170400	175550		

Note: The data on this form is preliminary and includes estimates. It may not match final results.





# Equipment Use Summary

Equipment and Calibration Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7/27/11

## EPA Method 2

Pitot Tube Number: 4-4 Coef.: 0.840 Calibration Date: 10/25/10

Measurements: ☒ Preliminary ☒ With Isokinetic Runs ☐ Separate

## EPA Method 3

☒ Integrated Bag ☐ Glass Bulb ☐ Bag/Bulb ☒ Oxygen Analyzer  
☒ No. Per Run ☒ Multipoint ☒ With Iso Train ☐ Single Point

## EPA Method 4

☐ Back Half Iso-train ☐ Separate ☐ Wet/Dry Bulb ☐ Not Measured  
☒ Impingers/Dry Column ☒ Condenser/Dry Column ☐ Midget Impinger (approx)

## Isokinetic Train (M-5, 8, 17, 23, 26A, 29, 0010, etc.)

Nozzle Material: ☐ Stainless Steel ☐ Quartz ☒ Glass ☐ Other

Nozzle Calibration: 0.242 0.243 0.243 0.243 0.243 Avg. = 0.243

Probe: 4' Feet Effective Material: ☒ Glass ☐ Stainless Steel  
☐ Teflon ☐ Other

Control Module No.: CM-4 Cal. Date 5-27-11  $\gamma$  0.9949  $\Delta H@$  1.704

Filter Type: ☐ 2 1/2" Round ☐ 4" Round ☐ Thimble ☒ Other NA  
Filter Media: ☐ Glass Fiber ☐ Quartz ☐ Paper ☐ Teflon  
☐ Stainless Steel ☐ Cellulose ☒ Other NA

Solid Sorbent: ☒ None ☐ XAD-2 ☐ Other

Wet Catch Analyses: Organic EPA 8 EPA 29 Inorganic EPA 23 Semi-vols EPA 202 EPA 26 Other 0061

## Constant Rate Train(s)

Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Bag Sampler Nos.: NA \_\_\_\_\_

## Gas Analyzers

☐ NOx ☐ SO2 ☐ CO ☐ THC  
☒ O2 ☒ CO2 ☐ FTIR ☐ Other



# Field Calculation Summary

Computer Initialization and Run Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7/26/11

Initialization Parameters						
Parameter	Initial	Run 1	Run 2	Run 3	Run 4	Run 5
Meter Coefficient - $\gamma$	1.0053					
Orifice Coefficient - $\Delta H @$	1.603					
Pitot Coefficient - $C_p$	0.840					
Nozzle Diameter - $D_n$	0.257					
Barometric Pressure - $P_b$	28.94					
Static Pressure - $P_g$	-0.95					
Oxygen Estimate - %O <sub>2</sub>	6.0	4.6	4.5	4.5		
No. of Traverse Points	16					
Point Duration - $\Delta T$	4					
Meter Start Temp, °F - $t_m$	85					
Initial Meter Volume - $V_i$	130.44	131.81	191.75	249.80	307.95	
Round Duct Diameter, Inches	115					
Rect. Duct Width, Inches	—					
Rect. Duct Depth, Inches	—					
Final Volume - $V_f$		191.50	249.55	307.65	307.367.50	
Total Run Time - $\theta$		64	64	64	64	
Condensate Volume, ml (g)		165	159	166	176	
End of Run Summary						
Parameter		Run 1	Run 2	Run 3	Run 4	Run 5
Average Sq. Rt. of the $\Delta P$	$\sqrt{\Delta P}$	1.1187	1.0873	1.0915	1.1150	
Average Orifice Meter	$\Delta H$	2.31	2.17	2.18	2.31	
Average Stack Temperature	$t_s$	463.8	465.1	466.1	466.6	
Average Meter Temperature	$t_m$	92.2	91.0	89.8	89.4	
Sample Volume, Actual	$V_m$	59.69	57.80	57.85	59.55	
Sample Volume, Dry Standard	$V_{std}$	55.82	54.15	54.33	55.97	
Moisture Content	MC	12.21	12.14	12.57	12.81	
Average Gas Velocity	$V_s$	86.26	81.72	82.16	84.01	
Isokinetic Variation	%I	99.0	99.1	99.4	100.6	
Volumetric Airflow, Actual	ACFM	364680	353670	355570	363570	
Volumetric Airflow, Standard	SCFM	201120	194280	195600	199900	
Volumetric Airflow, Dry Std.	DSCFM	176560	171130	171000	174130	

Note: The data on this form is preliminary and includes estimates. It may not match final results.



