Wood Buffalo Environmental Association

Progress Report

2023-2024

Q1: April-June

SUBMITTED JULY 2023

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1. Contract Scope and Delivery

This Progress Report is submitted quarterly by the Wood Buffalo Environmental Association (WBEA) on behalf of its members to Alberta Environment and Protected Areas (AEPA) in accordance with the services and deliverables listed in Schedule A of the Government of Alberta contract 20AEM838-03 and 20AEM842-03, as amended.

As per the AEPA contracts (Table 1), the WBEA provides environmental monitoring services based on the annual Oil Sands Monitoring (OSM) work plans and associated costs.

The WBEA received notice that its 2023-2024 workplan and budget had been approved on May 8th, 2023. The WBEA is awaiting a final AEPA contract with updated deliverables. In the interim, a contract extension for the 2022-2023 contracts 20AEM838-03 and 20AEM842-03, as amended, was implemented and the deliverables from the 2022-2023 workplan were used in this progress report.

Table 1: Current AEPA Contracts and Work Plans

AEPA Contract	Work Plan Name	Work Plan Reference
20AEM838-03	Atmospheric Pollutant Active Monitoring Network	A-LTM-S-1-2324
20AEM842-03	Integrated Atmospheric Deposition Monitoring	A-PD-6-2324

2. Introduction

The WBEA is a multi-stakeholder, community-based, not-for-profit association that operates in the largest municipality in Canada. The WBEA monitors the air in the Regional Municipality of Wood Buffalo (RMWB) 24 hours a day, 365 days a year and conducts a variety of air, land, and odour monitoring programs. The information collected from all the WBEA's air monitoring stations between Conklin and Fort Chipewyan, most of which are located at or near oil extraction plants, is openly and continuously shared with stakeholders and the public on the WBEA's website (https://wbea.org/) and through annual reports, community engagement, and outreach activities.

An Air Quality Task Force was established in 1985 to address environmental concerns raised by the Fort McKay First Nation related to oil sands development. In 1990, this Task Force became the Regional Air Quality Coordinating Committee. Then in 1996 the area was endorsed as a regional airshed by the Clean Air Strategic Alliance (CASA). The WBEA was incorporated as an Alberta Non-Profit Society in 1997 and assumed responsibility for air quality monitoring within the boundaries of the RMWB. The WBEA became a working partner of the Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA) in 2014. With the dissolution of AEMERA on June 30th, 2016, the WBEA began working with the OSM Program and AEPA to fulfill its mandate to provide independent ambient air monitoring in the region.

The WBEA submits annual work plans to the OSM Program. Once the work plans, and any required changes, are approved, the WBEA receives a contract with deliverables for the work from AEPA. This Progress Report is a quarterly update on the work agreed to in the OSM Work Plans and the associated AEPA Contract and includes program updates, exceedances and non-compliances, research and development overviews and adaptive monitoring progress.

Note: Ambient air and laboratory data must be quality assured and controlled prior to submittal to Alberta Environment's Air Data Warehouse and upload to the WBEA website. The data validation process follows one month behind the current month (i.e., data from May is reviewed throughout June and submitted by the end of June). To ensure reporting of the most accurate data, this progress report will include data and statistics for the previous quarter (2022-2023 Q4) that have already been validated, where applicable.

3. Atmospheric Pollutant Active Monitoring Network, 2023-2024 Work Plan Reference A-LTM-S-1-2324

The components of the Atmospheric Pollutant Active Monitoring Network Work Plan that are fulfilled, or supported, by the WBEA are described below:

(1) ***Long-term core ambient air monitoring network*** *– includes continuous and time-integrated air monitoring. The Wood Buffalo Environmental Association (WBEA) operates 29 ambient air monitoring stations (AMSs) in the Athabasca Oil Sands Region (including the acute air monitoring station in Fort McKay - Waskōw ohci Pimâtisiwin). The Lakeland Industry and Community Association (LICA) operates 4 AMSs in the Cold Lake Oil Sands Region, and the Peace River Area Monitoring Program (PRAMP) operates 5 AMSs in the Peace River Oil Sands Region. All three airsheds collect time-integrated samples for the National Air Pollution Surveillance (NAPS) program and other parameters that cannot be collected through continuous monitoring. The long-term core air monitoring network was developed to fulfill EPEA Approval compliance monitoring requirements and satisfy community and scientific interests. Both the WBEA and PRAMP core ambient air monitoring networks are undergoing assessments to develop a series of recommendations to rationalize/optimize the network. The results of these assessments are not expected until late 2022 or early 2023 but recommendations can start informing network changes in 2023/24.*

(2) ***Recommendations 14/15 in the report "Recurrent Human Health Complaints Technical Information Synthesis – Fort McKay Area"*** *(Alberta Energy Regulatory and Alberta Health, 2016) – continue to be implemented. Implementation of these recommendations will improve air monitoring consistency within 30 km of Fort McKay and allow improved characterization of the air pollutants and their sources that cause air quality and odour concerns in the community. Some aspects of this monitoring are intended to be short-term or focused, as described in Section 10.0 Work Plan Approach/Methods.*

(3) ***Odour Monitoring*** *– The WBEA created an odour monitoring app (COMP) that allows the public to provide anonymous information on the odours they experience. The app collects information such as odour type, intensity, duration, timing and location. The collected information is compared to data at WBEA ambient air monitoring stations to determine if or how ambient air quality trends are related to odours. All submitted odour observations and annual reports can be found at www.comp.wbea.org.*

(4) ***Transition to an Adaptive Monitoring Approach*** *– will continue in 2023-24. This will involve a structured approach to: (a) reviewing the existing monitoring network and document the purpose or objective for each station and for each parameter monitored at each station; (b) developing a shared understanding of regulatory and community expectations that will guide any OSM adaptive monitoring framework based adjustments required to the current long-term surveillance program; (c) determining which air quality parameters are applicable for the Adaptive Monitoring approach; (d) quantifying baselines for selected parameters; and (e) establishing limits of change for selected parameters.*

In addition, the Atmospheric Pollutant Active Monitoring Network work plan includes collaboration with two community-based (FMFN and Fort McKay Metis Nation (FMMN)) monitoring projects, one for dust and one for odour that were by that were approved for funding and commenced in 2022-23.

