Alberta Oil Sands Development and Odour Issues

The First Nation of Fort McKay's Experience, Perspective and Initiatives

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***Abstract*— Fort McKay is an Aboriginal community located in the midst of oil sand development in North East Alberta. Increasing emissions of key air contaminants from oil sands industry are monitored and regulated by provincial government. Though industrial odours have long been a cause of complaint in the region, to date odours have not been monitored or regulated by provincial governments, creating escalating conflict and increasing tension between industry, local communities, and government. Fort McKay has developed internal monitoring capacity to recognize and characterize industrial odours in conjunction with regional air shed monitoring for a range of air contaminants. Odour monitoring results are used to inform the community on potential direct and in-direct health impacts. Along with wind direction ambient air monitoring results are also used to identify possible industrial sources of odours and support requests for more effective control of oil sands related industrial emissions. Notably, the lands surrounding Fort McKay prior to industrial development were a pristine boreal forest environment, and the increasing presence of industrial development increasingly erodes the quality of the surrounding natural environment. Supporting more effective management and government regulation of pollution emissions, including odours, remains a goal for Fort McKay as the most heavily impacted community in the Alberta Oil Sands.**

Keywords—oil sands, Aboriginal First Nation, odours, eNose, pollution, human health

I. Introduction

Oil sands development in the Wood Buffalo area of NE Alberta has been accelerating over the last 50 years due to commercialization and advancement of oil sands extraction and upgrading technologies. The natural landscape of boreal forest, muskeg and fen in this region has provided home to Dene, Cree and other First Nations and Metis people for thousands of years. The intrusion of industry into an environment which in living memory was pristine, has caused and continues to cause conflict between Government approved industrial development and the aspirations of the indigenous inhabitants.

The Fort McKay First Nation's (FMFN) community (population ~550) is located on the banks of the Athabasca River, in the heart of Alberta's Oil Sands Mining, Extraction and Upgrading developments, FMFN is arguably the most impacted of any community in the Wood Buffalo region. Prevailing winds carry air pollutant emissions from large-scale mining, extraction, upgrading and tailing ponds over and through the small community, and water contaminants in the Athabasca River flows northward through the community. Figure 1 shows the location of Fort McKay, its proximity to existing Industrial Development, and the density of planned mining operations.

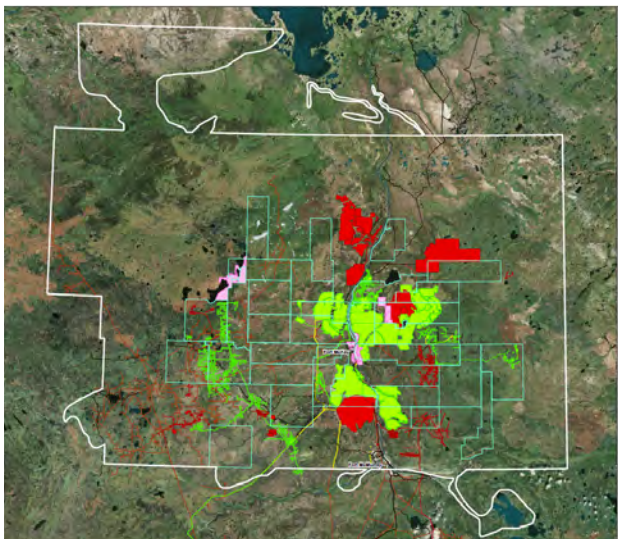

Figure 1a Map of Oil Sands Developments in North East Alberta showing the location of the community of Fort McKay (centre) in relation to surrounding Existing and Approved and Oil Sands Mining and SAGD Leases.

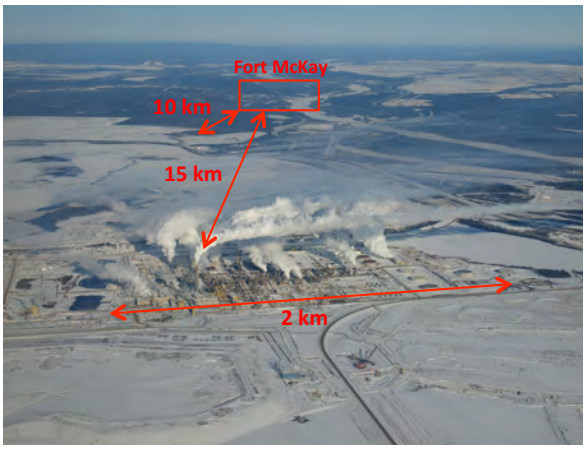

Figure 1b Aerial Photograph (northerly view) showing the proximity of major oil sands industrial mining operations and the community of Fort McKay.

In response to air pollution exposure and impact issues Fort McKay leadership has negotiated and supported the development of independent air pollution monitoring systems, as well as integrating collaborative regional monitoring stations on its land. Data collected from these air quality monitoring systems are used to identify and characterize priority air quality issues. Results are regularly shared with Government, Industry and other Regional Stakeholders in an effort to highlight pollution impact issues and support more stringent regulatory standards, and more effective mitigation and abatement of industrial pollution in the region.

While the Alberta Government has made progress in regulating major air emissions and managing air quality, the applied requirements are often not as stringent as in many other first world jurisdictions. Finding a balance between the need for sustainable economic development and local environmental protection is a challenging one, and the community of Fort McKay is on the front line of the debate on what that balance should be.

