WBEA@Work

AN UPDATE ON WBEA'S LATEST WORK

VOLUME 4 ISSUE 4, DECEMBER 2014

Executive Director's Report

Dr. Kevin Percy

During the third and fourth quarters of 2014, WBEA staff have continued to deliver Association programs and operations under the terms and deliverables of the 2014/15 Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA) – Wood Buffalo Environmental Association (WBEA) contract. WBEA's Members and regional stakeholders continued to actively participate in the Governance Committee (GC), Ambient Air Technical Committee (AATC), Terrestrial Environmental Effects Monitoring (TEEM) Committee, Human Exposure Monitoring Program (HEMP) Committee and the Communications Advisory Committee.

Governance

Regular quarterly meetings of the General Membership (WBEA Board) were held on September 17th and December 10th. Status reports on our monitoring programs and operations were given, as per usual, and the business of the Association was accomplished.

At WBEA GM #129 (September 17), key agenda items included:

- A detailed briefing on the WBEA Responsibility Matrix, being developed by the GC.
- Updates on the **Joint Canada-Alberta Implementation Plan for Oil Sands Monitoring (JOSM)** Air Component Advisory Committee (CAC) planning process for 2015/16.
- Updates on the AEMERA-WBEA 2014/15 contract.
- Tabling and endorsement of the final version of WBEA's Southern Monitoring Plan.

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A SAGD facility in the southern Regional Municipality of Wood Buffalo.

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One of five WBEA-Fort McKay Berry Focus Group monitored berry patches, in 2014.

At WBEA GM #130 (December 10):

- The main focus of the GM was a detailed technical briefing I gave Members on the 2015/16 work plans submitted to JOSM.
- A question and answer session followed, and additional updates were provided to Members on projects that the Air CAC had recommended for approval.
- The draft TOR for a new WBEA Traditional Knowledge (TK) Committee, developed by a TEK Task Group established by the Board, was tabled.

JOSM

The JOSM CAC process, underway since August, has been reviewing work plans submitted for 2015/16. As in 2013/14, WBEA's work plans are being considered at the Air CAC table, with the exception of Communications. Administrative and data systems/management activities have been included in WBEA's ambient air, deposition, enhanced deposition and human exposure monitoring activities. I did attend the Air CAC meetings August-November this year, but as a "technical" specialist in air and deposition.

WBEA Operations and Outreach

I am pleased to report that WBEA ambient air monitoring, with seventeen stations operating as of December 2014, continued to perform at a high level. Considerable effort has been devoted to obtaining the array of permits and legal agreements required to install the third JOSM enhanced deposition Air Monitoring Station (AMS) 18, near Conklin. At the time of writing, the Conklin site is prepared and the station is onsite. Requirements to enhance **Buffalo Viewpoint (AMS 4)**, our fourth JOSM enhanced deposition station, are well underway and a lease of occupation (LOC) is expected soon.

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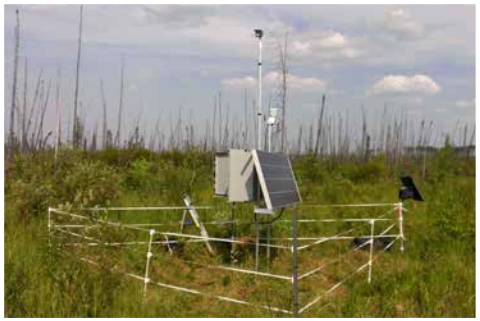

Lakeshore Helicopters, a local Aboriginally-owned company, delivered Portable Ozone Monitoring Systems to three remote locations in the region, left. One of the units is set up and operational. Note the solar panel and solar powered bear fence, right.

WBEA's terrestrial monitoring activities were all delivered on time, in Q3 and Q4. Continuous ozone monitoring was accomplished at three remote sites with the use of Portable Ozone Monitoring Systems. WBEA's six 30 m tall meteorological towers continued to deliver hourly data.

Our Data System's team is beta-testing software that will allow for full and instant public access to all historical WBEA continuous and time-integrated data, by the end of Q1 2015. Integrated data, such as those for volatile organic compounds (VOC), will also include relevant metadata files.

Our Communications Advisors have been very busy with various reporting, outreach and visiting delegation activities. Notable activities include a **2014 Winter Community Report**, featuring an Environment Canada article on ambient air mercury monitoring, and development of a new improved, more interactive WBEA website, to be launched in February 2015. Staff also hosted a WBEA booth at an oil sands conference in Calgary, where WBEA-contracted scientists delivered five scientific presentations. WBEA's Communications Advisors have participated as well in the JOSM Communications & Engagement CAC.