# Equipment Use Summary

Equipment and Calibration Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC-SV0019

Date 7/26/11

## EPA Method 2

Pitot Tube Number: 4-02 Coef.: 0.810 Calibration Date: 10-13-10  
Measurements: ☒ Preliminary ☒ With Isokinetic Runs ☐ Separate

## EPA Method 3

☒ Integrated Bag ☐ Glass Bulb ☐ Bag/Bulb ☐ Oxygen Analyzer  
☒ No. Per Run ☐ Multipoint ☒ With Iso Train ☒ Single Point

## EPA Method 4

☒ Back Half Iso-train ☐ Separate ☐ Wet/Dry Bulb ☐ Not Measured  
☒ Impingers/Dry Column ☐ Condenser/Dry Column ☐ Midget Impinger (approx)

## Isokinetic Train (M-5, 8, 17, 23, 26A, 29, 0010, etc.)

Nozzle Material: ☐ Stainless Steel ☐ Quartz ☒ Glass ☐ Other  
Nozzle Calibration: 

<u>0.257</u>	<u>0.258</u>	<u>0.257</u>	<u>0.256</u>	<u>0.257</u>
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 Avg. = 0.257

Probe: 4' Feet Effective Material: ☒ Glass ☐ Stainless Steel  
☐ Teflon ☐ Other \_\_\_\_\_

Control Module No.: CM-12 Cal. Date 6/30/11  $\gamma$  1.0053  $\Delta H@$  1.603

Filter Type: ☐ 2 1/2" Round ☐ 4" Round ☐ Thimble ☒ Other NONE  
Filter Media: ☐ Glass Fiber ☐ Quartz ☐ Paper ☐ Teflon  
☐ Stainless Steel ☐ Cellulose ☒ Other NONE-BYPASS

Solid Sorbent: ☒ None ☐ XAD-2 ☐ Other \_\_\_\_\_

Wet Catch Analyses: Organic EPA 8 EPA 29 Inorganic EPA 23 Semi-vols EPA 202 EPA 26 Other M-0011

## Constant Rate Train(s)

Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Bag Sampler Nos.: MAN \_\_\_\_\_

## Gas Analyzers

☐ NOx ☐ SO2 ☐ CO ☒ THC  
☒ O2 ☐ CO2 ☐ FTIR ☐ Other



2018/2019

# Field Calculation Summary

Computer Initialization and Run Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7/28/11

Initialization Parameters						
Parameter	Initial	Run 1	Run 2	Run 3	Run 4	Run 5
Meter Coefficient - $\gamma$	1.006					
Orifice Coefficient - $\Delta H@$	1.889					
Pitot Coefficient - $C_p$	0.84					
Nozzle Diameter - $D_n$	.156					
Barometric Pressure - $P_b$	28.88	28.88	28.88	29.03		
Static Pressure - $P_g$	-.95	-.95	-.95	-.95		
Oxygen Estimate - %O <sub>2</sub>	4	4	4	4		
No. of Traverse Points	12					
Point Duration - $\Delta T$	~ 20					
Meter Start Temp, °F - $t_m$	86	86	98	80		
Initial Meter Volume - $V_i$	—	280.60	373.47	462.60		
Round Duct Diameter, Inches	11.5					
Rect. Duct Width, Inches	—					
Rect. Duct Depth, Inches	—					
Final Volume - $V_f$		(.39) 373.39	462.43	551.04		
Total Run Time - $\theta$		251.2	238.7	238.2		
Condensate Volume, ml (g)		301	265	267		
End of Run Summary						
Parameter		Run 1	Run 2	Run 3	Run 4	Run 5
Average Sq. Rt. of the $\Delta P$	$\sqrt{\Delta P}$	1.1643	1.1580	1.1494		
Average Orifice Meter	$\Delta H$	0.456	0.453	0.452		
Average Stack Temperature	$t_s$	459.2	99.4571	454.8		
Average Meter Temperature	$t_m$	93.9	88.96	105.4		
Sample Volume, Actual	$V_m$	92.79	88.96	88.44		
Sample Volume, Dry Standard	$V_{std}$	88.10 <del>88.10</del>	81.26	80.32		
Moisture Content	MC	13.85	13.30	13.53		
Average Gas Velocity	$V_s$	88.26	87.60	86.63		
Isokinetic Variation	%I	104.2 <del>102.5</del>	101.5	101.1		
Volumetric Airflow, Actual	ACFM	381991	379132	374908		
Volumetric Airflow, Standard	SCFM	211361	20254	20532		
Volumetric Airflow, Dry Std.	DSCFM	182082	182284	181182		