One air pollution issue which has little to no regulatory control in Alberta is that around release and impacts of industrial odours. The various departments within the Government of Alberta have so far failed to monitor, regulate, or manage odours in an effective way and are only now considering tentative initiatives to approach sensitive issues around oil sands related regional odours. Lack of recognition and management of odours has become a priority issue for Fort McKay leadership and the community at large. Odours are associated with Human Health and Quality of Life concerns, and without more responsible recognition and management, odours will continue to polarize and increase regional and local tensions.

Over the past decade or so, our local Fort McKay pollution science team, working through the Fort McKay Sustainabilty Dept (FMSD) has established and progressivley expanded an independent air monitoring system using a variety of techniques including: electronic Nose (eNose) systems to 'sniff' the air and express concentration in Odour Units, cannister sampling with follow up analysis of Chemicals of Concern, and integrated data from the regional air monitoring network. Often, detection of air quality issues, through our internal Fort McKay monitoring systems, are the first indication there is an air emissions problem in the region. We have also expanded use of human noses within the community and surrounding traditional lands to detect and characterize industrial odours. It is issues around odours where there is a fundamental disconnect between on the one hand Industry Practices and Government Regulation, and on the other hand perceived impacts on Health, Wellbeing and Quality of Life within the local impacted community of Fort McKay. In this paper, we present selected data from our internal monitoring systems and community perspectives on odours. Further, we summarize some of the odour management initiatives which have been initiated in the region, but are now in jeopardy due to a lack of commitment and leadership within the Provincial Government coupled with resistance from the oil sands industry – particularly acute now with low oil prices resulting in reduced investment in environmental stewardship. We conclude with suggestions from the informed community perspective of Fort McKay on how the Oil Sands region of Alberta can do a better job of recognizing, managing and mitigating odour impacts from industrial development.

We note that Fort McKay offers a unique and important regional perspective. The Fort McKay community is made up of Aboriginal peoples with a long-standing cultural tradition of land use. This embodies a deep respect for the land and its ability to provide healthy sources of food and medicine which is fundamental to community identity. Added to this mix are issues around individual and family Health and Well being as well as Treaty Eight constitutional rights. The location of Fort McKay, as ground zero for industrial impacts, coupled with its now well-developed capacity for independent air monitoring, makes the Fort McKay perspective on regional odour issues an important and informed one.

II. Odour Issues in Fort McKay

Fort McKay is a First Nation and Métis community of approximately 550 residents located along the Western bank of Athabasca River approximately 60kms north of the city of Fort McMurray in Northeastern Alberta. It is in the center of the mineable portion of the Athabasca Oil Sands Region (AOSR) and is surrounded by large oil sands developments. The air emissions from these developments associated with tailings ponds, bitumen upgrading, flaring, and open pit mining at these oil sands sites all create odorous emissions that impact Fort McKay on a regular basis, often during what operators report as "normal/non-upset" operating conditions. Air quality data from 2014 indicates that, on average, on approximately one day in every three, an odour/air quality event occurred in Fort McKay that resulted in an industrially emitted odour having the high likelihood of being detected by a Fort McKay community member. Indeed, anecdotal discussions with community members indicate that odours often take place on a near daily basis, and vary in frequency,

character, and intensity depending on the time of day, season, and meteorology.

Community members often describe odours in Fort McKay as being like: “rotten eggs”, “cat urine”, “body odour”, “sulphur” and “asphalt/tar/oil”. People living in Fort McKay regularly report that these odour/air quality events give them headaches, and cause their eyes, nose, and throat to become irritated. The authors of this paper can indeed corroborate many of these accounts from their own personal experiences in the community during odour events.

III. eNose Odour Monitoring in Fort Mckay

In 2013 Fort McKay (with funding support from Total E&P Canada) implemented a pilot program utilizing eNoses (electronic noses) developed by Odotech Inc[1]. The intent being to help in the identification of odour events in Fort McKay in an effort to better quantify the frequency and magnitude of odour events in the community. It was recognized that eNose’s are mainly intended to be used near an odour source. Fort McKay’s use of the eNose in a community setting has indeed pushed the limitations of what the eNose was designed to do, but some useful and interesting results have been obtained during this pilot program and are outlined below in case studies 1, 2, 3, 4, and 5. Due to practical limitations, neither of the or the two eNose’s in Fort McKay are spatially co-located alongside either of the 2 continuous air monitoring stations in the community - the Environment Canada CAM-1 Air Monitoring Station, nor the Wood Buffalo Environmental Association’s (WBEA’s) Bertha Ganter (AMS1) air monitoring station. These stations are however within 1 km of the two eNoses locations and thereofre allow some level of useful comparison between eNose and continuous monitoring air measurements.

WBEA’s AMS1 station continuously measures a number of different air quality parameters, but in the case studies only SO_2, Total Reduced Sulphur (TRS), and Total Hydrocarbons (THC) were used in the comparison since these parameters, especially TRS and THC, are generally good indicators of the potential for odours in the community i.e. odour events are generally associated with THC levels above 2 ppm and/or TRS levels above 0.5 ppb. It is important to point out that THC concentrations are generally accepted to be approximately 1.8-1.85 ppm for background due to the atmospheric background level of methane.