As 2015 approaches.....

With continued development in the southern and northern portions of the Regional Municipality of Wood Buffalo, WBEA's workload will increase again in 2015, with up to four new air monitoring stations to be installed. A particular focus will be on execution of Phase One of the Southern Monitoring Plan. The extent of the work plan, which staff will execute in order to meet stakeholder needs and science requirements, will of course be dependent upon decisions made by the JOSM process.

On behalf of WBEA Staff and Contractors, I would like to wish you a very Happy Holiday!

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Volatile Organic Compound (VOC) Passive Monitoring in the Athabasca Oil Sands Region, Alberta, Canada

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The working principle of passive sampling is diffusion of gaseous pollutants across a surface to an adsorbing material onto which the pollutant of interest accumulates over time. The continual adsorption of the pollutant from the air maintains a concentration gradient near the surface that allows uptake of the pollutant to occur without any forced air movement (no pump or fan is required). Electricity demands, moving parts, and size make active monitoring technologies a challenge for the remote locations, whereas passive monitors are small, unobtrusive and costs for sample collection are low. The ability of passive samplers to collect analytes over extended periods of time allows for high sensitivity for low concentration pollutants. Sensitivity is limited only by the amount of time for which a sampler can be exposed and the blank value of the analyte on an unexposed adsorbent surface.

In the summer of 2013, a pilot study was conducted in the Athabasca Oil Sands Region of northeastern Alberta, Canada, to test and evaluate the applicability of the Radiello volatile organic compound (VOC) passive sampling technology (http://www.radiello.com) as an additional approach for integrated monitoring/characterization of VOCs at remote locations. Measurement accuracy, precision and replicability of Radiello passive samplers were assessed in the previous studies (Fujita et al., 2009; Mason et al., 2011, Zielinska et al., 2014) by comparison with reference methods. The sampling commenced at the beginning of July 2013 and ended in mid-September 2013. Two monthly sets of samples were collected. In the summer of 2014 the project was expanded to include two additional sites and a longer sampling period. The sampling started in May 2014 and ended in September 2014. Four monthly sets of samples were collected. In addition to monthly samples, collocated bi-weekly samples were collected at two sites. Figure 1 shows the sampling locations. Some of these remote sites were only accessible by helicopter.

Radiello passive samplers with Carbograph 4 (adsorbing cartridge code R145) were used for passive sampling of VOCs in the range of C_6-C_{12}, while Radiello samplers with Carbopack X (adsorbing cartridge code R141) were used for sampling of C_4-C_5 species (see Table 1). Isoprene and α-pinene are biogenic species; α-pinene is emitted by coniferous vegetation, whereas isoprene is emitted by deciduous plants. The remaining compounds are predominantly of anthropogenic origin. Table 1 lists the compounds, together with their abbreviated names (mnemonics), analyzed for this study and Figure 2 shows the Radiello diffusive samplers.

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Table 1. List of compounds (with their mnemonics) analyzed for this study

Mnemonic	Compound	Mnemonic	Compound
i_prene	Isoprene*	n_non	n-Nonane
a_pine	α-Pinene*	n_dec	n-Decane
bud13	1,3-Butadiene	etbz	Ethylbenzene
n_hex	n-Hexane	styr	Styrene
benze	Benzene	mp_xyl	m/p-Xylene
cyhexa	Cyclohexane	bz124m	1,2,4-Trimethylbenzene
tolue	Toluene	n_unde	n-Undecane
n_oct	n-Octane	n-dode	n-Dodecane

**biogenic species*

After sampling Radiello cartridges were sent to DRI Organic Analytical Laboratory (OAL) overnight in coolers with blue ice (ice packs) and analyzed by the thermal desorption gas chromatography – mass spectrometry (GCMS) method.

Figure 3 shows the concentrations (in ppbv) of all VOC species analyzed for this study, obtained from the analysis of monthly samples collected in summer 2014. As this figure shows, the concentrations of these species are low, in the range of sub-ppbv, with α-pinene being the most abundant in nearly all sites.

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Figure 1. Sampling locations (approximate).

Figure 2. Radiello diffusive samplers. Left – adsorbing cartridge outside of the diffusive body; right – Radiello R145 and R141 assembled within their diffusive bodies and installed in a protective shelter.

