

Giant  
YELLOWKNIFE MINES LIMITED

MEMO TO: G.B. Halverson

CC:

FROM: M.E. Goodfellow

DATE: October 18, 1988

SUBJECT: Stack Sampling Results

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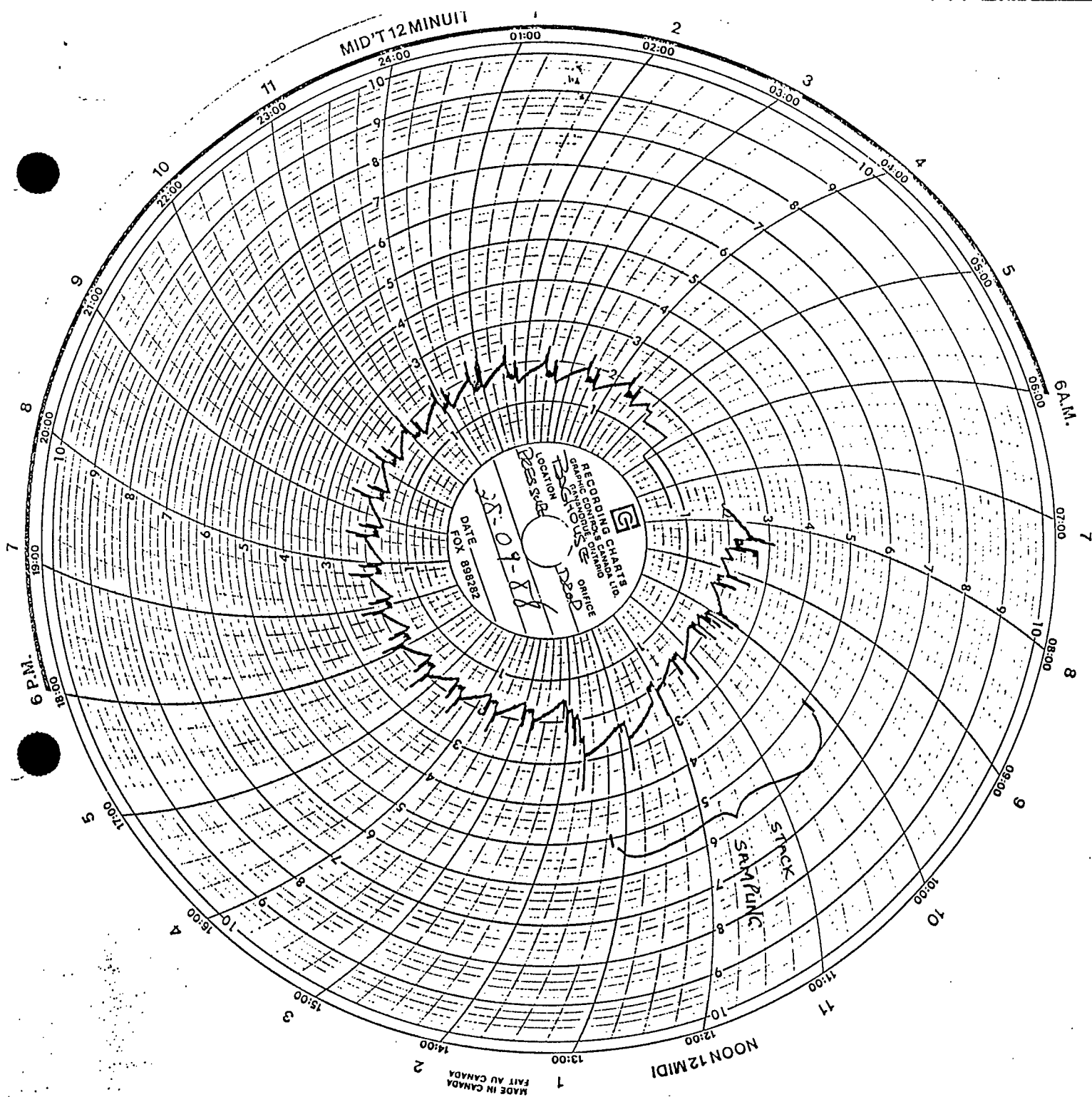
Summary:

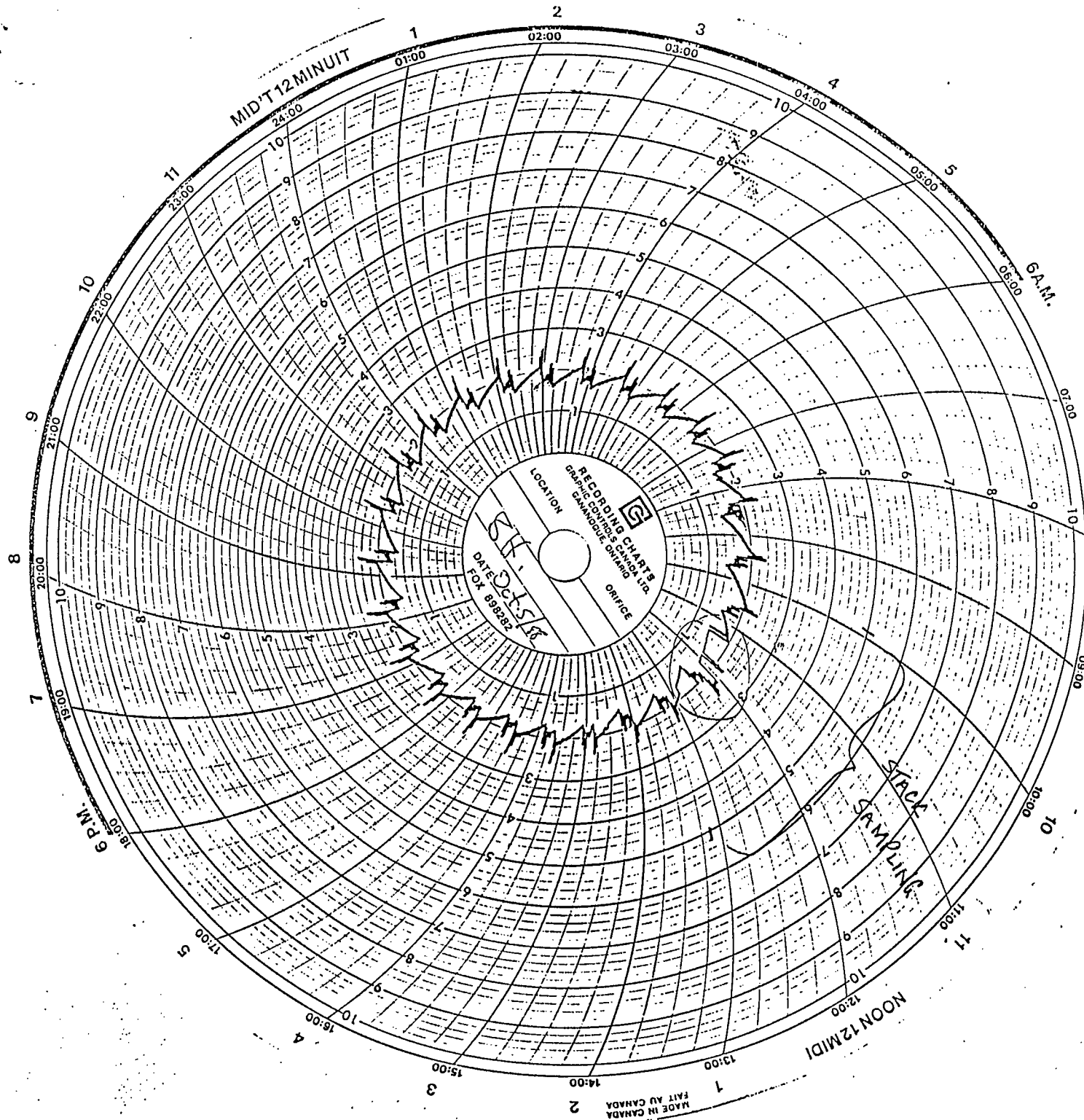
Stack sampling was conducted on September 28, 1988, by E. Collins of Environmental Protection Services and M. E. Goodfellow. During sampling, an air failure occurred causing a continuous shaking cycle in the baghouse. Arsenic concentrations were  $158.1 \text{ mg/m}^3$ . A reference range is set at  $50 \text{ mg/m}^3$ .