Lastly, the Oski-ôtin air monitoring station in Fort McKay has been decommissioned. This was formerly a standalone component of this work plan. No funds will be requested in 2023/24 for Oski-ôtin, although several reporting products involving Oski-ôtin measurements will be released in 2023/24.

The objectives of the 2023-24 work plan are:

(1) To measure impacts from Oil Sands development on ambient air quality.
(2) To provide ambient air data that citizens, industrial members, and regulatory bodies can use to make informed decisions on health, facility compliance, and environmental management policy.
(3) To provide ambient air data for community needs, including the Air Quality Health Index (AQHI), the Fort McKay Air Quality Index (FMAQI), and measuring representative ambient concentrations in populated areas.
(4) Implement ambient air monitoring approved by the Fort McKay Air Quality and Odour (FMAQO) Advisory Committee (specific to Recommendations 1, 14 and 15).
(5) To measure air parameters in Fort McKay that will assist in odour identification and source characterization/attribution during air quality and odour events.
(6) To understand the impacts of Oil Sands development on the odours experienced in communities in the AOSR.
(7) To understand the relationship between the odours experienced by community members and the ambient air data collected at active air monitoring stations.
(8) To measure air parameters in Fort McKay that will assist in dustfall identification and source characterization during dustfall and low visibility events.
(9) To understand the impacts of Oil Sands development on the dustfall experienced in Fort McKay.
(10) To understand the relationship between the dustfall experienced by community members in Fort McKay and the ambient air data collected at active air monitoring stations.
(11) To ensure that monitoring carried out in the region is relevant to the concerns of community members.
(12) To implement the adaptive monitoring approach, as directed by the OSM Program Oversight Committee, where appropriate in the Atmospheric Pollutant Active Monitoring Network.
(13) Create an Indigenous-led air monitoring program in the Peace Athabasca Delta and at reserve locations in partnership with WBEA.
(14) Expand the Fort Chipewyan air monitoring capabilities to fill the air quality data gap with time integrated sampling.
(15) Build community capacity through training of ACFN and MCFN Personnel for sampling program operations and maintenance.

The following section provides details on the Q1 2023-2024 milestones and objectives under Workplan A-LTM-S-1-2324 (Atmospheric Pollutant Active Monitoring Network) but is based off the deliverables under the existing Government of Alberta contract 20AEM838-03, as noted in Section 1 above.

3.1 Continuous Monitoring - Operate 29 ambient air monitoring stations including the air monitoring station in Fort McKay (Waskōw ohci Pimâtisiwin station - FMAQOAC Recommendation 1).

i. Complete monthly calibrations at all ambient air monitoring stations in the WBEA network in compliance with Alberta's Air Monitoring Directive (AMD). Perform preventative maintenance and repairs, as required.

A total of 152 analyzers were operated in the network between January to April 2023. The WBEA performed approximately 160 calibrations on analyzers and calibrators each month. Operational average times for January to April 2023 are included in Table 2 and range from 97.1% to 98.6%.

Monthly calibrations were completed at all 29 monitoring stations, in compliance with the AMD. Preventative maintenance and repairs were carried out as needed (see Table 5 for repairs of issues found during internal audits).

Table 2: WBEA Continuous Analyzer Operation Statistics, by Month, January to April 2023

Month	Average Operational Time (%)	# of Analyzers with Operational Uptime %						Total # of Analyzers
		< 90*	90 to 92	93 to 94	95 to 96	96 to 98	98 to 100	
January	98.5	6	0	4	7	5	130	152
February	97.1	5	3	4	1	6	134	152
March	98.4	5	0	1	2	8	137	152
April	98.6	1	1	0	9	8	133	152

*For details on analyzers operating at less than 90% uptime, please refer to Section 3.12: Table 8.

ii. Perform annual calibrations on meteorological sensors at air monitoring stations.

Annual calibrations on meteorological sensors started in May 2023 and will continue throughout the summer and fall months.

iii. Provide locations of Portable Stations in the WBEA Network.

The locations of portable stations in the WBEA Network for 2023-2024 Q1 are listed in Table 3. AMS 101, 103, 104 and 106 are located at the WBEA Center for upgrades in preparation for deployment. AMS 102 was deployed at the Jackfish 1 CNRL facility to complete six months of monitoring to meet the requirements of EPEA Approval 224816-01-00. AMS 104 was installed at MEG Energy's Sawbones Bay location to meet the requirements of EPEA Approval 216466-01-00. AMS 105 is currently housing the Reduced Sulphur Compounds (RSC) & Volatile Organic Compounds (VOC) gas chromatographs (GCs) at Bertha Ganter-Fort McKay (please refer to Section 11(iii) for more information).

Table 3: Location of Portable Stations in WBEA Network, April to June 2023

WBEA Portable Number	April	May	June
AMS 101	WBEA Center	WBEA Center	WBEA Center
AMS 102	Jackfish 1	Jackfish 1	Jackfish 1
AMS 103	WBEA Center	WBEA Center	WBEA Center
AMS 104	WBEA Centre	WBEA Centre	Sawbones Bay
AMS 105	Bertha Ganter – Fort McKay	Bertha Ganter – Fort McKay	Bertha Ganter – Fort McKay
AMS 106	WBEA Center	WBEA Center	WBEA Center

iv. Provide continuous analyzer operation statistics, by month.

Continuous analyzer operation statistics are provided in Table 4. A total of 17 analyzers operated below 90% uptime between January and April 2023. Of these, wind (7), SO_2 (3) and H_2S (3) analyzers experienced the most issues causing downtime.