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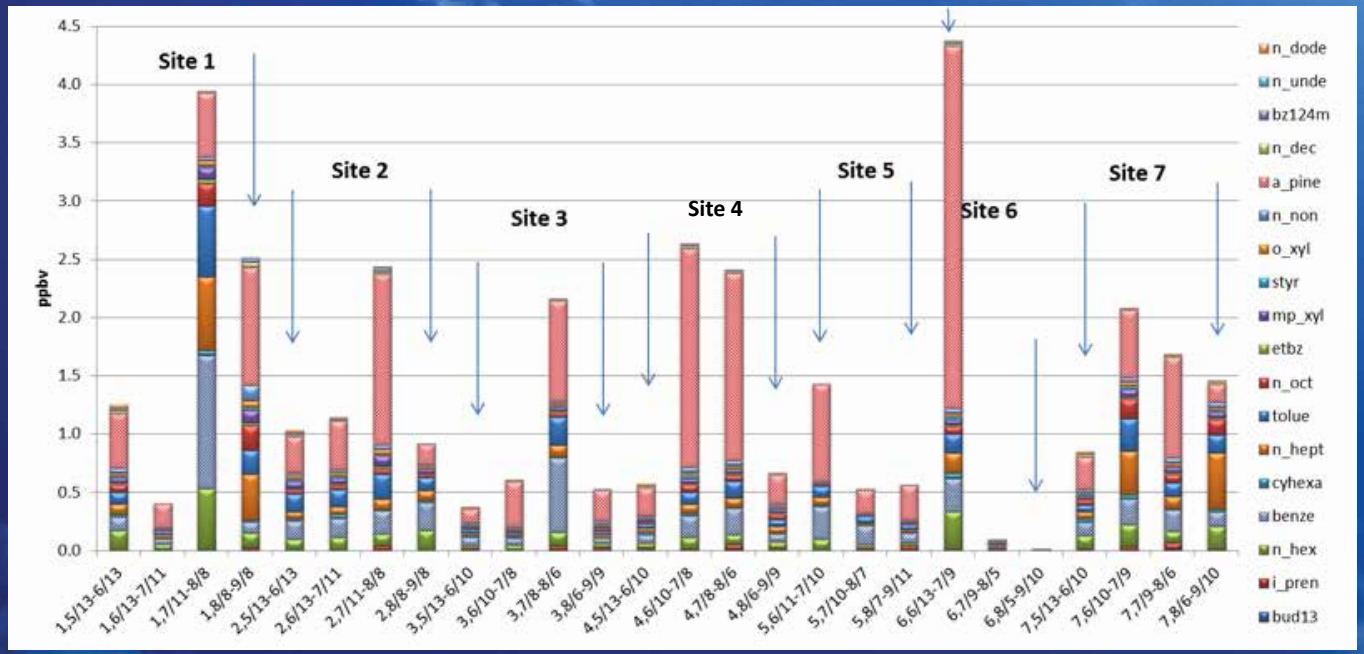

Figure 3. Concentrations of VOC species in monthly samples collected at all sampling sites.

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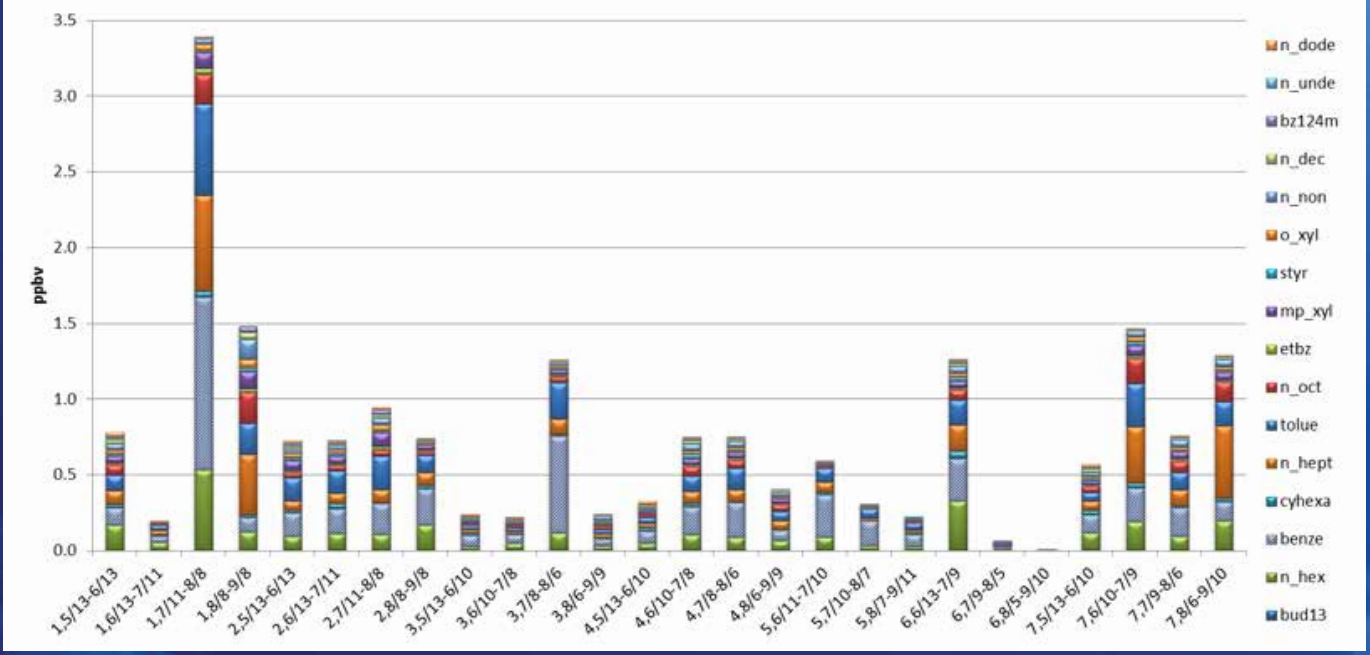