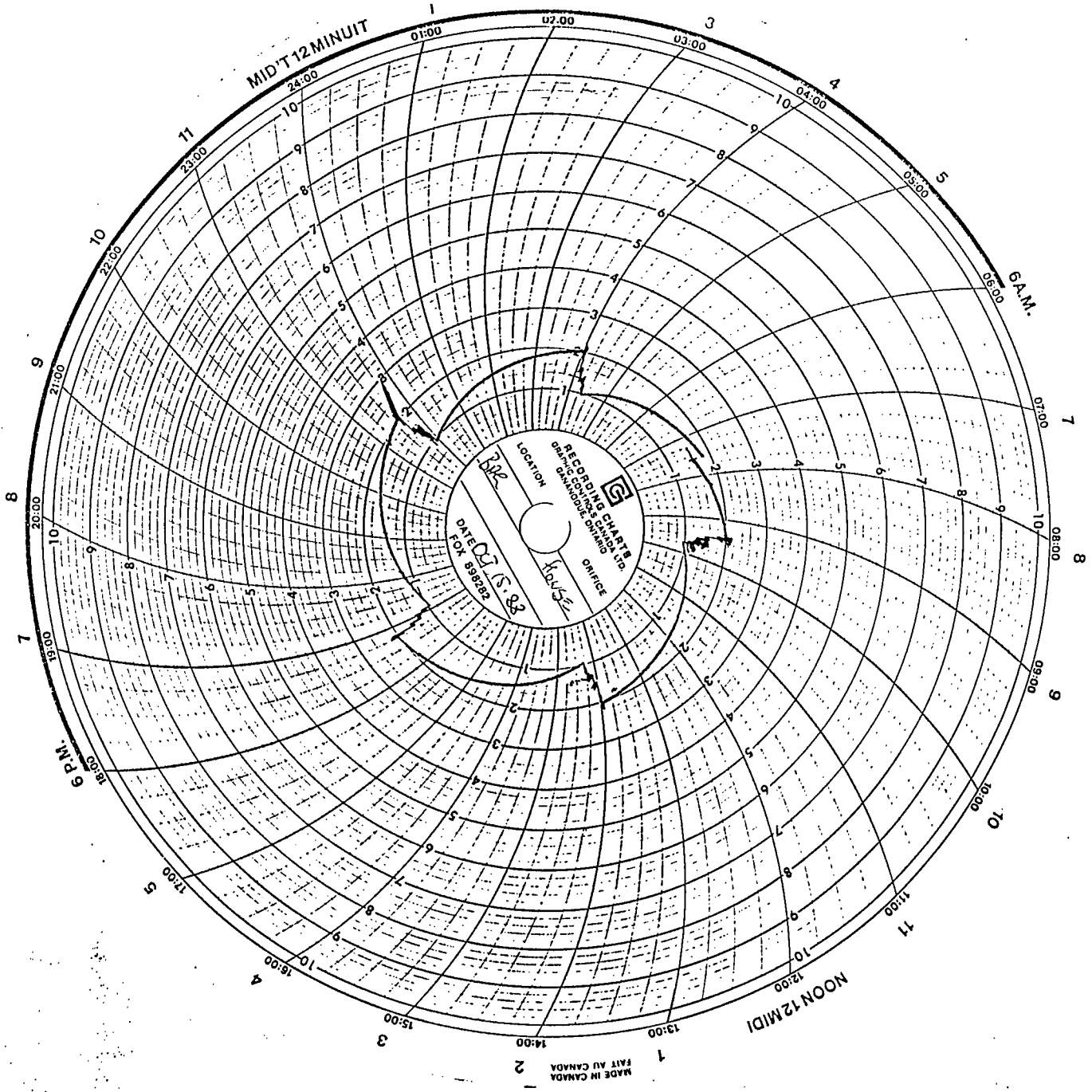
The second stack sampling run was conducted on October 5, 1988, by E. Collins and M.E. Goodfellow. During sampling, the Cottrell fan was readjusted and the flues were blown down again causing continuous shaking of the baghouse. Thus arsenic concentrations were  $198.8 \text{ mg/m}^3$ . In this run, the arsenic concentration may be high due to contamination of the probe sample while removing from the stack.

Baghouse charts for the above sampling runs are attached. A chart with a normal shaking cycle is also attached. Further sampling will be conducted upon receipt of a new stack thermocouple. Sampling will also be conducted at normal operation of the baghouse.

*M.E. Goodfellow*  
M. E. Goodfellow  
Project Metallurgist







RECORDING CHARTS LTD.  
OFFICE  
DATE 01/15/82  
LOCATION B22  
FOX 89882

NOON 12 MID

MID T 12 MINUIT

MADE IN CANADA  
FAIT AU CANADA

GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING  
CONDITIONS DURING RUN

DATE : October 5, 1988  
RUN : 88-2

STACK CONDITIONS

Fair.

ROASTER CONDITIONS

Stack fan setting : C+  
Feed rate : 6.38 tph

COTTRELL CONDITIONS

Inlet temperature : 721 degrees F  
Outlet temperature : 550 degrees F

BAGHOUSE CONDITIONS

Inlet temperature : 225 degrees F  
Pressure drops : 1.9 in H2O  
Shaking cycle : %  
100

COMMENTS

A bright warm sunny day with an ambient temperature of 11 degrees C.

GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING

DATE : October 5, 1988  
RUN : 88-2

PARTICULATE LOADING

Weight of filter	Final	497.5 mg
	Initial	333.9 mg
		-----
Total particulate weight		163.6 mg

ARSENIC LOADING

PARTICULATE

Total particulate weight	163.6 mg
Diluted volume	100.0 mL
Arsenic concentration	1,600.0 ppm
Total As in particulate	160.0 mg

VAPOUR

Total wash water volume	2,000 mL
Arsenic concentration	184 ppm
Total As in vapour	368.0 mg

TOTAL ARSENIC LOADING 528.0 mg

ARSENIC CONCENTRATION 198.8 mg/m

VOLUMETRIC FLOWRATE 48,560.6 m<sup>3</sup>/hr

ARSENIC MASS EMISSION RATE 9.7 kg/hr or 510.8 lb/day

GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING  
MOISTURE ANALYSIS DATA SHEET

DATE : October 5, 1988

RUN : 88-2

TEST CONDUCTED BY : M. E. Goodfellow, E. Collins

REF:STACKMST.WR1

IMPINGER #	IMPINGER CONTENTS	WEIGHT (g)	
1	100 mL water	Final	1,552.0
		Initial	1,419.0
		GAIN	133.0 (a)
2	100 mL water	Final	1,447.0
		Initial	1,417.0
		GAIN	30.0 (b)
3	100 mL water	Final	1,434.0
		Initial	1,423.0
		GAIN	11.0 (c)
4	empty	Final	1,293.0
		Initial	1,287.0
		GAIN	6.0 (d)
5	200 g silica gel	Final	221.0
		Initial	200.0
		GAIN	21.0 (e)

Total volume of excess water = a + b + c + d + e = 201.0 mL

GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING

October 5, 1988

RUN # 88-2

Excess water in impingers and gel	201.0000 mL
Barometric pressure	98.1500 kPa
Diameter of sampling nozzle	12.7000 mm
Volume of water vapour	0.2734 m
Dry gas volume	2.6553 m
Moisture content	0.1255
Absolute stack pressure	99.095 kPa