For practicality’s sake, only one eNose’s response is shown for each case study, but differences do occur between each eNose, and it should be emphasized that an eNose is a semi-quantitative odour measurement and management tool that attempts to signal the presence of different groups of odourants, and potentially quantify its relative strength, based the development of an eNose output signal to sensory odour observations correlation. What makes this task difficult in the case of the odour signals from the eNoses in Fort McKay is that the composition of the air mixture is highly variable, and likely never quite the same from event to event which makes establishing correlations between eNose signal outputs and odour levels and response challenging. Appendix A also has the case study figures and data in a more enlarged format for increased ease of interpretation.

[1] http://www.odotech.com/en/products/odowatch/

Case Study 1: April 2, 2014 (No odour event)

On April 2, 2014 the air quality in Fort McKay was good, with no detectable odours and wind from the North. This is confirmed by the data presented below in Figures 2A (WBEA AMS1 data) and 2B (Fort McKay eNose response which recorded a maximum odour concentration of approximately 0.85 O.U./m^3).

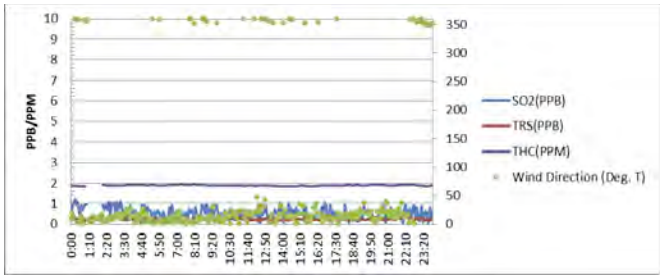

Figure 2A. WBEA’s AMS1 Data – April 2, 2014

Figure 2B. eNose Response (O.U./m^3) – April 2, 2014

Case Study 2: April 30, 2014 (Odour event)

On April 30, 2014 the air quality in Fort McKay was affected by industrial emissions from the South. with detectable odours occurring during morning and mid-day. The presence of odours was predictable based on the ambient air quality measurements during the day which are presented below in Figures 3A (WBEA AMS1 data) and 3B (Fort McKay eNose response which recorded a maximum of approximately 6 O.U./m^3 during the event).

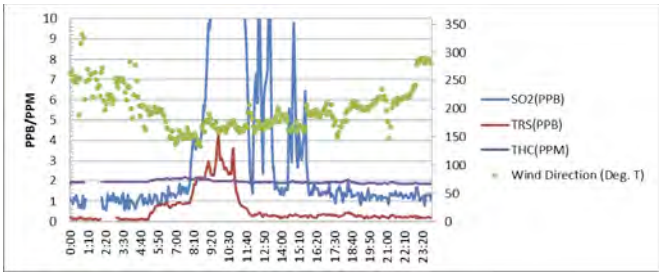

Figure 3A. WBEA's AMS1 Data – April 30, 2014

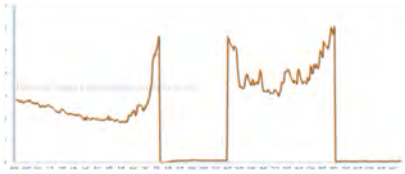

Figure 3B. eNose Response (O.U./m^3) – April 30, 2014

Case Study 3: July 27, 2014 (Odour event)

On July 27, 2014 the air quality in Fort McKay was affected by industrial emissions from the South with detectable odours occurring during morning and afternoon. The presence of odours was predictable based on the ambient air quality measurements during the day which are presented below in Figures 4A (WBEA AMS1 data) and 4B (Fort McKay eNose response which recorded a maximum of approximately 55 O.U./m^3 during the event.).

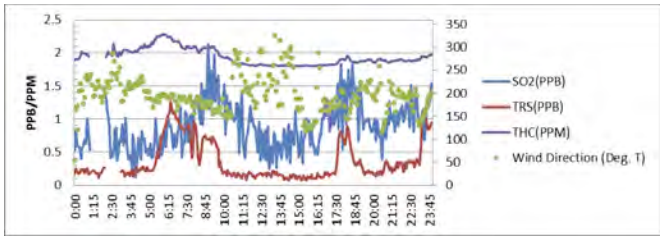

Figure 4A. WBEA's AMS1 Data – July 27, 2014

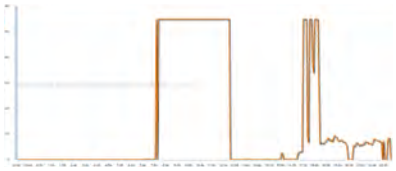

Figure 4B. eNose Response (O.U./m^3) – July 27, 2014

Case Study 4: July 29, 2014 (Odour event)

On July 29, 2014 the air quality in Fort McKay was affected by industrial emissions from the South. The presence of odours was predictable based on ambient air quality measurements during the day which are presented below in Figures 5A (WBEA AMS1 data) and 5B (Fort McKay eNose response which recorded a maximum of approximately 55 O.U./m^3 during the event).