Note: The data on this form is preliminary and includes estimates. It may not match final results.





# Equipment Use Summary

Equipment and Calibration Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7/28/11

## EPA Method 2

Pitot Tube Number: 4-02 Coef.: 0.84 Calibration Date: \_\_\_\_\_

Measurements: ☐ Preliminary ☒ With Isokinetic Runs ☐ Separate

## EPA Method 3

☒ Integrated Bag

☐ Glass Bulb

☐ Bag/Bulb

☐ Oxygen Analyzer

1 No. Per Run

☐ Multipoint

☐ With Iso Train

☐ Single Point

## EPA Method 4

☒ Back Half Iso-train

☐ Separate

☐ Wet/Dry Bulb

☐ Not Measured

☒ Impingers/Dry Column

☐ Condenser/Dry Column

☐ Midget Impinger (approx)

## Isokinetic Train (M-5, 8, 17, 23, 26A, 29, 0010, etc.)

Nozzle Material: ☒ Stainless Steel ☐ Quartz ☐ Glass ☐ Other

Nozzle Calibration: 

.176	.176	.176	.176	.176
.156	.156	.156	.156	.156

 Avg. = .156

Probe: 4' Feet Effective Material: ☒ Glass ☐ Stainless Steel  
☐ Teflon ☐ Other \_\_\_\_\_

Control Module No.: CM-1 Cal. Date 6/16/11  $\gamma$  1.006  $\Delta H@$  1.289

Filter Type: ☒ 2 1/2" Round ☐ 4" Round ☐ Thimble ☐ Other \_\_\_\_\_

Filter Media ☒ Glass Fiber ☐ Quartz ☐ Paper ☐ Teflon

☐ Stainless Steel ☐ Cellulose ☐ Other \_\_\_\_\_

Solid Sorbent: ☒ None ☐ XAD-2 ☐ Other \_\_\_\_\_

Wet Catch Analyses: Organic EPA 8 EPA 29 Inorganic EPA 23 Semi-vols ☒ EPA 202 EPA 26 Other \_\_\_\_\_

## Constant Rate Train(s)

Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_

Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_

Bag Sampler Nos.: \_\_\_\_\_

## Gas Analyzers

☐ NOx

☐ SO2

☐ CO

☐ THC

☐ O2

☐ CO2

☐ FTIR

☐ Other

NA m RV  
7/28/11



# Field Calculation Summary

Computer Initialization and Run Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 2/28/11

Initialization Parameters						
Parameter	Initial	Run 1	Run 2	Run 3	Run 4	Run 5
Meter Coefficient - $\gamma$	0.9949					
Orifice Coefficient - $\Delta H@$	1.704					
Pitot Coefficient - $C_p$	<del>0.250</del>	0.840 mm				
Nozzle Diameter - $D_n$	0.250					
Barometric Pressure - $P_b$	28.88					
Static Pressure - $P_g$	0.95					
Oxygen Estimate - %O <sub>2</sub>	4.5					
No. of Traverse Points	16					
Point Duration - $\Delta T$	6					
Meter Start Temp, °F - $t_m$	85	85	85	95		
Initial Meter Volume - $V_i$	424.50	424.76	512.53	600.00		
Round Duct Diameter, Inches	11.5					
Rect. Duct Width, Inches	—					
Rect. Duct Depth, Inches	—					
Final Volume - $V_f$		511.60	599.80	687.40		
Total Run Time - $\theta$		96	96	96		
Condensate Volume, ml (g)		282	316	279		
End of Run Summary						
Parameter		Run 1	Run 2	Run 3	Run 4	Run 5
Average Sq. Rt. of the $\Delta P$	$\sqrt{\Delta P}$	1.1387	1.1331	1.1261		
Average Orifice Meter	$\Delta H$	2.29	2.29	2.28		
Average Stack Temperature	$t_s$	463.7	461.0	460.1		
Average Meter Temperature	$t_m$	84.9	90.3	93.4		
Sample Volume, Actual	$V_m$	88.86.81	87.27	87.40		
Sample Volume, Dry Standard	$V_{std}$	81.27	80.89	80.54		
Moisture Content	MC	14.64	15.53	14.02		
Average Gas Velocity	$V_s$	85.96	85.70	84.84		
Isokinetic Variation	%I	101.8	103.2	101.8		
Volumetric Airflow, Actual	ACFM	37230	370890	367160		
Volumetric Airflow, Standard	SCFM	204770	204770	202890		
Volumetric Airflow, Dry Std.	DSCFM	176020	172940	174450		