NORTH/SOUTH TRAVERSE DATA

SAMPLE POINT	SAMPLE TIME (min.)	STACK GAS TEMPERATURE		VELOCITY PRESSURE		ORIFICE PRESSURE		GAS METER VOLUME		DRY GAS TEMPERATURE		IMPINGER TEMP	STACK GAS VELOCITY	PER CENT ISO KINETIC
		F	K	(in H2O)	(kPa)	(in H2O)	(kPa)	(ft <sup>3</sup> )	(m <sup>3</sup> )	F	K	F	(m/s)	%
00	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
01	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
02	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
03	5.0	150	339	0.010	0.0025	0.50	0.1245	2.10	0.0595	52.0	284	30.0	1.887	112.14%
04	5.0	150	339	0.010	0.0025	0.50	0.1245	2.30	0.0651	54.0	285	30.0	1.887	122.34%
05	5.0	165	347	0.020	0.0050	1.00	0.2491	2.80	0.0793	56.0	286	30.0	2.701	106.32%
06	5.0	195	364	0.025	0.0062	1.25	0.3114	3.10	0.0878	60.0	289	32.0	3.092	107.02%
07	5.0	210	372	0.025	0.0062	1.20	0.2989	3.00	0.0850	65.0	291	32.0	3.127	103.74%
08	5.0	215	375	0.030	0.0075	1.45	0.3612	3.60	0.1020	69.0	294	32.0	3.438	113.27%
09	5.0	215	375	0.035	0.0087	1.70	0.4234	4.00	0.1133	72.0	295	32.0	3.713	115.94%
10	5.0	215	375	0.035	0.0087	1.70	0.4234	3.20	0.0906	75.0	297	30.0	3.713	92.23%
11	5.0	215	375	0.040	0.0100	1.75	0.4359	3.90	0.1104	78.0	299	30.0	3.970	104.57%
12	5.0	215	375	0.040	0.0100	2.00	0.4982	4.00	0.1133	80.0	300	29.0	3.970	106.92%
13	5.0	215	375	0.035	0.0087	1.75	0.4359	3.70	0.1048	83.0	301	29.0	3.713	105.08%
14	5.0	215	375	0.040	0.0100	2.00	0.4982	4.20	0.1189	84.0	302	30.0	3.970	111.44%
15	5.0	215	375	0.035	0.0087	1.75	0.4359	3.70	0.1048	86.0	303	29.0	3.713	104.50%
16	5.0	215	375	0.035	0.0087	1.75	0.4359	3.80	0.1076	87.0	304	30.0	3.713	107.13%

Average per cent isokinetic variation = 108.05%



**GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING**

October 5, 1988

RUN # 88-2

**EAST/WEST TRAVERSE DATA**

SAMPLE POINT	SAMPLE TIME (min)	STACK GAS TEMPERATURE F	STACK GAS TEMPERATURE K	VELOCITY PRESSURE (in H2O)	VELOCITY PRESSURE (kPa)	ORIFICE PRESSURE (in H2O)	ORIFICE PRESSURE (kPa)	GAS METER VOLUME (ft )	GAS METER VOLUME (m )	DRY GAS TEMPERATURE F	DRY GAS TEMPERATURE K	IMPINGER TEMP F	STACK GAS VELOCITY (m/s)	PER CENT ISOKINETIC %
00	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
01	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
02	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
03	5.0	115	319	0.010	0.0025	0.60	0.1494	2.20	0.0623	75.0	297	15.0	1.832	109.17%
04	5.0	130	327	0.015	0.0037	0.85	0.2117	2.60	0.0736	75.0	297	15.0	2.273	106.78%
05	5.0	170	350	0.015	0.0037	0.80	0.1993	2.60	0.0736	75.0	297	15.0	2.349	110.33%
06	5.0	205	369	0.015	0.0037	0.75	0.1868	2.60	0.0736	76.0	297	17.0	2.413	113.13%
07	5.0	210	372	0.030	0.0075	1.50	0.3736	3.40	0.0963	77.0	298	20.0	3.425	105.01%
08	5.0	215	375	0.025	0.0062	1.25	0.3114	3.30	0.0935	80.0	300	20.0	3.138	111.37%
09	5.0	215	375	0.030	0.0075	1.50	0.3736	3.40	0.0963	81.0	300	20.0	3.438	104.62%
10	5.0	215	375	0.035	0.0087	1.75	0.4359	3.70	0.1048	82.0	301	20.0	3.713	105.27%
11	5.0	215	375	0.040	0.0100	2.00	0.4982	4.30	0.1218	84.0	302	20.0	3.970	114.10%
12	5.0	215	375	0.040	0.0100	2.00	0.4982	3.80	0.1076	85.0	302	22.0	3.970	100.64%
13	5.0	215	375	0.045	0.0112	2.30	0.5729	4.10	0.1161	88.0	304	22.0	4.211	101.89%
14	5.0	215	375	0.045	0.0112	2.30	0.5729	4.30	0.1218	90.0	305	22.0	4.211	106.48%
15	5.0	215	375	0.040	0.0100	2.00	0.4982	4.20	0.1189	91.0	306	25.0	3.970	110.02%
16	5.0	215	375	0.040	0.0100	2.00	0.4982	4.20	0.1189	92.0	306	25.0	3.970	109.83%

Average per cent isokinetic variation = 107.76%

Average isokinetic variation for the entire test = 107.90%

Plant GYML  
 Run Number 88-2  
 Date October 5, 1988  
 Operator MEG / E. Collins (EPS)  
 Ambient Temperature, °C 11

Barometric Pressure, kPa 98.15  
 Assumed Moisture, % 6.0  
 Heater Box Setting, °F High  
 Probe Tip Dia., in 0.5  
 Probe Length, ft 13.0  
 Probe Heater Setting High

N/S TRAVERSE

POINT	CLOCK TIME	DRY GAS METER (ft³)	PITOT in H2O (P)	ORIFICE (H), in H2O		TEMPERATURE °F		PUMP VACUUM (Hg)	TEMPERATURE (°F)			STACK PRESS. (in Hg)
				DESIRED	ACTUAL	DRYGAS	PROBE		SAMPLE CASE	IMPINGE	STACK	
00												
01												
02												
9:52 03	0	495.5	0.010	0.52	0.50	52	150	4.0	20	30	150	0.30
04	5	497.6	0.010	0.52	0.50	54	150	4.0	40	30	150	
05	10	499.9	0.020	1.02	1.00	56	165	4.0	80	30	165	0.30
06	15	502.7	0.025	1.23	1.25	60	195	6.0	80	32	195	
07	20	505.8	0.025	1.22	1.20	65	220	7.0	80	32	210	0.30
08	25	508.8	0.030	1.46	1.45	69	225	7.0	100	32	215	
09	30	512.4	0.035	1.71	1.70	72	225	8.0	120	32	215	0.30
10	35	516.4	0.035	1.72	1.70	75	225	7.0	140	30	215	
11	40	519.6	0.035	1.74	1.75	78	225	7.0	180	30	215	0.30
12	45	523.5	0.040	1.99	2.00	80	225	8.0	180	29	215	
13	50	527.5	0.035	1.76	1.75	83	225	8.0	160	29	215	0.30
14	55	531.2	0.040	2.01	2.00	84	225	7.0	150	30	215	
15	60	535.4	0.035	1.76	1.75	86	225	8.0	140	29	215	0.30
16	65	539.1	0.035	1.76	1.75	87	225	8.0	140	30	215	

542.9

Plant GMIL  
 Run Number 88-2  
 Date October 5, 1988  
 Operator MEG / E. Collins (EPS)  
 Ambient Temperature, °C 12