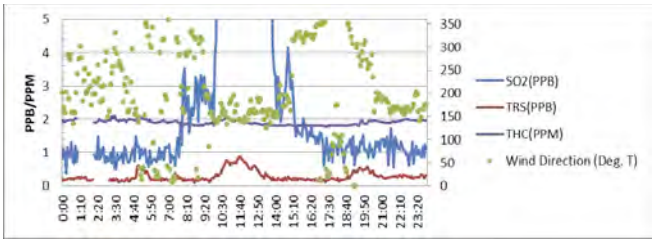

Figure 5A. WBEA's AMS1 Data – July 29, 2014

Figure 5B. eNose Response (O.U./m^3) – July 29, 2014

Case Study 5: August 27, 2015 (Odour event)

On August 27, 2015 the air quality in Fort McKay was affected by industrial emissions from the South detectable odours occurring during mid-day. The presence of odours was predictable based on the ambient air quality measurements during the day which are presented below in Figures 6A (WBEA AMS1 data) and 6B (Fort McKay eNose response which recorded a maximum of approximately 3 O.U./m^3 during the event.).

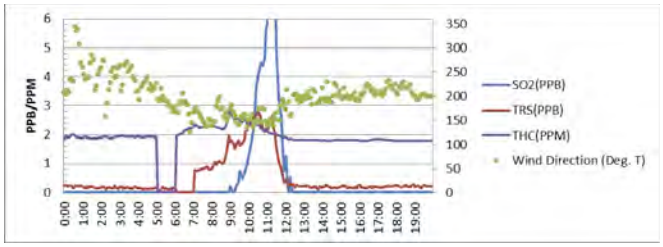

Figure 6A. WBEA's AMS1 Data – August 27, 2015

Figure 6B. eNose Response (O.U./m^3) – August 27, 2015

These five case studies illustrate:

a) The types of air quality and odour events that are a frequent occurrence in Fort McKay and which are the result of oil sands related emissions..

b) Air quality and odour events in Fort McKay are frequently associated with winds blowing from a southerly direction and therefore meteorology clearly plays a role in the air quality and odour events that Fort McKay experiences.

c) Elevated measurements of Total Reduced Sulphur (TRS), Total Hydrocarbons (THC), and SO_2 continue to show a strong correlation with odour events in Fort McKay.

d) eNose measurements sometimes correlate well with odour events and elevated ambient TRS and THC readings as these case studies demonstrate however based on the examination of a larger number of odour events and eNose responses, the eNose often does not detect odour events and this appears to be a sensitivity issue i.e. during strong odour events an eNose signal is measured but during milder odour events there is no signal

e) The eNose response signal does not seem to correlate well the concentrations of TRS, SO_2, or THC during an odour event in Fort McKay.

In conclusion, based on the experience to date with eNoses in Fort McKay, eNoses cannot be relied on as a standalone tool for odour detection and measurement. However, used in conjunction with ambient air measurements of specific odourants or odourant groups, eNoses can be used to provide a semi-quantitaive indication of the odour concentrations associated with odourant measurements. A key to the successful application is the linkage and correlation of sensory odour observations with eNose signal outputs and this is something that is planned, but to date has not happened, in Fort McKay. Once this is done the eNoses should become a more useful odour measurement tool although this will not address the sensitivity limitations of the instrument.

IV. Odour Event Canister Sampling

One of the limitations of odour related ambient air quality sampling in the region has been the reliance on continuous H2S/TRS monitoring data from the WBEA monitoring network to characterize and assess odour events. In general there has been no sensory and very limited detailed air quality characterization sampling or analysis to characterize and quantify odour events and provide the information necessary to identify the specific odourants and/or odourant sources which is a necessary step in developing odour management strategies. To address this shortcoming the Fort McKay Sustainability Department (FMSD), with support from Suncor, Shell and CNRL, implemented a special odour and potential poor air quality event monitoring program which started in April 2010.

Fort McKay's odour and potential poor air quality event sampling program involves the collection of two 10-minute air samples during an odour or industry upset event. Samples are collected in SilcoSteel canisters (6 liter volume). The samples are then shipped as quickly as possible (generally the same day) to the AITF Environmental Monitoring Laboratory in Vegreville, Alberta and analyzed for a broad range of volatile organic compounds (VOCs) and reduced sulphur compounds (RSCs). The canister samples are analyzed using gas chromatography (GC) and a mass spectrometry detector (MSD) for VOCs, a flame ionization detector (FID) for lighter VOCs (1-4 carbon atoms) and a sulfur chemiluminescence detector (SCD) for RSCs.

The samples are collected simultaneously at two locations in the community: one location is adjacent to (WBEA) Bertha Ganter air monitoring station (AMS#1) in Fort McKay and the other location is either along the river near the community's boat launch site or on Target Road in the northwest area of the community. The sampling locations are shown in Figure 7.

To date there have been approximately 25 odour event samplings. A detailed assessment of each odour event sampling is conducted which: looks at wind direction and speed at the time of the event; compares canister sample analysis results to the characteristics of certain known emission sources; and looks at regional air quality during and before the odour event as measured by the WBEA air monitoring network. This type of analysis allows possible emission sources and emission types to be identified for follow-up with operators and/or the regulators.

No collective analysis of all the odour-event canister sampling data collected to date has been collected but this type of analysis is planned. Table 1 provides a summary of the reduced sulphur compound (RSC) data from 15 odour-event sampling between May 2010 and June 2013. This data provides some insights into the RSCs contributing to odour events in Fort McKay i.e. hydrogen sulphide, carbon disulphide, dimethyl disulphide, allyl sulphide and thiophenes.