Table 4: Continuous Analyzer Operation Statistics by Parameter, January to April 2023

Month	Overall Average Operational Time	No. of analyzer(s) below 90%	SO2	H2S	TRS	THC	O3	NO2	CO	CO2	NH_3	$PM_{2.5}$	Wind
January 2023	98.5%	6	1	1	1	0	0	0	0	0	1	0	2
February 2023	97.1%	5	1	1	0	1	0	0	0	0	0	0	2
March 2023	98.4%	5	1	1	0	1	0	0	0	0	0	0	2
April 2023	98.6%	1	0	0	0	0	0	0	0	0	0	0	1
Numbers of analyzers in the network		152	25	14	12	20	11	21	4	3	2	15	25
Total Number of non- compliances In 12 months		38	4	3	2	6	3	2	0	1	4	2	11
Percentage of non-compliance by parameter			10.5%	7.9%	5.3%	15.8%	7.9%	5.3%	0.0%	2.6%	10.5%	5.3%	28.9%

3.2 Time-integrated monitoring - Deploy and collect all required time-integrated samples, instrument maintenance, and sample results.

i. Time-integrated sampling updates, as per NAPS schedule.

Time-integrated sample collection incidents and recovery percentages are provided below in Table 5 (See Appendix B for equipment present at each AMS location). The WBEA collected and deployed between 255 to 371 samples per month in January to March 2023; the number of samples is influenced by the number of NAPS days per month. A total of 8 incidents impacting the samples occurred between January and March 2023 and total recovery for this timeframe was over 99%.

Table 5: Time Integrated Sample Collection - Incidents and Recovery, January to March 2023

Month	No. of Incidents	Total No. of samples	% Recovery	# NAPS days	Incidents per Sample Type							
					$PM_{2.5}$	PM_{10}	EC/OC	VOC	PAH	Precip	TSP	Dustfall
January	0	309	100.0	5	0	0	0	0	0	0	0	0
February	2	255	99.2	4	0	1	1	0	0	0	0	0
March	6	371	98.4	6	2	1	2	0	1	0	0	0
Q4 Total	**8**	**935**	**99.9**	**15**	**2**	**2**	**3**	**0**	**1**	**0**	**0**	**0**

ii. Submit time-integrated data with monthly data reports.

WBEA time-integrated data has been collected and centralized within a database. A catalogue containing sample types, number of data points, and date ranges is available to view on the WBEA website: https://wbea.org/network-and-data/integrated-data-search/. Time-integrated data can be refined by sample type, location, date range etc. Data can be downloaded in a spreadsheet format from the website.

3.3 Continue the WBEA's Quality Assurance Program

i. Maintain the WBEA's Reference Centre, monthly calibrations on reference analyzers, perform CGAs, maintain primary reference materials.

Over the last quarter, regular maintenance and calibrations were carried out on instruments in WBEA's Reference Centre. One new calibrator MFC was calibrated and 11 cylinder gas audits (CGAs) were completed on incoming reference gases. Of the 11 CGAs completed, one H_2S reference gas cylinder failed WBEA CGA criteria (4.7% out) and was returned to the manufacturer.

ii. Complete quarterly calibrations and audits on all time-integrated sampling equipment.

Quarterly calibrations and audits of time-integrated sampling equipment were completed at all nine air monitoring stations during the months of May and June.

iii. Complete annual internal audits at all WBEA ambient air monitoring stations and additional ones, as required.

The WBEA has an internal audit program that follows the same procedures as AEPA; however, the WBEA applies stricter audit criteria allowing the WBEA to initiate investigations and potential maintenance repairs before an AMS analyzer would fail AEPAs audit. Table 6 lists all internal audits that were conducted in the WBEA Network from April to June 2023.

Table 6: List of Internal WBEA Audits, April to June 2023

Air Monitoring Station	Audit Date	Parameters Audited	Audit Response	Follow-up
Bertha Ganter - Fort McKay	April 13, 2023	NH_3	Testing to validate drift observed during NH_3 points. Audit showed no issues, site testing had shown undue influence from station temperature where 2-3 degree temperature change affected instrument by 40 ppb. Adjusted station temperature controls to be tighter with minimal drift.	NH_3 calibration will be observed following audit; if response drift is still observed further modifications will be added to minimize influence of station temperature on converter operation.
Waskōw ohci Pimâtisiwin	April 19 & 21, 2023	SO_2, TS, H_2S, TRS	All instrument performance was good. Tested TS response with SO_2/HC mixture cylinder and response was -5% low, suspect HC kicker may not be removing gases from the sample stream.	Technician to test/validate with replaced kicker.
Patricia McInnes	April 26, 2023	NH_3	Tested NH_3 instrument for response drift caused by station temperature shift. Audit showed no issues, site testing demonstrated a 20 ppb drift over a 3 degree temperature shift.	Results of site testing at Bertha Ganter – Fort McKay may be applied to this station, as applicable.

3.4 Operate the Community Odour Monitoring Program (COMP) App.

The Community Odour Monitoring Program (COMP) was launched September 2017 to help understand the linkages among odours in the communities and ambient air quality. Users submit odour observations through the WBEA COMP App. The number of odour observations and unique users that were submitted through the COMP app in 2023 are listed in the Table 7. Near real-time odour observation information, data from the WBEA's community air monitoring stations for odour-causing compounds and the COMP annual report can all be found at https://comp.wbea.org/.

Table 7: Number of Odour Observations Submitted in 2023

Month	Observations	Unique Users
January	8	5
February	8	7
March	6	6
April	2	1
May	3	3
June		
July		
August		
September		

October		
November		
December		

i. Create awareness of the COMP and COMP App for community members.

The WBEA is working on an upcoming awareness campaign to increase community knowledge about the COMP program.

ii. Submit 2022 COMP Annual Report to AEPA and post on the WBEA website.