Figure 4. Concentrations of VOC species in monthly samples collected at all sampling sites, with the biogenic species (isoprene and α-pinene) excluded.

When the biogenic compounds are excluded, as shown in Figure 4, the most abundant species are benzene, toluene, n-hexane and n-heptane, which are of anthropogenic origin. However, their concentrations are very low, in the sub ppbv range. Generally, the highest VOC concentrations are observed in sites 1 and 7, which are situated close to the main mining area (Figure 1). Sites 3, 4, and 5, situated further away are generally the lowest.

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If the VOC concentrations data are arranged by month, as shown in Figure 5, the highest concentrations are generally observed during warmer months, June and July.

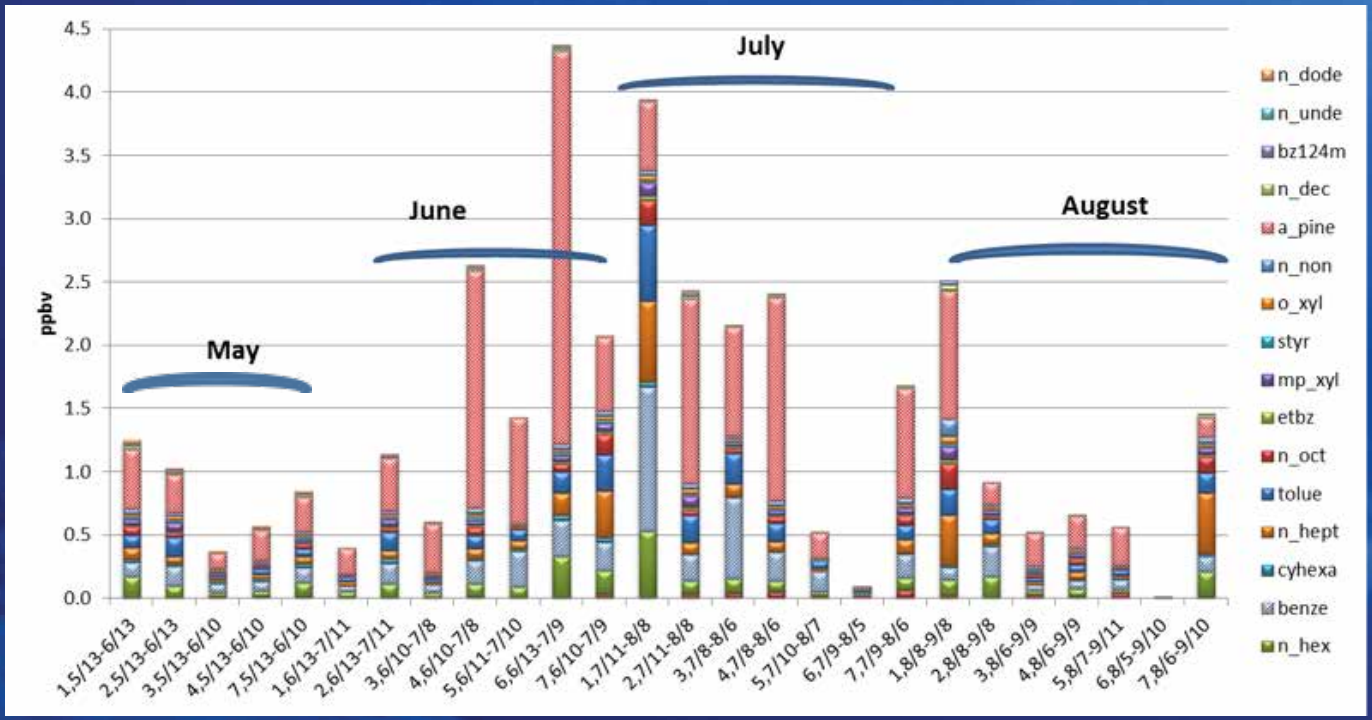

Figure 5. VOC concentration data arranged by months.

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Since Radiello passive samplers are certified up to two weeks sampling period, it was important to compare bi-weekly and monthly samples. These samples were collected in parallel at sites 1 and 2, which were accessible by a vehicle. Figure 6 shows the comparison. With exception of samples collected in site 2 from June 13 to July 11, the comparison is very good – monthly samples are close to the average of two bi-weekly