Figure 7: Odour Sampling Locations in Fort McKay

Table 1 Fort McKay Air Canister Analysis Results for some Reduced Sulphur Compounds

Target Reduced Sulphur Compounds Detected in Fort McKay's Odour-Event Canister Sampling Program during the Period May 11, 2010 to June 20, 2013 (15 Sampling Events - 30 Canister Samples)

Compound Name	Conc Units	Method Detection Limit	Odour Threshold (OT)[1]	Number of Detections (30 samples)	Max	Max/OT
Hydrogen sulphide	ppbv	~1ppbv	0.41	7	7	17.1
Carbonyl sulphide	ppbv	~1ppbv	55	29	29	0.5
Methyl mercaptan	ppbv	~1ppbv	0.07	0	0	0.0
Ethyl mercaptan	ppbv	~1ppbv	0.0087	0	0	0.0
Dimethyl sulphide	ppbv	~1ppbv	1	1	1	1.0
Carbon disulphide	ppbv	~1ppbv	8	15	15	1.9
Isopropyl mercaptan	ppbv	~1ppbv	0.006	0	0	0.0
tert-Butyl mercaptan	ppbv	~1ppbv	0.029	0	0	0.0
Propyl mercaptan	ppbv	~1ppbv	0.013	0	0	0.0
Thiophene	ppbv	~1ppbv	0.56	1	1	1.8
sec-Butyl mercaptan	ppbv	~1ppbv	0.03	0	0	0.0
Isobutyl mercaptan	ppbv	~1ppbv	0.0068	0	0	0.0
Ethyl sulphide	ppbv	~1ppbv	0.033	0	0	0.0
Butyl mercaptan	ppbv	~1ppbv	0.029	0	0	0.0
tert-Pentyl mercaptan	ppbv	~1ppbv	0.03	0	0	0.0
Dimethyl disulphide	ppbv	~1ppbv	0.2	5	14.3	71.5
2-methyl Thiophene	ppbv	~1ppbv	0.56	7	7	12.5
3-methyl Thiophene	ppbv	~1ppbv	0.56	4	4	7.1
Pentyl mercaptan	ppbv	~1ppbv	0.0078	0	0	0.0
2-ethyl Thiophene	ppbv	~1ppbv	0.56	0	0	0.0
Allyl sulphide	ppbv	~1ppbv	0.02	1	1	50.0
2,5-dimethyl Thiophene	ppbv	~1ppbv	0.56	1	1	1.8

[1] Odour thresholds based either on: 1) Nagata, Y. "Measurement of odor threshold by triangle odor bag method." Odor Measurement Review, Japan Ministry of the Environment. 2003. www.env.go.jp/en/air/odor/olfactory_mm/04ref_2.pdf; or 2)TCEQ. (2012a). March 2012 Effects Screening Levels. http://www.tceq.texas.gov/toxicology/esl/list_main.html/

V. Considerations in Attributing an Air Quality and/or Odour Event in Fort McKay to a Specific Industrial Operation and/or Source(s)

In an effort to advance odour event analysis to better understand the possible source(s) of odours, Fort McKay has developed a document entitled: "*Considerations in Attributing an Air Quality and/or Odour Event in Fort McKay to a Specific Industrial Operation and/or Source(s)*"[2]. This document outlines the general approach that is followed when analyzing an air quality and/or odour event in Fort McKay in terms of attributing the event to a particular facility, emission source and/or operating condition or upset. The key factors considered and evaluated are:

a) regional meteorology immediately before and during the odour event,

b) air quality readings at monitoring stations in the region and in the community before, during and after the odour event,

c) characteristics of the various types (area, volume, stack) and specific emission sources in the region e.g. tailings ponds, sulphur recovery unit stacks, coke and CO boilers, etc.

d) the operational status of facilities immediately, during and after the odour event; and

e) sensory observations during the odour event e.g. very strong hydrocarbon odour.

The following is an example of how an attribution assessment is conducted. On September 19, 2011 there was an odour episode in Fort McKay. The wind was from the south during this event, which pointed to possibly Suncor and/or Syncrude as the source, air quality and wind direction/speed data from WBEA (http://www.wbea.org/) AMS2 (Mildred Lake), AMS13 (UE-1) and AMS1 were assessed. The following figure demonstrates a clear relationship between air quality at AMS2 and AMS1 with a delay of approximately 1.25-1.5 hours between H2S/TRS peaks at AMS2 and AMS1. This time delay reflects the approximate 16km distance between the 2 stations and a wind speed of ~10km/hr in the 7-9am period. Based on wind direction data at both AMS1 and AMS2 and this type of emission tracking, this event was attributed to ground level (tailings pond) emissions from Suncor.

The ability to conduct odour event analysis and attribution has been significantly enhanced recently with the siting of an Environment Canada comprehensive air monitoring station in Fort McKay which has a Radio Acoustic Sounding System (RASS) which measures wind, turbulence and temperature vertical profiles up to approx. 500 meters every 15 min and Light Detection and Ranging (LIDAR) which measures vertical aerosol profiles into the upper troposphere. These instruments allow for a much better assessment of possible emission dispersion.