The 2022 COMP Annual Report was finalized April 2023 and OSM and AEPA were notified. The report can be found at https://comp.wbea.org/2022-annual-report/

3.5 Complete site commissioning of the new Mildred Lake AMS location.

Mildred Lake AMS has not met AMD siting criteria for quite some time, due to the presence of a nearby Quonset. Initial plans to relocate the station started in 2022; however, activities have been suspended due to construction scheduled at the new proposed location. The WBEA is working with the appropriate member to determine a path forward in establishing a new permanent AMS location. In the meantime, the Quonset was removed, so the Mildred Lake AMS currently meets AMD siting criteria and continues to operate.

3.6 Modify operations and reporting to meet new requirements in the Air Monitoring Directive (AMD) and the new AAAQG for TRS.

No modifications in operations or reporting were required to meet changing AMD requirements in the first quarter. The AEPA is anticipated to release a new 30-minute average TRS guideline; this guideline has yet to be released. Once implemented, the WBEA will be required to update its data management system to produce 30-minute averages.

3.7 Continue partnership with Athabasca Chipewyan First Nation (ACFN) and Mikisew Cree First Nation (MCFN) to create an Indigenous-led air monitoring program in the Peace Athabasca Delta.

The WBEA, ACFN, and MCFN completed the third year of a three-year plan to expand the air monitoring capabilities within the community of Fort Chipewyan and support the Air Quality Monitoring in the Peace Athabasca Delta Indigenous Community Based Monitoring (ICBM) work plan at the end of 2022-2023. ACFN and MCFN staff operate and maintain the Fort Chipewyan AMS and changeout time-integrated samples. This work is ongoing and is now considered routine network operations.

i. Purchase and install a PM2.5 EC/OC sampler.

The WBEA acquired a Partisol $PM_{2.5}$ EC/OC sampler which was installed and began sampling in February 2022 at the Fort Chipewyan AMS. ACFN and MCFN members were trained on the operation of the sampler and sample changeout procedures by experienced WBEA staff.

ii. Report data in routine monthly and annual reports to be consistent with the current ambient air monitoring program.

Reporting of the Fort Chipewyan AMS is included in the WBEA's routine monthly and annual reports, which are submitted to the AEPA and are available on WBEA's website.

3.8 Phase 2 of the Continuous Hydrocarbon Instrument Evaluation.

The continuous hydrocarbon instrument evaluation study aimed to ensure WBEA hydrocarbon analyzers are accurately reporting ambient hydrocarbon concentrations. This study is currently separated into two phases.

Phase 1 (Complete): The intent of phase one was to compare Thermo 51i to Thermo 55i analyzers. This was done in a co-location study and any differences in the data response between the different analytical technologies was examined. The reason for this analysis was that the WBEA recently replaced Thermo 51i analyzers with Thermo 55i analyzers at several stations. Phase one results indicated that the Response factor (RF) for the 51iTHC analyzer was much lower than expected for propane only.

Phase 2 (Awaiting deployment): Based on the findings of the phase one study, the WBEA determined it was important to better understand the differences in analyzer response factors for propane across multiple manufactured flame ionization detector systems. The WBEA decided to include five instruments in this study: Thermo 51i, Thermo 55i, API N901, Mocon 9000NMHC and Envea NMHC. This equipment was installed in the new Mannix air monitoring station shelter which was scheduled to be deployed in early 2023; however, the WBEA is still awaiting site clearance to carry out the work.

3.9 Phase 2 of the Continuous Particulate Instrument evaluation.

The purpose of the continuous particulate instrument evaluation study is to understand the differences in PM monitoring technologies and how they may affect PM data in the WBEA Network. This study is currently separated into two phases.

Phase 1 (Complete): This portion of the study was completed in 2021-2022 and included a co-located study of the old and new $PM_{2.5}$ continuous monitoring technology. The purpose was to (1) understand any differences in response between the technologies, (2) to collect PM_{10} and $PM_{2.5}$ federal reference method (FRM) data to compare to both technologies for reference, and (3) to compare T640 PM_{10} data to the FRM for PM_{10} to validate the T640 as it is not a federal equivalent method (FEM) analyzer for PM_{10}.

Phase 2 (Current): The purpose of phase two is to attempt to find differences in the PM monitoring methods to more accurately collect $PM_{2.5}$ data. The phase two study will involve the following instruments:

- API T640
- API T640x (FEM for PM 10 & PM 2.5)
- API T640 + BGI mini PM10 head
- SHARP 5030
- Partisols (PM 2.5 & 10)

The Fort McKay South AMS site compound was the chosen location for this study as it has the space and power available to accommodate the study. The shelter, with instruments installed, was deployed to the Fort McKay South AMS compound in March 2023.

3.10 Implement a Regional Dustfall Monitoring.

The WBEA's Ambient Air Technical Committee (AATC) approved the proposed Regional Dustfall Monitoring Proposal at the September 14th, 2022 committee meeting. The study is focused on publicly accessible residential and recreational areas and will measure the monthly collection of dustfall according to the American Society for Testing and Materials 1739-98 method. This was created with a two-year study design. Following the two-year study period, a report will be created comparing the dustfall measurements to the continuous $PM_{2.5}$, PM_{10}, and TSP measurements also taken at the Community AMSs.

The dustfall collectors were deployed in October 2022 and sampling began in November 2022. Dustfall collectors were deployed at six sites: Bertha Ganter AMS, Patricia McInnes AMS, Athabasca Valley AMS, Anzac AMS, Janvier AMS, and Conklin AMS. Scheduled sampling collection is ongoing. A lab was selected for sample analysis. Data has been collected, analyzed, and reviewed. Exceedances of the Alberta Ambient Air Quality Guideline (AAAQG) for Dustfall in residential and recreation areas (53mg/100cm) are available at https://wbea.org/data/air-quality-events/.

A seventh dustfall collector was established Jun 12th, 2023 at Wapasu AMS as part of a co-location study with a turf surrogate surface sampler (TSSS). This dustfall collected will only be deployed during summer months (May-September).