Note: The data on this form is preliminary and includes estimates. It may not match final results.



# Equipment Use Summary

Equipment and Calibration Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7/28/11

## EPA Method 2

Pitot Tube Number: 4-01 Coef.: 0.840 Calibration Date: 10/13/10

Measurements: ☐ Preliminary ☒ With Isokinetic Runs ☐ Separate

## EPA Method 3

☒ Integrated Bag ☐ Glass Bulb ☐ Bag/Bulb ☐ Oxygen Analyzer  
( No. Per Run ☒ Multipoint ☒ With Iso Train ☒ Single Point

## EPA Method 4

☒ Back Half Iso-train ☐ Separate ☐ Wet/Dry Bulb ☐ Not Measured  
☒ Impingers/Dry Column ☐ Condenser/Dry Column ☐ Midget Impinger (approx)

## Isokinetic Train (M-5, 8, 17, 23, 26A, 29, 0010, etc.)

Nozzle Material: ☐ Stainless Steel ☐ Quartz ☒ Glass ☐ Other  
Nozzle Calibration: 0.250 0.250 0.250 0.250 0.250 Avg. = 0.250

Probe: 4' Feet Effective Material: ☒ Glass ☐ Stainless Steel  
☐ Teflon ☐ Other

Control Module No.: CM-4 Cal. Date 5/27/11  $\gamma$  0.9949  $\Delta H@$  1.704

Filter Type: ☐ 2 1/2" Round ☒ 4" Round ☐ Thimble ☐ Other  
Filter Media: ☐ Glass Fiber ☒ Quartz ☐ Paper ☐ Teflon  
☐ Stainless Steel ☐ Cellulose ☐ Other

Solid Sorbent: ☒ None ☐ XAD-2 ☐ Other

Wet Catch Analyses: Organic EPA 8 EPA 29 Inorganic EPA 23 Semi-vols EPA 202 EPA 26A Other

## Constant Rate Train(s)

Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Bag Sampler Nos.: \_\_\_\_\_

## Gas Analyzers

☐ NOx ☐ SO2 ☐ CO ☐ THC  
☒ O2 ☒ CO2 ☐ FTIR ☒ Other



OTM 29

# Field Calculation Summary

Computer Initialization and Run Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7-28-17