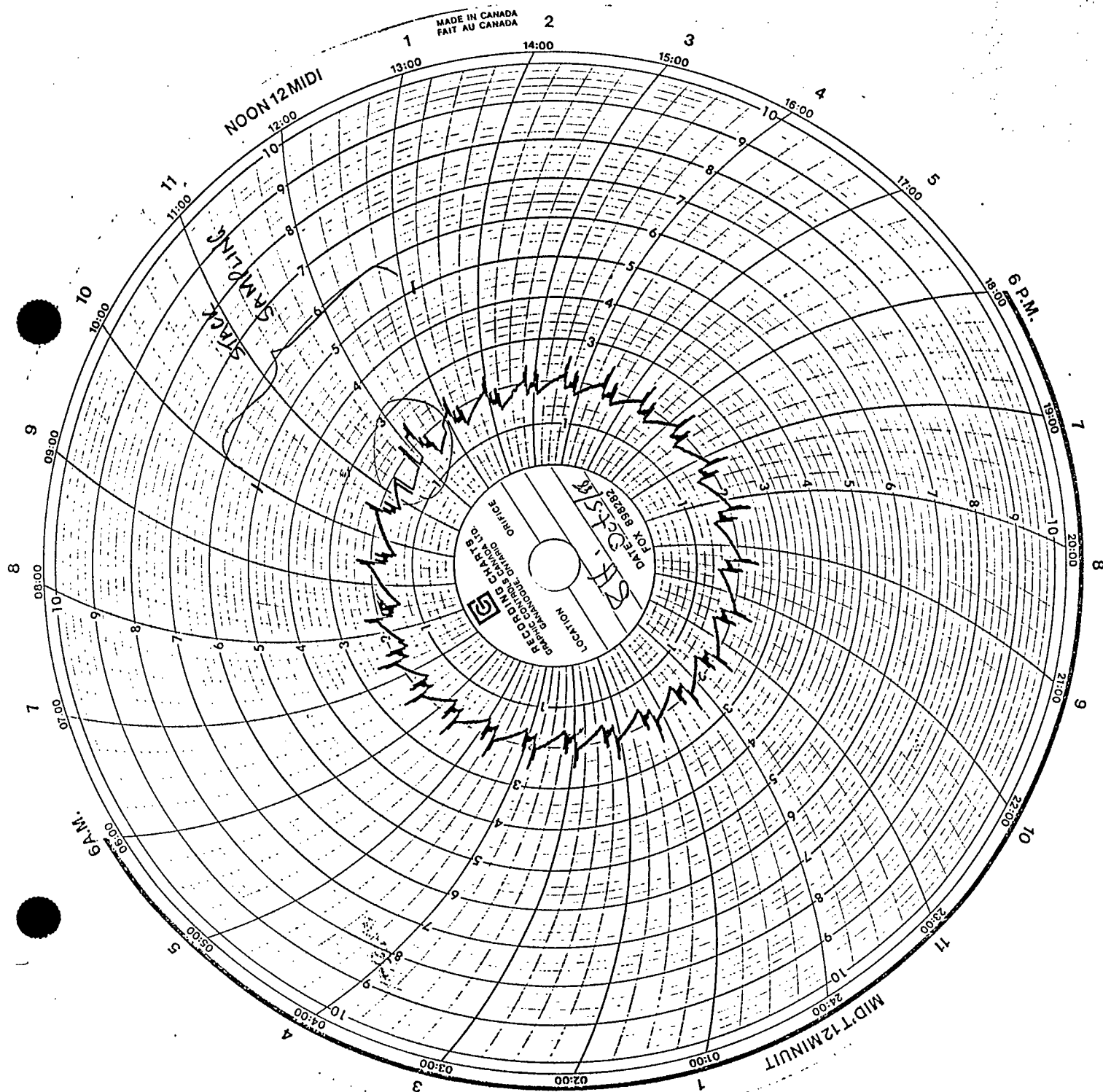
Barometric Pressure, kPa 78.15  
 Assumed Moisture, % 6.0  
 Heater Box Setting, °F High  
 Probe Tip Dia., in 0.5  
 Probe Length, ft 13.0  
 Probe Heater Setting High

E/W TRAVERSE

POINT	CLOCK TIME	DRY GAS METER (ft³)	PITOT in H2O (P)	ORIFICE (H), in H2O		TEMPERATURE °F		PUMP VACUUM (Hg)	TEMPERATURE (°F)			STACK PRESS. (in Hg)
				DESIRED	ACTUAL	DRYGAS	PROBE		SAMPLE CASE	IMPINGE	STACK	
00												
01												
02												
03	0	543.3	0.010	0.58	0.60	75	115	3.0	20	15	115	0.20
04	5	545.5	0.015	0.85	0.85	75	130	3.0	60	15	130	
05	10	548.1	0.015	0.79	0.80	75	170	3.0	80	15	170	0.25
06	15	550.7	0.015	0.75	0.75	76	205	3.0	90	17	205	
07	20	553.3	0.030	1.49	1.50	77	220	4.0	100	20	210	0.25
08	25	556.7	0.025	1.24	1.25	80	225	6.0	120	20	215	
09	30	560.0	0.030	1.49	1.50	81	230	6.0	120	20	215	0.20
10	35	563.4	0.035	1.74	1.75	82	230	6.0	120	20	215	
11	40	567.1	0.040	2.01	2.00	84	230	7.0	130	20	215	0.30
12	45	571.4	0.040	2.01	2.00	85	230	7.0	130	22	215	
13	50	575.2	0.045	2.28	2.30	88	230	8.0	140	22	215	0.30
14	55	579.3	0.045	2.28	2.30	90	230	8.0	150	22	215	
15	60	583.6	0.040	2.03	2.00	91	230	8.0	160	25	215	0.30
16	65	587.8	0.040	2.03	2.00	92	230	7.0	160	25	215	

592.0

23



88-2

October 5, 1988

$$\begin{aligned}
 Q_s &= \text{VOLUMETRIC FLOWRATE} = 3600 U_{avg} A (1 - B_{wo}) \frac{T_{ref}}{T_{avg}} \frac{P_s}{P_{ref}} \\
 &= 3600 (3.339)(5.8)(1 - 0.1255) \frac{298}{366} \frac{99.095}{101.3} \\
 &= 48\,560.618 \text{ m}^3/\text{hr} \\
 &= 809.344 \text{ m}^3/\text{min}
 \end{aligned}$$

$$\begin{aligned}
 C_{AS} &= \text{AS CONCENTRATION} = \frac{W_{As}}{V_{mref}} = \frac{528}{2.6553} \\
 &= 198.8 \frac{\text{mg}}{\text{m}^3}
 \end{aligned}$$

$$\begin{aligned}
 E_{RAS} &= \text{AS EMISSION RATE} = C_{AS} Q_s \times 10^{-6} \\
 &= (198.8)(48\,560.618) \times 10^{-6} \\
 &= 9.7 \text{ kg/hr} \\
 &= 510.8 \text{ lb/day}
 \end{aligned}$$

GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING  
CONDITIONS DURING RUN

DATE : October 28, 1987  
RUN : 87-3

STACK CONDITIONS

Good.

ROASTER CONDITIONS

Stack fan setting : C  
Feed rate : 5.58 tph

COTTRELL CONDITIONS

Inlet temperature : 707 degrees F  
Outlet temperature : 607 degrees F

BAGHOUSE CONDITIONS

Inlet temperature : 225 degrees F  
Pressure drops : 1.8 in H<sub>2</sub>O  
Shaking cycle : 10.7 %

COMMENTS

An overcast day with an ambient temperature of 0 degree C. Problems were encountered with the probe thermocouple. Readings were not consistent.

Gary.  
Here is a copy of the  
last stack sampling run.  
As emission rate & As  
concentration has decreased  
from the first two runs  
changing No. 3 bags in  
baghouse has aided in  
reducing As emissions  
but the results are  
still high.

Notes Muriel.  
2 more baghouses to be changed  
in 1987. SJK

GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING

DATE : October 28, 1987  
RUN : 87-3

PARTICULATE LOADING

Weight of filter	Final	510.0 mg
	Initial	323.2 mg
		-----
Total particulate weight		186.8 mg

ARSENIC LOADING

PARTICULATE

Total particulate weight	186.8 mg
Diluted volume	100.0 mL
Arsenic concentration	784.5 ppm
Total As in particulate	78.5 mg

VAPOUR

Total wash water volume	2360.0 mL
Arsenic concentration	49.8 ppm
Total As in vapour	117.5 mg

TOTAL ARSENIC LOADING	196.0 mg	
ARSENIC CONCENTRATION	66.2 mg/m <sup>3</sup>	
VOLUMETRIC FLOWRATE	59,083.3 m <sup>3</sup> /hr	
ARSENIC MASS EMISSION RATE	3.9 kg/hr	or 206.8 lb/day

GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING  
MOISTURE ANALYSIS DATA SHEET

DATE : October 28, 1987

RUN : 87-3

TEST CONDUCTED BY : T. R. Raponi, M. E. Goodfellow

IMPINGER #	IMPINGER CONTENTS	WEIGHT (g)	
1	100 mL water	Final	1,562.0
		Initial	1,424.0
		GAIN	138.0 (a)
2	100 mL water	Final	1,499.0
		Initial	1,417.1
		GAIN	81.9 (b)
3	100 mL water	Final	1,351.0
		Initial	1,423.0
		GAIN	(72.0) (c)
4	empty	Final	1,292.5
		Initial	1,238.0
		GAIN	4.5 (d)
5	200 g silica gel	Final	222.0
		Initial	200.0
		GAIN	22.0 (e)

Total volume of excess water = a + b + c + d + e = 174.4 mL



GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING

October 28, 1987

RUN # 87-3

Excess water in impingers and gel	174.4000 mL
Barometric pressure	97.9334 kPa
Diameter of sampling nozzle	12.7000 mm
Volume of water vapour	0.2372 m <sup>3</sup>
Dry gas volume	2.9619 m <sup>3</sup>
Moisture content	0.0741
Absolute stack pressure	99.0194 kPa