3.11 Fulfill monitoring Recommendations 14/15 from the Fort McKay Air Quality and Odours Advisory Committee (FMAQOAC) in accordance with the schedule outlined in the approved OSM Program work plan. Document all activities completed

i. Operations, maintenance, and reporting of air measurements for the Poplar Creek AMS.

A location and DML were secured but obtaining power at the station proved to be a substantial hurdle. The decision on whether move forward with the install of the Poplar Creek AMS has been deferred to the Rec 14/15 committee, and the WBEA is awaiting a decision. Short-term and/or portable monitoring possibilities are being investigated.

ii. Analysis and Reporting of VOC and RSC compounds for the Triggered Samplers.

This project was initiated through the Rec 14/15 committee monitoring workplan. The intent was to design and build prototype VOC canister and RSC tube sampling systems to capture triggered samples during events of semicontinuous NMHC and continuous TRS readings in the Fort McKay region. The WBEA designed and ordered two custom-made triggered samplers – one for RSC compounds, based on a methodology the WBEA developed in 2017, and one for VOCs. Both samplers were installed at Bertha Ganter – Fort McKay AMS in March 2022.

Field sampling has begun, and the first samplers have been sent to the lab for analysis. The current RSC trigger is 1.9 ppb TRS/ 5-min average, based on the methodology reference previously. The current VOC trigger is 0.3 ppm NMHC/5-min average which was modified in October 2022 from the

previous trigger which was 0.6 ppm. These triggers may be updated as necessary based on operational performance. Since installation, 120 triggered RSCs and 69 VOC canisters have been collected for analysis. Samples have been sent to the lab and the data is currently under review.

iii. Operation, maintenance and data analysis of both VOC and RSC GC.

This deliverable includes ongoing improvement of the monitoring methodology, data analysis, and provision of quality-controlled data to stakeholders. Once full implementation and testing is complete, the semi-continuous gas chromatograph monitoring will be included as part of the long-term active air monitoring network.

The VOC GC was operational but with interruptions in sampling. A WBEA technician and a Markes technician installed a new Markes system March 28th, 2023. The instrument is operational but still has intermittent issues; troubleshooting this system is ongoing.

The RSC GC experienced issues with its hard drive reaching capacity, which caused the instrument to stop sampling. The issue with the hard drive was resolved March 8th, 2023, and the instrument is running and collecting data. Upcoming activities include replacement of the calibration gas cylinder.

3.12 Provide data from the WBEA's ambient air monitoring network.

i. Maintain processing, validation, and reporting of all WBEA ambient air quality data. Make all data available on the WBEA's website.

During the first quarter of 2023-2024, monthly ambient air data was reviewed, as per the WBEA's monthly data validation process. Quality controlled Level II data was made available on the WBEA's website 30 days after the end of the calendar month in which the data were collected (https://wbea.org/data/continuous-monitoring-data/)

WBEA time-integrated data was collected and centralized within a new database. A catalogue containing sample types, number of data points, and date ranges is available to view on the WBEA website. Time-integrated data can be refined and downloaded in a spreadsheet format from the website. The catalogue and download page are available at **:** https://wbea.org/data/time-integrated-data-search/

ii. Report exceedances of the Alberta Ambient Air Quality Objectives and Guidelines, and non-compliances of the Air Monitoring Directive to the Alberta Government as established by WBEA's Immediate Reporting Protocol and the Fort McKay Acute Response Triggers (FMART) Process.

The WBEA notifies members of exceedances in the ambient air network using the Air Quality Events app. Exceedances are also reported through the WBEA's ambient air monitoring monthly data reports. These reports can be found at https://wbea.org/monthly-continuous-data-and-calibration-reports/

Additionally, the Air Quality Events allows users to search through any air quality events that occur in the Network. The database can be accessed at https://wbea.org/air/air-quality-events/.

Exceedances and non-compliances that occurred in the WBEA network are listed in Table 8 and Table 9, respectively.

Table 8: AAAQG/O Exceedances, January to March 2023

Event Type	Station	Date	Hour Ending (MST)	Period	Parameter	Concentration
AAAQG	Stony Mountain	1/7/2023	23:00	1-hr	PM2.5	96.1 µg/m3
AAAQG	Ells River	1/8/2023	4:00	1-hr	PM2.5	87.0 µg/m3
AAAQO	Conklin	1/8/2023	24:00	24-hr	PM2.5	45.1 µg/m3
AAAQO	Ells River	1/8/2023	24:00	24-hr	PM2.5	35.2 µg/m3
AAAQG	Stony Mountain	1/8/2023	1:00	1-hr	PM2.5	107.6 µg/m3
AAAQG	Conklin	1/8/2023	24:00	1-hr	PM2.5	84.4 µg/m3
AAAQG	Stony Mountain	1/8/2023	24:00	1-hr	PM2.5	101.2 µg/m3
AAAQO	Mannix	1/15/2023	21:00	1-hr	H2S	22.3 ppb
AAAQO	Mannix	1/15/2023	20:00	1-hr	H2S	31.5 ppb
AAAQO	Mannix	1/15/2023	19:00	1-hr	H2S	45.9 ppb
AAAQO	Mannix	1/15/2023	18:00	1-hr	H2S	34.0 ppb
AAAQO	Mannix	1/15/2023	17:00	1-hr	H2S	29.5 ppb
AAAQO	Mannix	1/15/2023	16:00	1-hr	H2S	12.1 ppb
AAAQO	Mannix	1/15/2023	11:00	1-hr	H2S	19.2 ppb
AAAQG	Buffalo Viewpoint	1/15/2023	10:00	1-hr	PM2.5	83.6 µg/m3
AAAQG	Buffalo Viewpoint	1/15/2023	9:00	1-hr	PM2.5	88.0 µg/m3
AAAQG	Buffalo Viewpoint	1/15/2023	8:00	1-hr	PM2.5	133.7 µg/m3
AAAQG	Buffalo Viewpoint	1/15/2023	7:00	1-hr	PM2.5	161.7 µg/m3
AAAQG	Fort McKay South	1/15/2023	5:00	1-hr	PM2.5	80.7 µg/m3
AAAQG	Barge Landing	1/15/2023	5:00	1-hr	PM2.5	94.9 µg/m3
AAAQO	Barge Landing	1/15/2023	24:00	24-hr	PM2.5	29.5 µg/m3
AAAQO	Fort McKay South	1/15/2023	24:00	24-hr	PM2.5	30.2 µg/m3
AAAQO	Mannix	1/15/2023	24:00	24-hr	H2S	10.2 ppb
AAAQO	Buffalo Viewpoint	1/15/2023	24:00	24-hr	PM2.5	44.9 µg/m3
AAAQG	Buffalo Viewpoint	1/16/2023	9:00	1-hr	PM2.5	82.8 µg/m3
AAAQO	Lower Camp	1/17/2023	18:00	1-hr	H2S	15.0 ppb
AAAQO	Lower Camp	1/17/2023	4:00	1-hr	H2S	13.9 ppb