Initialization Parameters						
Parameter	Initial	Run 2	Run 3	Run 4	Run 5	
Meter Coefficient - $\gamma$	1.0653					
Orifice Coefficient - $\Delta H @$	1.715					
Pitot Coefficient - $C_p$	0.84					
Nozzle Diameter - $D_n$	0.25	0.226	0.189	0.189		
Barometric Pressure - $P_b$	28.80	28.88	28.86	28.88		
Static Pressure - $P_g$	-0.95	-0.95	-0.95	-0.95		
Oxygen Estimate - %O <sub>2</sub>	4	4	4	4		
No. of Traverse Points	16					
Point Duration - $\Delta T$	4					
Meter Start Temp, °F - $t_m$	85	90	90	98		
Initial Meter Volume - $V_i$	306.81	337.80	372.25	405.00		
Round Duct Diameter, Inches	165					
Rect. Duct Width, Inches	—					
Rect. Duct Depth, Inches	—					
Final Volume - $V_f$		372.02	404.13	436.94		
Total Run Time - $\theta$		48	64	64		
Condensate Volume, ml (g)		—	—	—		
End of Run Summary						
Parameter		Run 1	Run 2	Run 3	Run 4	Run 5
Average Sq. Rt. of the $\Delta P$	$\sqrt{\Delta P}$	1.1146	1.1036	1.0932		
Average Orifice Meter	$\Delta H$	1.49	0.72	0.72		
Average Stack Temperature	$t_s$	461.8	460.6	459.3		
Average Meter Temperature	$t_m$	92.0	95.9	104.3		
Sample Volume, Actual	$V_m$	34.22	31.84	31.94		
Sample Volume, Dry Standard	$V_{std}$	31.82	29.38	28.99		
Moisture Content	MC	13.33	13.33	13.30		
Average Gas Velocity	$V_s$	82.97	82.97	82.12		
Isokinetic Variation	%I	99.5	98.9	98.5		
Volumetric Airflow, Actual	ACFM	363330	359080	355410		
Volumetric Airflow, Standard	SCFM	200400	198360	196570		
Volumetric Airflow, Dry Std.	DSCFM	172530	171870	170420		

Note: The data on this form is preliminary and includes estimates. It may not match final results.





# Equipment Use Summary

Equipment and Calibration Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date \_\_\_\_\_

## EPA Method 2

Pitot Tube Number: 4-06 Coef.: 0.84 Calibration Date: 10-13-11

Measurements: ☐ Preliminary ☒ With Isokinetic Runs ☐ Separate

## EPA Method 3

☐ Integrated Bag ☐ Glass Bulb ☐ Bag/Bulb ☒ Oxygen Analyzer  
\_\_\_\_ No. Per Run ☐ Multipoint ☐ With Iso Train ☐ Single Point

## EPA Method 4

☒ Back Half Iso-train ☐ Separate ☐ Wet/Dry Bulb ☐ Not Measured  
☒ Impingers/Dry Column ☐ Condenser/Dry Column ☐ Midget Impinger (approx)

## Isokinetic Train (M-5, 8, 17, 23, 26A, 29, 0010, etc.)

Nozzle Material: ☐ Stainless Steel ☐ Quartz ☐ Glass ☐ Other

Nozzle Calibration: .234 .233 .234 .234 .234 Avg. = 0.234 R1  
0.250 0.251 0.251 0.250 0.250  
.225 .226 .226 .226 .226 R2

Probe: \_\_\_\_\_ Feet Effective Material: ☐ Glass ☐ Stainless Steel  
☐ Teflon ☐ Other \_\_\_\_\_

Control Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  $\Delta H@$  \_\_\_\_\_

Filter Type: ☐ 2 1/2" Round ☐ 4" Round ☐ Thimble ☐ Other \_\_\_\_\_  
Filter Media ☐ Glass Fiber ☐ Quartz ☐ Paper ☐ Teflon  
☐ Stainless Steel ☐ Cellulose ☐ Other \_\_\_\_\_

Solid Sorbent: ☐ None ☐ XAD-2 ☐ Other \_\_\_\_\_

Wet Catch Analyses: Organic EPA 8 EPA 29 Inorganic EPA 23 Semi-vols EPA 202 EPA 26 Other \_\_\_\_\_

## Constant Rate Train(s)

Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Bag Sampler Nos.: \_\_\_\_\_

## Gas Analyzers

☐ NOx ☐ SO2 ☐ CO ☐ THC  
☐ O2 ☐ CO2 ☐ FTIR ☐ Other



# Field Calculation Summary

Computer Initialization and Run Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date 7-26-11