samples. There is a possibility that this one monthly sample from the site 2 was compromised, so the average from the two bi-weekly samples collected at this location was used for displaying the monthly concentrations in Figure 3, 4 and 5.

In conclusion, this study confirmed that the passive Radiello samplers are a viable VOC measurement method, especially for remote sites (no power, limited access) with very low VOC concentrations. Extension of sampling time for up to one month seems to have no negative effect on measured VOC concentrations.

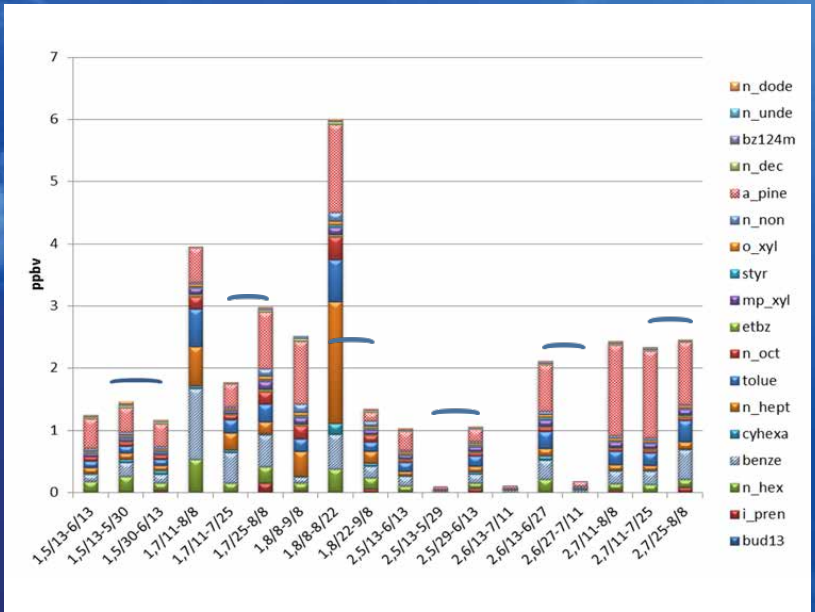

Figure 6. The comparison of monthly and bi-weekly samples collected at sites 1 and 2. Arches indicate bi-weekly samples.

References

Fujita, E.M., Mason, B., D.E. Campbell, B. Zielinska. 2009. Harbor Community Monitoring Study – Saturation Monitoring. www.arb.ca.gov/research/apr/past/05-304.pdf, C.A.R.B., Sacramento, CA.

Mason, J.B., E.M. Fujita, D.E. Campbell, B. Zielinska. 2011. Evaluation of Passive Samplers for Assessment of Community Exposure to Toxic Air Contaminants and Related Pollutants. Environ. Sci. Technol. 45, 2243-2249.

Zielinska, B., D. Campbell, V. Samburova (2014). Impact of Emissions from Natural Gas Production Facilities on Ambient Air Quality in the Barnett Shale Area: a Pilot Study. J. Air Waste Manage. Assoc., in press. DOI: 10.1080/10962247.10962014.10954735.