AAAQO	Lower Camp	1/17/2023	3:00	1-hr	H2S	10.8 ppb
AAAQG	Anzac	2/19/2023	2:00	1-hr	PM2.5	207.4 µg/m3
AAAQG	Anzac	2/19/2023	1:00	1-hr	PM2.5	214.3 µg/m3
AAAQO	Lower Camp	3/17/2023	20:00	1-hr	H2S	10.7 ppb
AAAQO	Lower Camp	3/17/2023	19:00	1-hr	H2S	13.8 ppb
AAAQG	Fort Hills	3/21/2023	4:00	1-hr	PM2.5	108.1 µg/m3
AAAQO	Ells River	3/25/2023	24:00	24-hr	TSP	167 µg/m3
AAAQG	Fort Hills	3/26/2023	23:00	1-hr	PM2.5	95.8 µg/m3
AAAQG	Fort Hills	3/26/2023	22:00	1-hr	PM2.5	85.0 µg/m3
AAAQO	Fort Hills	3/26/2023	24:00	24-hr	PM2.5	40.4 µg/m3
AAAQG	Surmont 2	3/27/2023	7:00	1-hr	PM2.5	90.7 µg/m3
AAAQG	Fort Hills	3/27/2023	2:00	1-hr	PM2.5	90.6 µg/m3
AAAQO	Fort Hills	3/27/2023	24:00	24-hr	PM2.5	40.4 µg/m3
AAAQG	Fort Hills	3/27/2023	1:00	1-hr	PM2.5	81.5 µg/m3
AAAQG	Fort Hills	3/27/2023	24:00	1-hr	PM2.5	92.0 µg/m3
AAAQG	Bertha Ganter - Fort McKay	3/28/2023	6:00	1-hr	PM2.5	99.6 µg/m3
AAAQG	Fort Hills	3/28/2023	4:00	1-hr	PM2.5	125.4 µg/m3
AAAQG	Fort Hills	3/28/2023	2:00	1-hr	PM2.5	133.8 µg/m3
AAAQO	Fort Hills	3/28/2023	24:00	24-hr	PM2.5	36.5 µg/m3
AAAQO	Bertha Ganter - Fort McKay	3/28/2023	24:00	24-hr	PM2.5	31.3 µg/m3
AAAQG	Fort Hills	3/28/2023	1:00	1-hr	PM2.5	95.2 µg/m3
AAAQG	Fort Hills	3/28/2023	24:00	1-hr	PM2.5	229.6 µg/m3
AAAQG	Fort Hills	3/29/2023	3:00	1-hr	PM2.5	88.5 µg/m3
AAAQO	Fort Hills	3/29/2023	24:00	24-hr	PM2.5	32.2 µg/m3
AAAQG	Fort Hills	3/29/2023	24:00	1-hr	PM2.5	81.4 µg/m3
AAAQG	Fort Hills	3/30/2023	5:00	1-hr	PM2.5	126.3 µg/m3
AAAQG	Bertha Ganter - Fort McKay	3/31/2023	24:00	30-day	Dustfall	99.8 mg/100cm2/30days