Initialization Parameters						
Parameter	Initial	Run 1	Run 2	Run 3	Run 4	Run 5
Meter Coefficient - $\gamma$	1.006					
Orifice Coefficient - $\Delta H@$	1.889					
Pitot Coefficient - $C_p$	.840					
Nozzle Diameter - $D_n$	.245					
Barometric Pressure - $P_b$	28.94	28.94	28.94	28.94		
Static Pressure - $P_g$	-.91	-.91	-.91	-.91		
Oxygen Estimate - %O <sub>2</sub>	5	5	5	5		
No. of Traverse Points	32 (16 x 2)					
Point Duration - $\Delta T$	10 (5 times)					
Meter Start Temp, °F - $t_m$	75	85	97	99		
Initial Meter Volume - $V_i$	485.02 * 631.98	632.32 *	632.57 *	779.30 *		* 779.30
Round Duct Diameter, Inches	11.5	485.02	632.57	779.30		
Rect. Duct Width, Inches	—					
Rect. Duct Depth, Inches	—					
Final Volume - $V_f$		632.32	779.03	929.83		
Total Run Time - $\theta$		187	187	187		
Condensate Volume, ml (g)		502	412	442		
End of Run Summary						
Parameter		Run 1	Run 2	Run 3	Run 4	Run 5
Average Sq. Rt. of the $\Delta P$	$\sqrt{\Delta P}$	1.0862	1.0875	1.1207		
Average Orifice Meter	$\Delta H$	2.18	2.15	2.27		
Average Stack Temperature	$t_s$	456.5	459.4	461.2		
Average Meter Temperature	$t_m$	94.0	98.2	98.9		
Sample Volume, Actual	$V_m$	142.03	146.46	150.57		
Sample Volume, Dry Standard	$V_{std}$	132.11	135.55	139.22		
Moisture Content	MC	14.70	12.52	13.00		
Average Gas Velocity	$V_s$	81.79	81.62	84.28		
Isokinetic Variation	%I	102.3	99.1	99.4		
Volumetric Airflow, Actual	ACFM	353980	353240	364770		
Volumetric Airflow, Standard	SCFM	196770	195750	201750		
Volumetric Airflow, Dry Std.	DSCFM	167840	171250	175520		

Note: The data on this form is preliminary and includes estimates. It may not match final results.





# Equipment Use Summary

Equipment and Calibration Summary

FSD PN: 1106-200

Project FHR\_FCC\_ICR

Site FCC (SV019)

Date \_\_\_\_\_

## EPA Method 2

Pitot Tube Number: \_\_\_\_\_ Coef.: \_\_\_\_\_ Calibration Date: \_\_\_\_\_

Measurements: ☐ Preliminary ☐ With Isokinetic Runs ☐ Separate

## EPA Method 3

☐ Integrated Bag ☐ Glass Bulb ☐ Bag/Bulb ☐ Oxygen Analyzer  
\_\_\_\_\_ No. Per Run ☐ Multipoint ☐ With Iso Train ☐ Single Point

## EPA Method 4

☐ Back Half Iso-train ☐ Separate ☐ Wet/Dry Bulb ☐ Not Measured  
☐ Impingers/Dry Column ☐ Condenser/Dry Column ☐ Midget Impinger (approx)

## Isokinetic Train (M-5, 8, 17, 23, 26A, 29, 0010, etc.)

Nozzle Material: ☒ Stainless Steel ☐ Quartz ☐ Glass ☐ Other

Nozzle Calibration: 

<u>.245</u>	<u>.244</u>	<u>.245</u>	<u>.245</u>	<u>.246</u>
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 Avg. = .245

Probe: \_\_\_\_\_ Feet Effective Material: ☐ Glass ☐ Stainless Steel  
☐ Teflon ☐ Other \_\_\_\_\_

Control Module No.: CM-1 Cal. Date 6-16-11  $\gamma$  1.006  $\Delta H@$  1.889

Filter Type: ☐ 2 1/2" Round ☒ 4" Round ☐ Thimble ☐ Other \_\_\_\_\_  
Filter Media ☐ Glass Fiber ☒ Quartz ☐ Paper ☐ Teflon  
☐ Stainless Steel ☐ Cellulose ☐ Other \_\_\_\_\_

Solid Sorbent: ☐ None ☐ XAD-2 ☒ Other XAD

Wet Catch Analyses: Organic EPA 8 EPA 29 Inorganic EPA 23 Semi-vols EPA 202 EPA 26 Other m-0010

## Constant Rate Train(s)

Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Midget Module No.: \_\_\_\_\_ Cal. Date \_\_\_\_\_  $\gamma$  \_\_\_\_\_  
Bag Sampler Nos.: 7-25-11 \_\_\_\_\_

## Gas Analyzers

☐ NOx ☐ SO2 ☐ CO ☒ THC  
☒ O2 ☒ CO2 ☐ FTIR ☐ Other