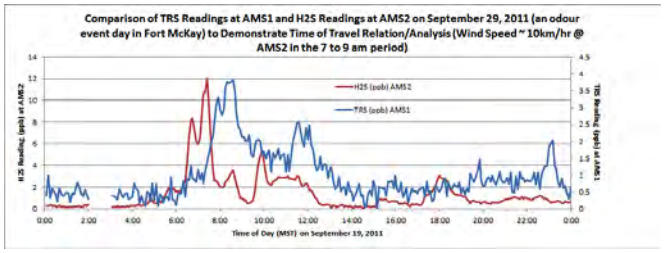

Figure 8: Example of Back Trajectory Type Air Quality Analysis Used to Relate Odour Events in Fort McKay to Possible Sources/Source Types

These types of analyses are generally provided to both government and the company to which the odour event was attributed. The intent being to identify odour sources or activities that should be the focus of odour management. To date these types of assessment have gained little traction with companies or regulators which is considered unfortunate as these types of assessments can and should be part of odour complaint follow-up and guide regional odour management planning.

[2] FMSD. Copies are obtainable from: Ryan Abel, Lead – Environment & Regulatory, In Situ. E-mail: rabel@fortmckay.com

VI. Odours and the Fort McKay Air Quality Index

In 2012 Alberta modified its air quality index (AQI)to an air quality health index (AQHI) (http://aep.alberta.ca/air/programs-and-services/air-quality-health-index/default.aspx). The previous AQI would frequently report good air quality in Fort McKay when odours were very bad and the current AQHI suffers from the same limitation. To address this inconsistent in air quality indexing and the air quality sensory experience of residents of Fort McKay, Fort McKay developed its own Fort McKay air quality index (FMAQI) in 2011. The FMAQI uses the 1-10 scale used for the Environment Canada AQHI[3].

The FMAQI includes indices for TRS and total hydrocarbon (THC) both of which are associated with odour events in the community. For TRS the hourly TRS value is put into a logarithmic equation i.e. natural log (Ln) of TRS reading in ppb times 4 plus 5 to give a TRS AQI value i.e. TRS AQI = 4*LN(TRS reading)+5. Since TRS levels are related to odours, the use of a logarithmic relation is considered appropriate as it is, in general, the way in which the human nose responds to odours i.e. at concentrations just above detection levels, odours increase in intensity (strength) as the concentration of the odourant(s) increases but above a certain level there is only a small increase in the intensity of the odour even though concentrations increase significantly. The coefficients used in the equation reflect the observed relationship between TRS levels and community odour complaints/observations with odours frequently being reported when TRS levels get above 0.6-0.7 ppb.

The WBEA[4] recently contracted a review of the FMAQI relative to the Alberta AQHI, which concluded that "*Overall the two index systems appear complementary and the addition of TRS, THC and SO_2 through the FMAQI definitely improves the classification of air quality on days with odour issues as compared to using the AQHI exclusively.*"

The FMAQI is now reported on the WBEA website in conjunction with the Alberta AQHI (http://www.wbea.org/) Figure 9 shows how the 2 indexes are reported on the website. The current Government of Alberta AQHI includes an odour messaging when hydrogen sulphide or total reduced sulphur (odour) concentrations exceed specified thresholds. Modifications to the odour-related criteria and messaging are being considered with a planned trial testing in the Regional Municipality of Wood Buffalo. Fort McKay has been involved in the development of this planned program.

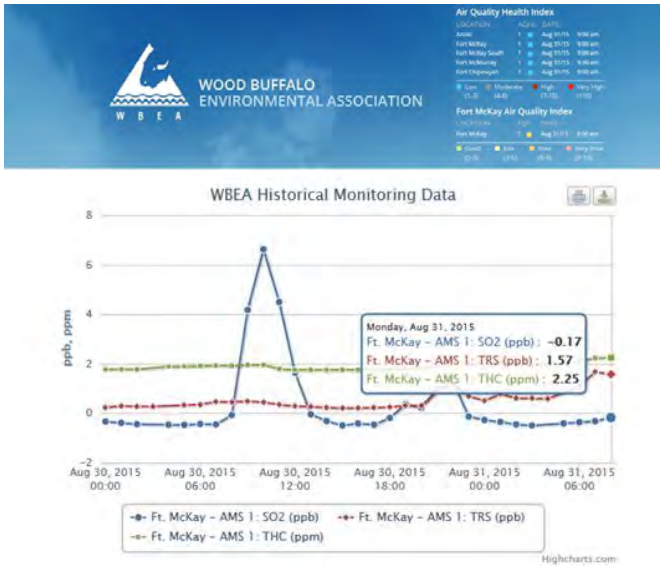

Figure 9 Screen Shot from WBEA web site depicting concurrent reporting of both AQHI and the FMAQI

The FMAQI has demonstrated that a workable and meaningful air quality index for odour can be developed but that it needs to be based on a well-established relationship between ambient air quality measurements and odour events.