NORTH/SOUTH TRAVERSE DATA

SAMPLE POINT	SAMPLE TIME (min.)	STACK GAS TEMPERATURE °F	STACK GAS TEMPERATURE °K	VELOCITY PRESSURE (in H2O)	VELOCITY PRESSURE (kPa)	ORIFICE PRESSURE (in H2O)	ORIFICE PRESSURE (kPa)	GAS METER VOLUME (ft <sup>3</sup> )	GAS METER VOLUME (m <sup>3</sup> )	DRY GAS TEMPERATURE °F	DRY GAS TEMPERATURE °K	IMPINGER TEMP °F	STACK GAS VELOCITY (m/s)	PER CENT ISOKINETIC %
00	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
01	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
02	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
03	5.0	105	314	0.015	0.0037	0.83	0.2067	2.44	0.0691	45.0	280	15.0	2.225	97.94%
04	5.0	115	319	0.025	0.0062	1.35	0.3363	2.98	0.0844	46.0	291	15.0	2.898	93.41%
05	5.0	150	361	0.035	0.0087	1.70	0.4234	3.48	0.0986	50.0	293	15.0	3.645	97.34%
06	5.0	200	366	0.035	0.0087	1.70	0.4234	3.54	0.1003	55.0	286	20.0	3.673	98.81%
07	5.0	205	369	0.040	0.0100	1.95	0.4857	3.74	0.1059	60.0	289	20.0	3.942	97.14%
08	5.0	210	372	0.040	0.0100	1.95	0.4857	3.77	0.1068	63.0	290	20.0	3.957	97.72%
09	5.0	210	372	0.050	0.0125	2.40	0.5978	4.24	0.1201	66.0	292	20.0	4.424	97.85%
10	5.0	195	364	0.050	0.0125	2.50	0.6227	4.20	0.1189	69.0	294	20.0	4.374	95.32%
11	5.0	195	364	0.045	0.0112	2.30	0.5729	4.30	0.1218	70.0	294	20.0	4.149	102.62%
12	5.0	195	364	0.060	0.0149	3.00	0.7472	4.49	0.1272	71.0	295	25.0	4.791	92.79%
13	5.0	195	364	0.050	0.0125	2.50	0.6227	4.47	0.1266	73.0	296	25.0	4.374	100.68%
14	5.0	190	361	0.045	0.0112	2.30	0.5729	4.18	0.1184	73.0	296	30.0	4.133	98.81%
15	5.0	210	372	0.045	0.0112	2.20	0.5480	4.17	0.1181	73.0	296	30.0	4.197	100.06%
16	5.0	210	372	0.050	0.0125	2.50	0.6227	4.35	0.1232	73.0	296	20.0	4.424	99.10%

Average per cent isokinetic variation = 97.83%

GIANT YELLOWKNIFE MINES LIMITED  
STACK SAMPLING

October 28, 1987

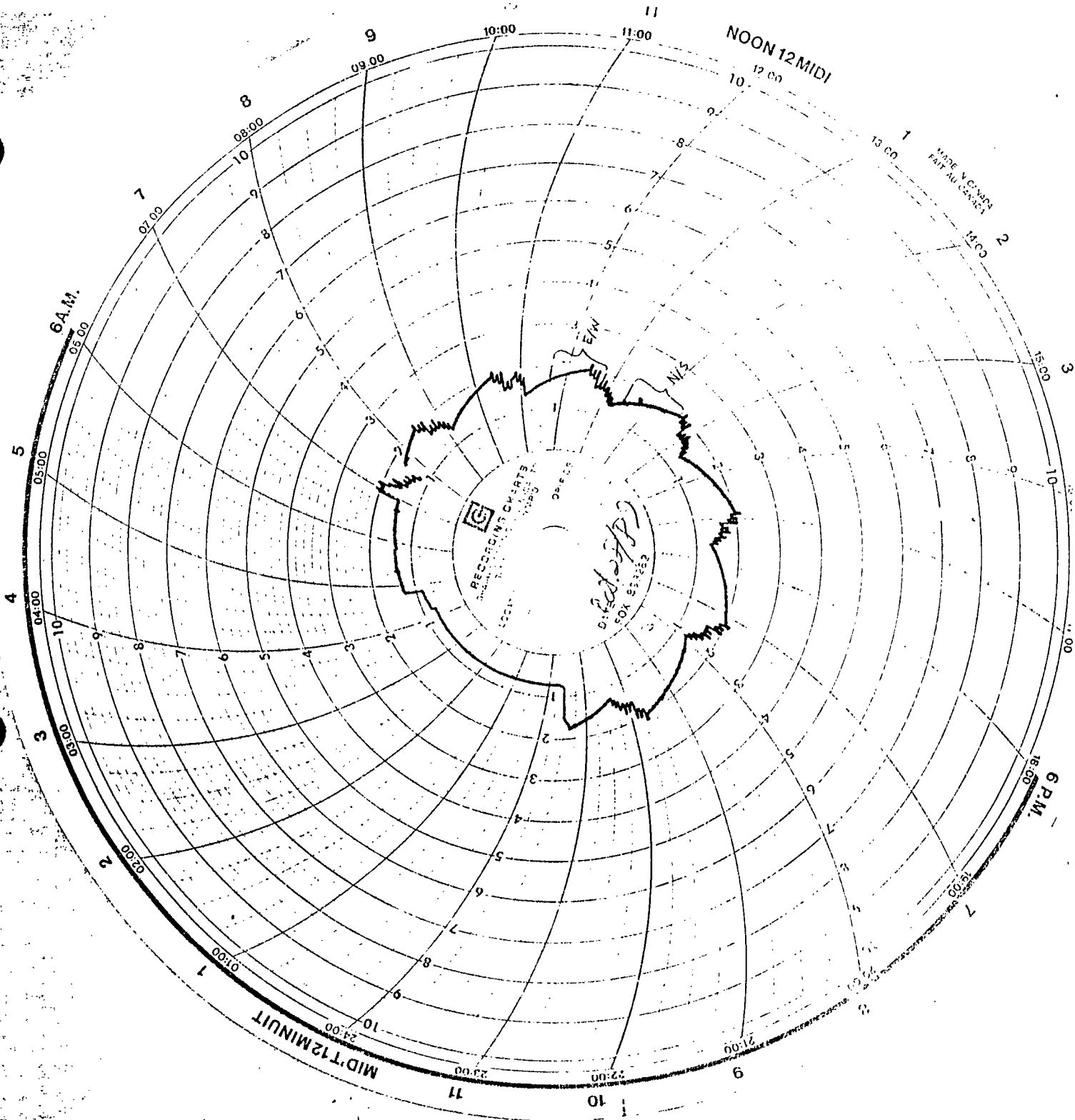
RUN # 87-3

EAST/WEST TRAVERSE DATA

SAMPLE POINT	SAMPLE TIME (min)	STACK GAS TEMPERATURE °F	STACK GAS TEMPERATURE °K	VELOCITY PRESSURE (in H2O)	VELOCITY PRESSURE (kPa)	ORIFICE PRESSURE (in H2O)	ORIFICE PRESSURE (kPa)	GAS METER VOLUME (ft <sup>3</sup> )	GAS METER VOLUME (m <sup>3</sup> )	DRY GAS TEMPERATURE °F	DRY GAS TEMPERATURE °K	IMPINGER TEMP °F	STACK GAS VELOCITY (m/s)	PER CENT ISOKINETIC %
00	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
01	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
02	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-
03	5.0	130	327	0.025	0.0062	1.33	0.3313	3.09	0.0875	42.0	279	15.0	2.935	98.89%
04	5.0	170	350	0.030	0.0075	1.50	0.3736	3.26	0.0923	43.0	279	20.0	3.323	98.27%
05	5.0	190	361	0.035	0.0087	1.70	0.4234	3.44	0.0974	45.0	280	25.0	3.645	97.18%
06	5.0	200	366	0.045	0.0112	2.20	0.5480	3.90	0.1104	47.0	281	30.0	4.165	97.65%
07	5.0	205	369	0.040	0.0100	1.90	0.4733	3.74	0.1059	50.0	283	30.0	3.942	99.03%
08	5.0	205	369	0.045	0.0112	2.20	0.5480	3.89	0.1102	52.0	284	30.0	4.181	96.81%
09	5.0	205	369	0.035	0.0087	1.68	0.4185	3.57	0.1011	55.0	286	30.0	3.687	100.02%
10	5.0	205	369	0.035	0.0087	1.68	0.4185	3.68	0.1042	56.0	286	35.0	3.687	102.90%
11	5.0	205	369	0.035	0.0087	1.68	0.4185	2.94	0.0833	56.0	286	40.0	3.687	82.21%
12	5.0	205	369	0.035	0.0087	1.70	0.4234	3.92	0.1110	58.0	287	40.0	3.687	109.20%
13	5.0	205	369	0.035	0.0087	1.70	0.4234	3.44	0.0974	58.0	287	40.0	3.687	95.83%
14	5.0	205	369	0.030	0.0075	1.45	0.3612	3.28	0.0929	58.0	287	45.0	3.414	98.63%
15	5.0	205	369	0.035	0.0087	1.70	0.4234	3.53	0.1000	59.0	288	45.0	3.687	98.14%
16	5.0	205	369	0.030	0.0075	1.45	0.3612	3.37	0.0954	59.0	288	50.0	3.414	101.14%

Average per cent isokinetic variation = 98.28%

Average isokinetic variation for the entire test = 98.05%



Plant GYML  
 Run Number 87-3  
 Location STACK  
 Date October 28, 1987  
 Operator TRR / MEG  
 Sample Case No. 1  
 Monitor Unit No. 1

Very Important - Fill in Blanks  
 Read and record at the start of  
 each test point.