Table 9: WBEA Non-Compliances, January to May 2023

Reporting Period	Date Reported	AEPA Ref Number	Location	Brief Description	Issue	Remedial Action
January	Jan 31 2023	408976	Bertha Ganter Fort McKay	The ammonia analyzer operated at less than 90% operating time as the analyzer could not produce a stable response over a 15-min period and failed the calibration.	The ammonia analyzer did not meet the AMD criteria for stable response, even though the as-found span and multi-point verification responses were within 10%.	The WBEA performed onsite maintenance but the analyzer did not return to normal operation. The analyzer required significant time to repair so an API 201E ammonia analyzer was deployed.
January	Feb 1 2023	409004	Fort Chipewyan	The WS/WD operated at less than 90% of January due to frozen sensors.	Ice and freezing temperatures froze the sensors.	Sensor operations returned to normal once temperatures stabilized.
January	Feb 8 2023	409189	Waskōw ohci Pimâtisiwin	Air monitoring analyzers (SO_2 and H_2S) and meteorological sensors (WS/WD) were down due to lack of electricity.	Electricity was disconnected by the service provider due to a miscommunication in the transfer of station ownership.	Error was addressed and power restored.
January	Feb 17 2023	409684	Janvier	The TRS analyzer operated for less than 90% operating time due to low station temperatures.	An on-site inspection found the station door was detached and thus internal station temperature was not maintained.	The broken station door was fixed and the TRS converter was replaced.
February	Feb 8 2023	409260	Waskōw ohci Pimâtisiwin	All air monitoring analyzers (SO_2 and H_2S) and meteorological sensors (WS/WD) were down due to lack of electricity at the station.	Electricity was disconnected by the service provider due to a miscommunication in the transfer of station ownership.	Error was addressed and power restored.
February	Mar 1 2023	409974	Ells River	The THC/NMHC/CH_4 analyzer operated below 90% due to baseline shifts outside the normal range.	Peaks shifted outside of the optimal data capture windows and, as a result, the baseline shifted outside the normal range.	The WBEA performed maintenance to rectify the issue but the analyzer did not resume normal operation. The analyzer was replaced.
February	May 17 2023	412838	Firebag	The WS/WD sensor malfunctioned due to a structural issue causing a misalignment of the tower orientation.	During daily systems checks, it was noted the WS/WD at Firebag was not comparing well to nearby sites. A physical inspection of the tower noted one set of bolts were missing, causing the tower to lean.	The WBEA replaced the missing bolts and ensured the tower was in proper alignment.
March	Mar 30 2023	410890	Waskōw ohci Pimâtisiwin	All air monitoring analyzers (SO_2 and H_2S) and meteorological sensors (WS/WD) were down due to lack of electricity at the station.	Electricity was disconnected by the service provider due to a miscommunication in the transfer of station ownership.	Error was addressed and power restored.
March	Apr 6 2023	411152	Barge Landing	The THC/NMHC/CH_4 operated at less than 90% due to analyzer malfunction and subsequent shift of baseline outside normal range.	Peaks shifted outside of the optimal data capture windows and, as a result, the baseline shifted outside the normal range.	The WBEA performed maintenance to rectify the issue but the analyzer did not resume normal operation. The analyzer was replaced.

March	May 17 2023	412838	Firebag	The WS/WD sensor malfunctioned due to a structural issue causing a misalignment of the tower orientation.	During daily systems checks, it was noted the WS/WD at Firebag was not comparing well to nearby sites. A physical inspection of the tower noted one set of bolts were missing, causing the tower to lean.	The WBEA replaced the missing bolts and ensured the tower was in proper alignment.
April	May 17 2023	412838	Firebag	The WS/WD sensor malfunctioned due to a structural issue causing a misalignment of the tower orientation.	During daily systems checks, it was noted the WS/WD at Firebag was not comparing well to nearby sites. A physical inspection of the tower noted one set of bolts were missing, causing the tower to lean.	The WBEA replaced the missing bolts and ensured the tower was in proper alignment.
May	May 17 2023	412838	Firebag	The WS/WD sensor malfunctioned due to a structural issue causing a misalignment of the tower orientation.	During daily systems checks, it was noted the WS/WD at Firebag was not comparing well to nearby sites. A physical inspection of the tower noted one set of bolts were missing, causing the tower to lean.	The WBEA replaced the missing bolts and ensured the tower was in proper alignment.
May	July 6 2023	415635	Bertha Ganter – Fort McKay	The $PM_{2.5}$ analyzer operated less than 90% uptime due to a significant drop in baseline.	The analyzer was found to be unresponsive and was subsequently replaced. Routine checks later in May noted another issue with the analyzer and it was noted the chamber needed cleaning; another replacement was deployed. Both incidents coincided with periods of intense smoke events, possibly overloading the sample filter.	The WBEA replaced analyzers, as needed, and monitored the situation. The analyzers were cleaned of any debris in the chamber.

iii. Provide real-time air quality data from continuous air monitoring stations to AEPA real-time website in the required format.

Real-time air quality data is provided on a continual basis to AEPA via a secure file upload from the WBEA Data Management System.

iv. Submit Monthly Ambient Air Monitoring Report to the Alberta Government and submit data to the AEPA Air Data Warehouse.

Table 10 lists the Monthly Air Monitoring Reports and Quality Assured Data that were submitted electronically via the Electronic Transfer System (ETS) to AEPA.

Table 10: Schedule of Monthly Air Monitoring Reports and Quality Assured Data Submissions from January to March 2023

Monthly Air Monitoring Report and Quality Assured Data	Date Submitted
January 2023	February 28, 2023
February 2023	March 31, 2023
March 2023	April 29, 2023

v. Provide WBEA data to citizens, industry members, regulatory bodies, and governments so that it can be used to make informed decisions on health, facility compliance, and environmental management and policy. All data management and accessibility outcomes will be in alignment with the OSM Program direction.

The WBEA makes data accessible on the WBEA website. Data is further disseminated through the Alberta Data Warehouse, community outreach activities, and through WBEA committee meetings. The WBEA engages with members including Indigenous communities, industry, three levels of government, and non-government organizations. The WBEA works with AEPA and OSM Program staff to ensure data management and accessibility outcomes are aligned.

vi. Any data not submitted to the Alberta Data Warehouse or not on the WBEA website will be provided directly to AEPA in an agreed upon format within three months of data collection.

In the event that WBEA data is not submitted to the Alberta Air Data Warehouse or not posted on the WBEA website, the WBEA will provide the data to AEPA in an agreed-upon format within three months of data collection.

vii. Submit the WBEA Continuous Ambient Air Quality Monitoring Program Annual Report 2022 – Volume 1 Continuous Data; Volume 2 Integrated Data; and Volume 3 Site Documentation.

The 2022 Annual Report was submitted on March 30, 2023 and is available online at https://wbea.org/annual-ambient-air-monitoring-data-reports/

3.13 Participate in Oil Sands Monitoring (OSM) Program related to optimizing and improving the active air monitoring network in the Athabasca Oil Sands Region (AOSR).

i. Participate in OSM Program Committees, activities, workshops, and webinars.

From April to June 2023, the WBEA participated in the OSM Air and Deposition TAC meetings, as required.

ii. Implement any additions, deletions, or any other changes to the WBEA active air monitoring network consistent with approved OSM Program workplan(s).

Based on the 2022-2023 workplan, in this quarter, there were no additions, deletions, or other changes to the WBEA active air monitoring network that were not previously identified.

iii. Document any additions, deletions, or any other changes to the WBEA continuous or time-integrated air monitoring network not indicated previously. Identify and describe any deviations from the approved OSM Program.