VII. Oil Sands Project Related Odour Impact Assessments

Larger new or expanded oil sands projects are required by regulation[5] to undertake an environmental impact assessments (EIAs) which is to include an assessment of possible project and cumulative odour issues[6]. Fort McKay conducts detailed reviews of all EIAs for projects proposed within its Traditional Lands and has been very frustrated that odour impact assessments (OIA) conducted as part of project

[3] http://ec.gc.ca/casaqhi/default.asp?lang=En&n=065BE995-1

[4] WBEA. 2015. Performance of the Fort McKay Air Quality Index (FMAQI) and Comparison with the Air Quality Health Index (AQHI). Prepared for the Wood Buffalo Environmental Association by Tom Dann RS Environmental
Ottawa, ON, Canada. January 16, 2015.

[5] Alberta Government. Environmental Protection And Enhancement Act: Environmental Assessment
(Mandatory And Exempted Activities) Regulation. Alberta Regulation 111/1993 **(**With amendments up to and including Alberta Regulation 62/2008). http://www.qp.alberta.ca/documents/Regs/1993_111.pdf

[6] Government of Alberta. 2013. Environmental Assessment Program: Guide to Preparing Environmental Impact Assessment Reports in Alberta. Updated March 2013. http://aep.alberta.ca/lands-forests/land-industrial/programs-and-services/environmental-assessment/documents/GuidePreparingEIAReportsAlberta-2013A.pdf

EIAs invariably concluded that odour related project and cumulative impacts were and would be minimal despite the reality that odours were currently a major issues.

Fort McKay has consistently identified four issues with the approach used in OIAs which are:

1) ***Averaging period*** – many OIAs were using 1 hour averaging periods for odourant concentrations;
2) ***Odour Thresholds*** – the odour thresholds used in OIAs were generally higher and in some cases much higher than currently recognized and scientifically defensible odour threshold values;
3) ***Odourant Additivity*** – OIAs generally compared the predicted single compound concentrations to the compounds odour threshold for that compound and if the value was below 1 the compound did not contribute to odour at that location – an approach that fails to consider the potential additive effect of mixtures of odourants particularly at lower concentrations;
4) ***Odorous Compounds Assessed*** – OIAs generally identified a limited number of potential odourants which was inconsistent with regional air quality monitoring that showed quite a large number of potentially odorous compounds being emitted in the region.

To address these deficiencies in OIAs the FMSD developed a document entitled: "*Guidance for Odour Impact Assessments and Odour Management for Proposed Oil Sands Projects on Fort McKay's Traditional Territories*"[7]. This Guidance Document was prepared to provide oil sands developers with guidance on Fort McKay's expectations regarding OIAs for proposed projects on Fort McKay's Traditional Territories.
The following is a summary of some of the key recommendations/requests in the Guidance Document.

1. ***Odourants Assessed in OIAs:*** a list of odourants for assessment is provided which is based on results from Fort McKay's odour-event canister sampling.
2. ***Odour Thresholds:*** Project proponents are requested to use, whenever possible, odour thresholds for odourants from Nagata (2003)[8] or another source meeting the Level 1 odour threshold methodology criteria as outlined by the Texas Commission on Environmental Quality.
3. ***Odourant Mixtures:*** Project proponents assume that the odour potential of mixtures of odourants is the sum of the odour units i.e. concentration of odourant divided by its odour threshold, of all the individual odourants in the mixture.
4. ***Averaging Times for OIAs:*** Proponents of proposed oil sands projects on Fort McKay's Traditional Territories use an averaging time of 3 minutes for estimating odour potential i.e. the frequency and duration of odour periods above 1 odour unit and use a multiplier of 2.6 to convert hourly odour predictions to 3 minute predictions or provide justification for the use of an alternate multiplier.

Recent project proponents have to varying degrees been using the FMSD OIA Guidance Document and the result has been that the more frequent and/or higher odour levels are being predicted.
While the Fort McKay OIA Guidance Document has advanced odour management in the Region, this type of document needs to be part of a more comprehensive regional odour management system and Fort McKay should not have been put in the position of having to develop such a document as this is clearly the responsibility of government regulators and environmental managers.

VIII. IMPACTS OF ODOURS ON HEALTH AND WELL-BEING

As noted in Section VII, Alberta's environmental legislation contains provisions requiring companies seeking regulatory approval to mine or process oil sands to conduct Environmental Impact Assessments (EIAs). In regards to air pollution, the EIA requires that chemical emissions are identified and emission concentrations estimated using spatial and temporal computer modeling. Expected concentrations are modeled across the regional landscape and are then compared against selected standards believed to protect the environment and/or human health. While these EIAs are generally competently undertaken and reported, the regulatory bar in choice or regulatory standard is not always set very high compared to other first world jurisdictions. Still, Alberta has set standards for the main criteria air pollutants, and for the most part with the exception of plant upsets, emission levels of criteria air contaminants are monitored and enforced.

Further, Alberta has established regional multi-stakeholder organizations to help identify and develop management systems for regional air pollution. One such organization is the Cumulative Environmental Management Association (CEMA) which is focused on oil sands industry and is tasked with objectively exploring gaps in existing regulatory mechanisms and proposing Management Frameworks to government to address the identified gaps. In principal, this has worked well as CEMA is a multi-stakeholder forum, and capable of absorbing and integrating polarized viewpoints. Government by itself, is only one stakeholder, and a stakeholder who has vested interest in development and conflicts of interest in its various responsibilities. Our

[7] FMSD. 2014. Copies are obtainable from: Ryan Abel, Lead – Environment & Regulatory, In Situ. E-mail: rabel@fortmckay.com
[8] *Nagata, Y. (2003) Odor intensity and odor threshold value, J. Jpn. Air Cleaning Assoc., 41, 17–25*

Provincial government appears to be conflicted as it shoulders responsibility for economic development, environmental protection, industry regulation as well as aspects of Aboriginal relation. The CEMA multi-stakeholder approach was one the community of Fort McKay, along with other regional communities, enthusiastically endorsed as CEMA provided both Aboriginal and non-Aboriginal local communities a voice and an effective seat at the negotiating table, along with Government (Provincial and Federal), Oil Sands Industry (Mining and SAGD), and many Not for Profit Non-Government Organizations (NGOs).

