



**Ambient Air Quality Monitoring Assessment in
the Lochend Area: August 2013**

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Summary

Alberta Environment and Parks performed a special air quality monitoring assessment in the Lochend area on August 27 and 28, 2013. In the Lochend area, located approximately 15 km northwest of Cochrane, hydraulic fracturing is used to extract oil and natural gas. Residents in the area are concerned about the effects of the flaring of hydraulic fracturing flow-back on local air quality.

In order to assess air quality during flaring events, Alberta Environment and Parks deployed the Mobile Air Monitoring Laboratory (MAML) downwind of two flares. The MAML measured carbon monoxide (CO), sulphur dioxide (SO₂), hydrogen sulphide (H₂S), total reduced sulphur (TRS), ozone (O₃), nitrogen oxide (NO), nitrogen dioxide (NO₂), nitrogen oxides (NO_x), ammonia (NH₃), methane (CH₄), non-methane hydrocarbon (NMHC), total hydrocarbon (THC), particulate matter with diameters less than 10 µg (PM¹⁰), 2.5 µg (PM^{2.5}), 1 µg (PM¹), and polycyclic aromatic hydrocarbons (PAH). No exceedances of Alberta Ambient Air Quality Objectives (AAQOs) were observed for the compounds measured by the MAML. At two out of seven monitored locations, the MAML detected levels of hydrocarbons that were higher than typical ambient background levels in Alberta, in part due to their close proximity to an active flare (<250m).

Air samples were also taken, via evacuated canister, at three of the seven MAML monitoring locations and were analyzed for volatile organic compounds (VOCs) and reduced sulphur compounds (RSCs). The concentrations of the compounds measured by the canisters were compared with the Alberta Ambient Air Quality Objectives (AAQOs) and the Texas Commission on Environmental Quality (TCEQ) Effects Screening Levels (ESL). None of the measured concentrations exceeded the available guidelines for the compounds to which they apply. Two of the canisters sampled some non-methane VOCs at concentrations higher than typical ambient background levels in Alberta. These VOCs isobutene, butane, isopentane, and pentane; all are common combustion products involved with burning natural gas. Similar to the MAML measurements, these non-methane VOCs were in higher concentrations at locations within close proximity to an active flare (<250m).

Results

Table 1: List of measurement sites used during the air quality monitoring assessment survey. Dist = approximate distance of well from MAML. Dir = approximate direction of well relative to MAML.

Site	Date	Latitude	Longitude	Canister	Well location	Dist (m)	Dir	Site description
1	27 Aug	51.3546	-114.4237	No	14-25-27-4 W5M	1700	NNE	TWP Rd 280A
2	27 Aug	51.35002	-114.4236	No	14-25-27-4 W5M	1300	NNE	Along RR 40
3	27 Aug	51.34371	-114.4044	No	14-25-27-4 W5M	2200	E	TWP Rd 275 and TWP Rd 275A
4	27 Aug	51.34865	-114.4098	No	14-25-27-4 W5M	1900	NE	TWP Rd 257A
5	28 Aug	51.32195	-114.3768	Yes	4-21-27-3 W5M	400	SSE	RR 34
6	28 Aug	51.32027	-114.3768	Yes	4-21-27-3 W5M	250	SSE	RR 34
7	28 Aug	51.31958	-114.3768	Yes	4-21-27-3 W5M	150	SSE	RR 34

Table 2: MAML hourly average measurements. AAAQOs are listed. Date and time is the end-time of hourly average in MST. (WS = wind speed; WD = wind direction, T = temperature, P = pressure, RH = relative humidity.)

Site #	Date & Time	WS	WD	T	P	RH	CO	SO ₂	H ₂ S	TRS	O ₃	NO	NO ₂	NO _x	NH ₃	CH ₄	NMHC	THC	PM ₁₀	PM _{2.5}	PM ₁	PAH	
Units		km/h	°	° C	hPa	%	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	µg/m ³	µg/m ³	µg/m ³	ng/m ³
1-Hour AAAQO							13000	172	10		82		159		2000					80			
1*	27/08/2013 13:27:00	10.6	210.9	22.1	872.9	36.1	460	0.6	0	0	40	0	0.4	0.2	4.3	1800	10	1810	21.4	2.4	0.9	2.5	
1*	27/08/2013 14:27:00	16.9	230.4	22.6	872.6	32.3	230	0	0	0	42.1	0	0.4	0	3.1	1790	0	1790	3.1	1.1	0.6	1.4	
2	27/08/2013 15:45:00	13.3	243.6	23	870	31.3	530	0	0	0	42.8	0	0.5	0	2.4	1780	20	1810	2.7	1.1	0.6	1.4	
3*●	27/08/2013 16:26:00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4*	27/08/2013 17:45:00	15.5	215.1	22.7	870.3	32.6	320	0.4	0	0	42	0	0.4	0.1	1.5	1790	20	1810	11.4	2.2	0.9	1.4	
4*●	27/08/2013 18:15:00	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5	28/08/2013 12:10:00	13	127.9	22.3	869.4	42.8	940	0.4	0.2	0	38.7	1.3	3.4	4.7	2.9	1800	90	1880	27.4	5.1	2.5	2.4	
6	28/08/2013 13:15:00	26.7	147.4	22.7	869.6	40.6	630	0.5	0.2	0	40.7	2.1	6.4	8.5	3.3	1950	300	2260	67.8	10.9	4.5	3.7	
7	28/08/2013 14:35:00	23.5	152.1	22.7	869.6	42.7	530	0.2	0	0	42.1	0.7	3	3.8	2.9	2070	560	2630	122.8	20.8	7.2	2.5	

* Site located near gravel road, could lead to elevated PM.

● Less than 45 minutes (75%) of valid data collected during the measurement period.

Table 3: Compounds that were detected in the canister samples, in ppb. For the c1c4 analysis of methane, the uncertainty is 39%. The method detection limit (MDL) for Freon-11 and Freon-12 is 0.2 ppb, while the MDL for the other VOC-PT compounds listed is 0.03 ppb. The uncertainties in the VOC compounds range from 4-28%.

Analysis	Compound	AAAQO (1-hour)	Short-Term Texas ESL	#3545 Site #5	#5362 Site #6	#1871 Site #7
c1c4	Methane	--	--	2.8x10 ³	1.9x10 ³	7.0x10 ³
VOC-PT	Freon-12	--	10000	0.98	0.549	0.159
VOC-PT	Isobutane	--	10000	0.357	12.6	24.1
VOC-PT	Butane	--	28000	0	34.3	67.7
VOC-PT	Isopentane	--	1300	2	11.2	22.3
VOC-PT	Freon-11	--	5000	0.132	0	0
VOC-PT	Acetone	2400	2500	5.2	0	0
VOC-PT	Pentane	--	1400	0	16.3	37.2
VOC-PT	Isoprene	--	20	0	0.404	0
VOC-PT	Methylene chloride	--	1100	0.001	0.001	0.001
VOC-PT	2-Methylpentane	--	850	0	0.249	0.666
VOC-PT	3-Methylpentane	--	1000	0	0	0.099
VOC-PT	Hexane	5960	1500	0	0.689	1.55