Ambient temperature, °F 1  
 Barometric pressure, in. Hg 97.9334  
 Assumed moisture % 6.0  
 Heater box setting, °F High  
 Pitobe tip dia. in. 0.5"  
 Pitobe length, ft. 13'  
 Pitobe heater setting High

E/W TRAVERSE DATA

Point	Clock Time	Dry Gas Meter ft <sup>3</sup>	Pitot, in. H <sub>2</sub> O P	Orifice H, in. H <sub>2</sub> O		Dry gas temperature OF		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature OF	Impinger Temp- erature OF	Stack Pressure in. Hg	Stack Temp- erature OF
				Desired	Actual	DRY GAS	PROBE					
00												75
01												75
02												110
03	0	247.225	0.025	1.33	1.33	42	?	4.0	100	15	0.35	130
04	5	250.31	0.030	1.50	1.50	43	?	5.0	140	20		170
05	10	253.57	0.035	1.69	1.70	45	?	5.0	150	25	0.30	190
06	15	257.01	0.045	2.16	2.20	47	?	6.0	160	30		200
07	20	260.91	0.040	1.91	1.90	50	?	6.0	180	30	0.33	205
08	25	264.65	0.045	2.15	2.20	52	?	7.0	180	30		205
09	30	268.54	0.035	1.68	1.68	55	105	5.5	200	30	0.35	205
10	35	272.11	0.035	1.68	1.68	56	120	6.0	240	35		205
11	40	275.79	0.035	1.68	1.68	56	135	6.0	220	40	0.25	205
12	45	278.73	0.035	1.70	1.70	58	145	6.0	200	40		205
13	50	282.65	0.035	1.70	1.70	58	155	6.0	210	40	0.30	205

Comments:

Plant IML  
 Run Number 87-3  
 Location STACK  
 Date October 28, 1987  
 Operator TRR/MEG  
 Sample Case No. \_\_\_\_\_  
 Monitor Unit No. \_\_\_\_\_

Very Important - Fill in Blanks  
 Read and record at the start of  
 each test point.

Ambient temperature, °F \_\_\_\_\_  
 Barometric pressure, in. Hg 97.9334  
 Assumed moisture % 6.0  
 Heater box setting, °F High  
 Pitobe tip dia. in. 0.5"  
 Pitobe length, ft. 13'  
 Pitobe heater setting High

E/W TRAVERSE DATA

Point	Clock Time	Dry Gas Meter ft <sup>3</sup>	Pitot, in. H <sub>2</sub> O P	Orifice H, in. H <sub>2</sub> O		Dry gas temperature OF		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature OF	Impinger Temp- erature OF	Stack Pressure in. Hg	Stack Temp- erature OF
				Desired	Actual	DRY GAS	PROBE					
14	55	286.09	0.030	1.46	1.45	58	—	5.0	230	45		205
15	60	289.37	0.035	1.70	1.70	59	—	6.0	210	45	0.35	205
16	65	292.90	0.030	1.46	1.45	59	220	5.0	200	50		205
END	70	296.27										

Comments:

Plant GMIL  
 Run Number 87-3  
 Location STACK  
 Date October 28, 1987  
 Operator TRR/MEG  
 Sample Case No. \_\_\_\_\_  
 Monitor Unit No. \_\_\_\_\_

Very Important - Fill in Blanks  
 Read and record at the start of  
 each test point.

Ambient temperature, °C 22  
 Barometric pressure, in. Hg 97.9334  
 Assumed moisture % 6.0  
 Heater box setting, °F High  
 Pitobe tip dia. in. 0.5"  
 Pitobe length, ft. 13'  
 Pitobe heater setting High

N/S TRAVERSE

Point	Clock Time	Dry Gas Meter ft <sup>3</sup>	Pitot, in. H <sub>2</sub> O P	Orifice H, in. H <sub>2</sub> O		Dry gas temperature OF		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature OF	Impinger Temp- erature OF	Stack Pressure in. Hg	Stack Temp- erature OF
				Desired	Actual	DRY GAS	PROBE					
00												75
01												70
02												75
03	0	296.33	0.015	0.83	0.83	45	—	2.5	60	15	0.30	105
04	5	298.77	0.025	1.36	1.35	46	—	4.0	120	15		115
05	10	301.75	0.035	1.71	1.70	50	65	6.0	160	15	0.30	190
06	15	305.23	0.035	1.70	1.70	55	150	6.0	180	20		200
07	20	308.77	0.040	1.94	1.95	60	165	7.0	200	20	0.35	205
08	25	312.51	0.040	1.95	1.95	63	185	7.0	220	20		210
09	30	316.28	0.050	2.44	2.40	66	185	7.5	220	20	0.33	210
10	35	320.52	0.050	2.51	2.50	69	—	8.0	220	20		195
11	40	324.72	0.045	2.26	2.30	70	185	7.5	220	20	0.33	195
12	45	329.02	0.060	3.02	3.00	71	185	10.0	240	25		195
13	50	333.51	0.050	2.54	2.50	73	—	8.5	240	25	0.30	195

Comments:

Plant ML  
Run Number 87-3  
Location STACK  
Date October 28, 1987  
Operator TRR/MEG  
Sample Case No. \_\_\_\_\_  
Monitor Unit No. \_\_\_\_\_

Very Important - Fill in Blanks  
Read and record at the start of  
each test point.

Ambient temperature, °C \_\_\_\_\_  
Barometric pressure, in. Hg 97.9331  
Assumed moisture % 6.0  
Heater box setting, °F High  
Pitobe tip dia. in. 0.5"  
Pitobe length, ft. 13'  
Pitobe heater setting High

N/S TRAVERSE

Point	Clock Time	Dry Gas Meter ft <sup>3</sup>	Pitot, in. H <sub>2</sub> O P	Orifice H, in. H <sub>2</sub> O		Dry gas temperature of		Pump Vacuum in. Hg Gauge	Sample Case Temp- erature of	Impinger Temp- erature of	Stack Pressure in. Hg	Stack Temp- erature of
				Desired	Actual	DRY GAS	PROBE					
14	55	337.98	0.045	2.29	2.30	73	—	7.0	240	30		190
15	60	342.16	0.045	2.23	2.20	73	—	7.0	260	30	0.35	210
16	65	346.33	0.050	2.48	2.50	73	—	7.0	260	20		210
END	70	350.675										

Comments:

## CALCULATIONS

$$\begin{aligned}
 V_{mref} = \text{DRY GAS VOLUME} &= 2.95 \frac{V_m (P_{bar} + \Delta H_{avg})}{T_{mavg}} \\
 &= 2.95 \frac{(2.9283) (97.9334 + 0.4719)}{287} \\
 &= 2.9619 \text{ m}^3
 \end{aligned}$$

$$\begin{aligned}
 V_{wref} = \text{WATER VAPOR VOLUME} &= 1.36 \times 10^{-3} W_{H_2O} \\
 &= 1.36 \times 10^{-3} (177.4) \\
 &= 0.2372
 \end{aligned}$$

$$\begin{aligned}
 B_{w0} = \text{MOISTURE CONTENT} &= \frac{V_{wref}}{V_{wref} + V_{mref}} + \frac{P_v}{P} \\
 &= \frac{0.2372}{0.2372 + 2.9619} + \frac{0}{97.9334} \\
 &= 0.0741
 \end{aligned}$$

$$P_v, T(^{\circ}\text{C}) = -6.6667$$

$$\begin{aligned}
 P_s = \text{ABSOLUTE STACK PRESSURE} &= P_{bar} + \Delta P_s \\
 &= 97.9334 + 1.0860 \text{ kPa} \\
 &= 99.0194 \text{ kPa}
 \end{aligned}$$

$$\text{STATIC STACK PRESSURE AVERAGE} = 0.32 \text{ in Hg}$$



87-3

OCTOBER 28, 1987

$$\begin{aligned}
 Q_s = \text{Volumetric Flowrate} &= 3600 U_{\text{avg}} A (1 - B_{\text{wo}}) \frac{T_{\text{ref}}}{T_{\text{avg}}} \frac{P_s}{P_{\text{ref}}} \\
 &= (3600) (3.798) (5.8) (1 - 0.0741) \frac{298}{362} \frac{99.0194}{101.3} \\
 &= 59\,083.753 \text{ m}^3/\text{hr} \\
 &= 984.729 \text{ m}^3/\text{min}
 \end{aligned}$$

$$\begin{aligned}
 C_{\text{AS}} = \text{As CONCENTRATION} &= \frac{W_{\text{AS}}}{V_{\text{mref}}} = \frac{196.0 \text{ mg}}{2.9619 \text{ m}^3} \\
 &= 66.174 \text{ mg/m}^3
 \end{aligned}$$

$$\begin{aligned}
 ER_{\text{AS}} = \text{As mass Emission Rate} &= C_{\text{AS}} Q_s \times 10^{-6} \\
 &= (66.174) (59\,083.753 \frac{\text{m}^3}{\text{hr}}) \times 10^{-6} \\
 &= 3.910 \text{ kg/hr} \\
 &= 206.84 \text{ lb/day}
 \end{aligned}$$

## FIGURE 2 MOISTURE ANALYSIS DATA SHEET

Plant GIANT YELLOWKNIFE MINES  
 Location STACK  
 Test Number 87-3  
 Date OCT. 28, 1987  
 Test Conducted by TRR/MEG

Impinger Number	Impinger Contents	Weight (g)	
1	Water 100 mL	Final <u>1562.0</u> Initial <u>1424.0</u> Gain _____	(a)
2	Water 100 mL	Final <u>1499</u> Initial <u>1417.1</u> Gain _____	(b)
3	Water 100 mL	Final <u>1351.0</u> Initial <u>1423.0</u> Gain _____	(c)
4	Empty	Final <u>1292.5</u> Initial <u>1288.0</u> Gain _____	(d)

Weight of Water Collected ( $W_{H_2O}$ ) = a + b + c + d

$W_{H_2O}$  = \_\_\_\_\_ g

600 mL H<sub>2</sub>O WASH

760 mL 100% H<sub>2</sub>O

2360 mL ~~100%~~  
TOTAL WASH

# 5

Silica gel

Initial 200g

Final 222g

BAGHOUSE MAINTENANCE RECORD  
(1971-1987)

Updated: 22-Oct-87

No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
New bags. Oct. 27/71	New bags. Mar. 28/71	New bags. Apr. 20/71	New bags. Oct. 15/71	New bags. Mar. 28/72	New bags. Oct. 31/72	New bags. Apr. 13/72	New bags. Nov. 7/71. 1972 in Mar. 7/72
New bags. May 17/74	New bags & shkr shafts Apr. 27/73	New bags. Nov. 23/72	New bags. May 3/74	New bags. Nov. 29/74	New bags. Apr. 25/75	New bags. Mar. 31/75	New bags. Nov. 16/75
New bags. (Universal) Jan. 17/77	New bags. (Universal) Nov. 14/75	New bags. (P & S) Oct. 17/75	New bags. (Lipsett) Mar. 19/76	New bags. (Universal) Dec. 10/76	New bags. (Universal) May 30/77	New bags (Red Lake) Jan/78 Cutin Mar/78	New bags (P & S) Sept. 25/78
New bags. (P & S) July 7/78	New bags. (Lipsett) June 16/77	New bags. (P & S) May 12/78	New bags. (Albany 1192) Aug. 26/76	New bags. (P & S) Oct. 27/78	New bags. (P & S) Jan. 11/79	New bags. (P & S) Nov. 9/79	New bags (P & S) Dec. 7/79
New bags. (P & S) April 8/80	New bags. (P & S) July 12/78	New bags. (P & S) Oct. 16/81	New bags. (Universal) May 10/77	New bags. (P & S) May 10/82	New bags. (P & S) Nov. 5/82	New bags. (P & S) May 27/83	New bags (P&S) Patched Jan. 14/85
New bags & walls. (P&S) May 25/84	New bags. (P & S) Mar. 27/82	New bags & walls. (P&S) June 14/85	New bags. (P & S) Dec. 1/78	New bags & walls. (P&S) May 24/86	New bags. (P & S) Nov. 18/84	New bags. (P & S) Sept. 28/84	New bags walls. (P & S) Mar. 27/85
New bags. (P & S) March 24/87	New bags. (P & S) Apr. 29/85	New bags. (P & S) Oct. 21/87	New bags. (P & S) Dec. 12/80		New bags. (P & S) Dec. 24/86	New bags & walls. (P&S) Nov. 21/86	
			New bags & walls. (P&S) Oct. 20/85				

# Roaster Stack Emission Test Summary

Date	Baghouse Conditions	Emission Rate (mg/m <sup>3</sup> As)	Emission Rate (lb/day As)	Isokinematic (%) ***	Baghouse Efficiency (%)
11/18/86	0% Shaking	16.31	53.46	100.25	99.68
11/19/85	0% Shaking	14.43	59.59	94.64	99.64
07/21/83	23% Shaking	8.62	31.40	92.14	99.87
12/15/82	25% Shaking	10.17	29.11	95.01	N.A.
08/25/81	33% Shaking	14.11	37.98	99.66	99.81
08/21/81	10% Shaking	9.26	24.51	98.14	99.84
08/20/81	28% Shaking	18.89	52.87	96.93	99.71
08/07/81	100% Shaking	18.38	59.66	96.75	99.72
07/31/81	45% Shaking	5.80	17.88	97.95	99.91
07/14/81	N.A.	5.51	18.37	97.05	99.92
06/24/81	0% Shaking	4.38	14.20	98.37	99.91
05/28/81	50% Shaking	6.70	18.55	100.66	99.96
05/27/81	23% Shaking	6.74	19.36	99.43	99.89
03/16/81	0% Shaking	6.16	17.29	81.53	99.92
07/25/79	30% Shaking	32.28	95.12	91.43	99.46
05/23/79	25% Shaking	4.75	15.20	90.24	99.93
02/15/79	0% Shaking	3.51	11.74	86.70	99.94
01/26/79	0% Shaking	2.10	6.00	94.38	99.97
10/25/78	50% Shaking	21.24	77.07	96.19	99.67
10/19/78	0% Shaking	24.54	74.31	94.27	99.67
10/18/78	5% Shaking	26.77	98.40	93.83	99.40
10/16/78	30% Shaking	17.52	53.39	100.60	99.76
07/06/78	25% Shaking	20.03	67.59	88.82	99.68
07/04/78	50% Shaking	24.53	74.60	96.10	99.64
06/26/78	70% Shaking	23.86	78.25	89.23	99.66
06/22/78	40% Shaking	19.99	63.80	89.05	99.73
06/19/78	0% Shaking	16.59	52.89	91.05	99.77
06/15/78	50% Shaking	44.66	131.24	86.13	99.37
05/09/78	100% Shaking	13.21	31.14	93.93	99.85
05/05/78	0% Shaking	5.95	13.96	95.11	99.93
05/03/78	0% Shaking	16.52	46.38	92.67	99.79
04/28/78	46% Shaking	5.76	14.88	82.90	99.92
04/26/78	0% Shaking	5.02	11.57	103.70	99.94
04/19/78	48% Shaking	12.36	28.53	108.34	99.78
10/28/77	100% Shaking	12.65	30.31	93.37	99.86
10/18/77	** 0% Shaking	14.63	36.26	99.31	99.83