It has been through CEMA that Odours have been identified as an important regional issue which is not being effectively addressed by current Government legislation. Specifically the Air Working Group within CEMA consisting of Government, Industry, NGO and Aboriginal representatives unanimously recognized the need for effective odour management as both a Quality of Life issue, as direct and indirect impacts to Health and Well Being.

While nuisance odours are often not considered a direct acute or chronic impact on health due to the usually very low concentrations of many odour-causing chemicals, it is well recognized that indirect health impacts are very real and present. This is particularly true in the largely Aboriginal community of Fort McKay where traditional values and traditional land use within a modern Aboriginal culture are promoted. Wild food including game meat such as moose and fish, and vegetation such as cranberry, blueberry, strawberries offers far better nutrition than store bought foods – particularly the store bought food most readily available in northern communities. The day(s) spend hunting and gathering promotes culturing integrity, community well being and promote individual health. A polluted environment, and/or a perceived polluted environment greatly reduces Fort McKay quality of life, reduces traditional land use, and reduces consumption of traditional foods. Unwelcome industrial odours are a very real problem contributing to community perceptions on environmental pollution and the inherent health of traditional foods. This issue was acknowledged by the Joint Review Panel Report[9] for the Shell Jackpine Mine Expansion which noted that:

"*While the Panel is satisfied that the Project will likely not contribute in a significant way to health issues related to air contaminants, the Panel believes that perceived bad air quality and unpleasant odours could foster the avoidance of traditional use.*"

[9] Report of the Joint Review Panel Established by the Federal Minister of the Environment and the Energy Resources Conservation Board Decision 2013 ABAER 011: Shell Canada Energy, Jackpine Mine Expansion Project, Application to Amend Approval 9756, Fort McMurray Area, July 9, 2013. Catalogue

Who wants to gather traditional food when the air stinks? Odours induce changes in behavior at a personal, family and community level. In reducing traditional food gathering, reliance on store bought food is increased, nutritional value and exercise is reduced. Odours then enhance obesity. Obesity contributes to diabetes and other health impacts like heart disease and stress. By reducing land use and traditional activities, odours then erode cultural health and reduce vitality of once vital and vibrant social support networks. Odours can be then seen to contribute to mental illness and addictions and many other problems. It is not the case that there is direct cause & effect between odours and health issues such as addictions, but most health professionals would recognize the indirect cause and effect between them.

Do odours directly impact health? Not so much. Do odours contribute indirect impacts to human health - definitely, and these impacts are real-world impacts, which escape conventional Environmental Impact Assessments. Reducing odours in and around the community would promote health and well-being. Even increasing capacity and understanding around odour causing emissions could reduce the indirect health impacts of odours.

For these reasons Fort McKay is presently prompting the Alberta Energy Regulatory (AER) to seriously tackle the issue of regional odours and help drive constructive initiatives to reduce the impacts of odours on health and well being. Fort McKay has made available the results of its measurements on odours to regional stakeholders and regards the presence of odours as being an unmet environmental impact of industrial development in the Alberta Oil Sands.

IX. SUMMARY

Unwanted industrial odours have become a fact of life in the community of Fort McKay, as well as for other communities living downwind of industry in Alberta's Oil Sands. What, in living memory, was once a pristine environment is now marred with vast open pit mines, toxic tailing ponds, and industrial upgrading and refining infrastructure. New industry players coming onto the scene must incorporate more advanced engineering and emissions control systems into their development plans. Many of the odour problems commonly experienced in Fort McKay emanate from older industrial operations who have emissions far above those associated with comparable newer developments. These older industries (i.e. Syncrude and Suncor) will likely continue to be responsible for the majority of ongoing odour issues in the community of Fort McKay without some required changes. Odours in particular are currently not monitored or managed in any meaningful way by any industry – old or new. As the Alberta Oil Sands region

develops and expands, Fort McKay argues that Provincial pollution legislation should assertively recognize the existence of odours through regional monitoring, and establish meaningful systems to effectively manage odourous emissions which balance needed economic development with impacts on health and well being in local communities such as Fort McKay.

Fort McKay will continue to develop internal capacity to monitor odours and identify sources of emissions. McKay will continue to voice support on the importance of recognition of odours, and promote mitigation through effective emission controls and integrated monitoring. Fort McKay will continue to press the Provincial Government of Alberta to develop and implement more effective odour management systems as part of its stated ambition to develop a 'world class' environmental monitoring system in Alberta.

Odours remain a challenging area for environmental management, but one that should not be ignored. The indirect impacts on Human Health and Quality of Life are uninvited and unwanted in the community of Fort McKay – ground zero in the Alberta Oil Sands.