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Reporting For the Lower Athabasca Regional Plan (LARP)

Dr. Kevin Percy, WBEA Executive Director

The Lower Athabasca Regional Plan (LARP) was the first regional plan developed under the Alberta Land-Use Framework. The LARP came into effect in September 2012. The intent of LARP, for air, is to:

- Manage air quality limits and triggers
- Monitor and evaluate ambient air quality data in the planning region
- Evaluate the effectiveness of the air framework in meeting the air quality objectives stated in the regional plan (http://esrd.alberta.ca/focus/cumulative-effects/cumulative-effects-management/management-frameworks/documents/LARP-AnnualProgressReport-2013.pdf).

The Wood Buffalo Environmental Association (WBEA) supports LARP by conducting regional air quality monitoring and providing quality-assured data to the Clean Air Strategic Alliance (CASA) for use by Alberta Environment and Sustainable Resource Development (AESRD). In 2013, the two air quality indicators, nitrogen dioxide (NO_2) and sulphur dioxide (SO_2) were measured continuously by WBEA at Air Monitoring Stations 13 (Fort McKay South) and 9 (Barge Landing). The triggers and limits set under Section 23 (1) (b) of the LARP, and the concentrations measured by WBEA, expressed against the LARP limits and triggers, are shown in Tables 1 and 2.

Table 1. LARP NO_2 limits and triggers with WBEA measured concentrations.

LARP Metrics	LARP Concentration	WBEA stations exceeding (concentration)
Annual average		
Limit	24 ppb	None
Level 3 trigger	16 ppb	None
Level 2 trigger	8 ppb	Bertha Ganter-Fort McKay-AMS 1 (7.7 ppb) Athabasca Valley-AMS 7 (9.9 ppb) Millennium Mine-AMS 12 (12.9 ppb) Albian Muskeg River-AMS 16 (11.6 ppb)
99th Percentile		
Level 4 trigger	92 ppb	None
Level 3 trigger	62 ppb	None
Level 2 trigger	30 ppb	Bertha Ganter-Fort McKay-AMS 1 (34.6 ppb) Patricia McInnes-AMS 6 (31.2 ppb) Athabasca Valley-AMS 7 (37.9 ppb) Millennium Mine-AMS 12 (42.5 ppb) Fort McKay South-AMS 13 (33.3 ppb) CNRL Horizon-AMS 15 (39 ppb) Albian Muskeg River-AMS 16 (40.3 ppb)

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WBEA Members View Operation's at Annual Open House and Tour

In 2013, no WBEA Air Monitoring Stations exceeded the NO_2 annual average-based limit or level 3 trigger. Four Air Monitoring Stations exceeded the annual NO_2 average-based trigger 2 level of 8 ppb. No WBEA Air Monitoring Stations exceeded the LARP NO_2 99th percentile-based level 4 trigger (92 ppb) or level 3 trigger (62 ppb). Seven stations exceeded the LARP NO_2 percentile-based level 2 trigger of 30 ppb. (Table1.)

Table 2. LARP SO_2 limits and triggers with WBEA measured concentrations.

LARP Metrics	LARP Concentration	WBEA stations exceeding (concentration)
Annual average		
Limit	8 ppb	None
Level 3 trigger	5 ppb	None
Level 2 trigger	3 ppb	None
99th Percentile		
Level 4 trigger	36 ppb	None
Level 3 trigger	24 ppb	Mannix-AMS 5 (30.8 ppb)
Level 2 trigger	12 ppb	Bertha Ganter-Fort McKay-AMS 1 (16.3 ppb) Mildred Lake-AMS 2 (22.2 ppb) Buffalo Viewpoint-AMS 4 (16.4 ppb) Patricia McInnes-AMS 6 (13.6 ppb) Lower Camp-AMS 11 (15.7 ppb) Millennium Mine-AMS 12 (14.0 ppb) Fort McKay South-AMS 13 (16.9 ppb) CNRL Horizon-AMS 15 (15.4 ppb) Albian Muskeg River-AMS 16 (19.7 ppb)

In 2013, no WBEA Air Monitoring Stations exceeded the annual average-based SO_2 limit or level 2 and 3 trigger concentrations. No WBEA Air Monitoring Stations exceeded the LARP SO_2 99th percentile-based level 4 trigger of 36 ppb. One WBEA Air Monitoring Station exceeded the LARP SO_2 99th percentile-based level 3 trigger of 24 ppb. Nine Air Monitoring Stations exceeded the LARP SO_2 99th percentile-based level 2 trigger of 12 ppb (Table2).

2013 ambient air quality data from WBEA's Bertha Ganter-Fort McKay Air Monitoring Station # 1, pictured, were reported to Alberta Environment and Sustainable Resource Development for inclusion in the Lower Athabasca Regional Plan (LARP).

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