Date	Baghouse Conditions	Emission Rate (mg/m <sup>3</sup> As)	Emission Rate (lb/day As)	Isokinematic (%) ***	Baghouse Efficiency (%)
10/06/77	N.A.	41.02	105.84	105.09	99.41
09/22/77	N.A.	18.12	64.80	89.59	99.71
09/09/77	N.A.	53.54	88.32	124.00	99.62
08/24/77 *	N.A.	214.87	680.00	N.A.	96.61
07/21/77	N.A.	247.37	760.46	N.A.	96.13
06/20/77	N.A.	193.13	621.00	N.A.	96.81
09/23/76	N.A.	206.14	698.00	N.A.	96.94
09/02/76	N.A.	152.84	482.00	N.A.	98.09
07/16/76	N.A.	88.80	266.30	N.A.	98.71
06/18/76	N.A.	117.01	343.80	N.A.	98.41
05/10/76	N.A.	119.21	390.40	N.A.	98.18
09/18/75	N.A.	139.00	436.49	N.A.	97.98
08/29/75	N.A.	193.80	604.95	N.A.	96.94
08/08/75	N.A.	203.81	664.03	N.A.	96.27
06/24/75	N.A.	194.52	673.70	N.A.	96.81
06/10/75	N.A.	124.27	428.70	N.A.	97.88
05/26/75	N.A.	78.40	273.01	N.A.	98.31
05/02/75	N.A.	77.64	273.06	N.A.	98.66

\*\*\* The isokinematic parameter is a calculated figure that determines if sampling of the gas stream was done at the correct temperatures and velocities. The range of 90% to 110% defines a valid test.

\*\* Initiated the practice of automatic shaking cycle controlled by pressure drop through the baghouse.

\* Initiated the use of Nutech Isokinetic stack sampling equipment replacing the previously used Joy apparatus.

The Federal Government's guideline limit for arsenic emissions is 50.0 mg/m<sup>3</sup>. In 1979 the Gazette of Canada reported the announcement of the Minister of the Environment to introduce legislation which would set a national standard for arsenic emissions from gold roasting plants. Under this act the new limit for arsenic emissions would be 20.0 mg/m<sup>3</sup>. Currently this proposed act is still under review and is not in force.

1985 Yellowknife Division Environmental Summary Report  
Section 6.0, Table 1.0

Roaster Stack Emission Test Summary

Date	Baghouse Conditions	Total Arsenic mg/SCM	lbs/day Arsenic	Per Cent Isokinetic	Baghouse % Efficiency
19/11/85	0% Shaking	14.43	59.59	94.64	99.64
21/07/83	23% Shaking	8.62	31.40	92.14	99.87
15/12/82	25% Shaking	10.17	29.11	95.01	N.A.
25/08/81	33% Shaking	14.11	37.98	99.66	99.81
21/08/81	10% Shaking	9.26	24.51	98.14	99.84
20/08/81	28% Shaking	18.89	52.87	96.93	99.71
07/08/81	100% Shaking	18.38	59.66	96.75	99.72
31/07/81	45% Shaking	5.80	17.88	97.95	99.91
14/07/81	Not Available	5.51	18.37	97.05	99.92
24/06/81	0% Shaking	4.38	14.20	98.37	99.91
28/05/81	50% Shaking	6.70	18.55	100.66	99.96
27/05/81	23% Shaking	6.74	19.36	99.43	99.89
16/03/81	0% Shaking	6.16	17.29	81.53	99.92
25/07/79	30% Shaking	32.28	95.12	91.43	99.46
23/05/79	25% Shaking	4.75	15.20	90.24	99.93
15/02/79	0% Shaking	3.51	11.74	86.70	99.94
26/01/79	0% Shaking	2.10	6.00	94.38	99.97
25/10/78	50% Shaking	21.24	77.07	96.19	99.67
19/10/78	0% Shaking	24.54	74.31	94.27	99.67
18/10/78	5% Shaking	26.77	98.40	93.83	99.40
16/10/78	30% Shaking	17.52	53.39	100.60	99.76
06/07/78	25% Shaking	20.03	67.59	88.82	99.68
04/07/78	50% Shaking	24.53	74.60	96.10	99.64
26/06/78	70% Shaking	23.86	78.25	89.23	99.66
22/06/78	40% Shaking	19.99	63.80	89.05	99.73
19/06/78	0% Shaking	16.59	52.89	91.05	99.77
15/06/78	50% Shaking	44.66	131.24	86.13	99.37
09/05/78	100% Shaking	13.21	31.14	93.93	99.85
05/05/78	0% Shaking	5.95	13.96	95.11	99.93
03/05/78	0% Shaking	16.52	46.38	92.67	99.79
28/04/78	46% Shaking	5.76	14.88	82.90	99.92
26/04/78	0% Shaking	5.02	11.57	103.70	99.94
19/04/78	48% Shaking	12.36	28.53	108.34	99.78

1985 Yellowknife Division Environmental Summary Report  
Section 6.0, Table 1.0 Continued

28/10/77	100% Shaking	12.65	30.31	93.37	99.86
18/10/77	0% Shaking	14.63	36.26	99.31	99.83 ***
06/10/77	Not Available	41.02	105.84	105.09	99.41
22/09/77	Not Available	18.12	64.80	89.59	99.71
09/09/77	Not Available	53.54	88.32	124.00	99.62
24/08/77	Not Available	214.87	680.00	N.A.	96.61 **
21/07/77	Not Available	247.37	760.46	N.A.	96.13
20/06/77	Not Available	193.13	621.00	N.A.	96.81
23/09/76	Not Available	206.14	698.00	N.A.	96.94
02/09/76	Not Available	152.84	482.00	N.A.	98.09
16/07/76	Not Available	88.80	266.30	N.A.	98.71
18/06/76	Not Available	117.01	343.80	N.A.	98.41
10/05/76	Not Available	119.21	390.40	N.A.	98.18
18/09/75	Not Available	139.00	436.49	N.A.	97.98
29/08/75	Not Available	193.80	604.95	N.A.	96.94
08/08/75	Not Available	203.81	664.03	N.A.	96.27
24/06/75	Not Available	194.52	673.70	N.A.	96.81
10/06/75	Not Available	124.27	428.70	N.A.	97.88
26/05/75	Not Available	78.40	273.01	N.A.	98.31
02/05/75	Not Available	77.64	273.06	N.A.	98.66

\* Percent isokineticity is a calculated number that determines if the gas sample was withdrawn at the correct temperatures and pressures. A value within the 90% - 110% range is necessary for a test to be considered acceptable.

\*\* Initiated use of Nutech Isokinetic stack sampling equipment - previous testing done with Joy apparatus.

\*\*\* Initiated use of automatic shaking cycle controlled by the pressure drop around the Baghouse.

#### LIMITS

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The Federal Governments allowable limit for arsenic emissions is still 50.0 milligrams per cubic metre while in 1979 the Gazette of Canada reported the Governments intention to lower the limit to 20 milligrams per cubic metre. The government has recently gazetted its intention to assess if the legislature is necessary and will be deciding if the law should proceed in its development.

1985 Yellowknife Division Environmental Summary Report  
Section 6.1

Prior to 1975, refer to the following summary reproduced from the 1977 Canadian Public Health Association Task Force on Arsenic's Final Report. It is a summary of Giants Stack Emissions to that time.

Table 2.0

Year	Arsenic Emissions (lbs/day)	No. of Data Submissions	Dust Recovery Efficiency	References
1974	485	5	98.1	a
1973	890	5	95.1	a
1972	875	4	96.5	a
1971	1930	8	93.1	a
1970	485	3	98.3	a
1969	660*	3	97.7*	a
1968	500*	2	98.8*	a
1967	285*	4	99.0*	a
1966	535*	3	98.3*	a
1965	-	-	-	-
1964	690*	4	98.2*	a
1963	(330)	-	-	c
1962	(330)	-	-	c
1961	(330)	-	-	c
1960	165	9	99.4	b
1959	115	7	99.6	b
1958	(3,300)	-	-	c
1957	6,500	10	61.6	b
1956	6,000	11	54.6	b
1955	6,400	4	66.5	b
1954	12,000	-	41.8	b
1953	-	-	-	-
1952	-	-	-	-
1951	(16,000)	-	-	c
1950	(16,000)	-	-	c
1949	(16,000)	-	-	c

Source: Hazra, A.K. and Prokopuk, R.A. A Report on Air Quality in Yellowknife, N.W.T., Air Pollution Control Section, Environmental Protection Service, Environment Canada. February 1977.

\* Corrected from previous data.

() Estimated

References: a. Company emission reports.

b. Company emission data as given to Health and Welfare Canada.

c. Estimated values from company production data.