Based on the 2022-2023 workplan, in this quarter, there were no additions, deletions, or other changes to the WBEA continuous or time-integrated air monitoring network that were not previously identified.

iv. Participate in development of Adaptive Monitoring Approach for Active Air Monitoring Network.

From April to June 2023, the WBEA participated in the OSM Air and Deposition TAC meetings, as required.

4. Integrated Atmospheric Deposition Monitoring, 2022-2023 Work Plan Reference A-PD-6-2223

Atmospheric deposition is a critical pathway that links stressors to responses. Deposition monitoring data are used by the Oil Sands Monitoring Program to assess responses, and to help determine the source(s) of stressors. The primary objectives for atmospheric deposition long-term monitoring are to:

(1) Determine levels and changes of atmospheric deposition for specific pollutants that pose a likely risk for forest, river, lake, and wetland ecosystem function (OSM Objective #1 and #2)

(2) Quantify the contribution of OS emissions to deposition of pollutants of concern, particularly at ecological monitoring sites, and provide these data to ecological effects monitoring projects (OSM Objectives #1 and #2)

(3) Improve integration within and across themes, including continued model comparison and delivering deposition maps required by other themes (OSM Objective #3)

This work plan monitors the spatial and temporal changes in deposition of pollutants of concern at relevant ecological monitoring sites, including: acidifying (e.g., nitrogen, sulphur, and base cations) and eutrophying (e.g., nitrogen) pollutants at forest and wetland sites; and contaminants (i.e., polycyclic aromatic compounds (PACs) and trace metals) at forest, wetland, and aquatic sites. This work plan also contains environmental effects monitoring related to deposition, including: soil and forest health indicators, and fen/bog indicators. These effects monitoring activities are co-located with deposition monitoring to allow for an assessment of if/how deposition is affecting the environment.

Source apportionment analyses and chemical transport models can both determine the contribution of specific OS and non-OS sources to deposition. Deposition modelling and GIS techniques will support the estimation of deposition at ecological monitoring sites where deposition is not actually measured, and allow for determination of contribution of OS sources. The key modelling tool that will enable the above is GEM-MACH, which is an observation-evaluated tool that simulates emissions, transport, transformation, and deposition, and is used for scenario testing. GEM-MACH will be used in a 'service delivery role by 2024 (e.g., providing annual deposition maps, scenario-testing), with transition to that role finishing 2022-23, including comparison against surface observations. Beyond 2024, GEM-MACH will undergo periodic evaluations and updates as emissions evolve and inputs/science improves.

Integration is an on-going and iterative process. The focus for 2023/24 will be: (i) completion of model comparison to surface monitoring network data, (ii) improvement using data from past studies and long-term monitoring, (iii) configuration of the model and its inputs to provide deposition maps and output to estimate change and for adaptive monitoring purposes, (iv) further alignment of deposition monitoring methods and approaches across the OS Regions, and (iv) continued transitioning, as appropriate, to the adaptive monitoring framework including formalizing baseline and limits of change for ambient deposition surveillance monitoring and modelling.

The following objectives relate to ambient deposition and effects surveillance monitoring (and should not be conflated with the OSM Program Objectives noted previously):

1) *Monitor air concentrations and deposition of nitrogen, sulphur, base cations, and ozone at forest and wetland sites in the Oil Sands Regions, as well as nitrogen and sulphur deposition at two downwind transboundary sites. These data are directly used with data from Objective #2 for assessing stressor-response links, as well as for model comparison (see Objective #9).*

2) *Monitor soil and vegetation parameters in the Athabasca and Cold Lake regions for indicators of vegetative changes and acidification. Soil measurements are integrated with measured and/or modelled deposition data to assess stressor-response linkages.*

3) *Monitor temporal and spatial changes in deposition through regional collection of lichen samples for trace metals, PAHs, total nitrogen, and total sulfur. Data derived from this biomonitoring provides critical information about the extent of stressors entering ecosystems via the deposition pathway. These data are also necessary for the Groundwater, Surface Water, and Terrestrial TACs to investigate effects and attribute these effects to specific sources.*

4) *Continue operating a monitoring site where all deposition measurement methods are co-located with an existing continuous monitoring station for the purpose of ensuring measurement comparability.*

5) *Test surrogate surface samplers, a method to quantify fugitive dust deposition, at a subset of air monitoring stations for the spring, summer and fall. If validated, these data will complement the wintertime snowpack measurements allowing for direct year-round quantification of fugitive dust deposition.*

The following section provides details on the Q1 2023-2024 milestones and objectives under Workplan A-PD-6-2324 (Integrated Atmospheric Deposition Monitoring) but is based off the deliverable under the existing Government of Alberta contract 20AEM842-03, as noted in Section 1 above.

4.1 Conduct active air sampling via denuder system at WBEA monitoring sites.

Denuders were deployed and actively monitored at eight locations throughout the Wood Buffalo region. Denuder filter pack changeouts are completed monthly. Dates for the 2023-2024 Q1 denuder changes are:

April 3rd - 5th, 2023
May 1st – 2nd, 2023
June 5th – 7th, 2023

An expansion of the denuder program was proposed in at the December 8th, 2022 TEEM Committee Meeting along with a proposed design update to increase the accuracy of flow rate. Five new denuder sites will be added between 2023 and 2024 to the program to fill spatial gaps at intermediate distance locations and in the northeastern region. These locations will receive the new denuder equipment design. Older sites will be retrofitted with the new design when possible.

4.2 Conduct deposition monitoring via ion exchange resin (IER) sampling at WBEA monitoring sites on a seasonal schedule (column changeout in spring and fall).

The WBEA submitted a proposal to the TEEM Committee on December 8th, 2022, to optimize the Ion Exchange Resin (IER) program. The proposal included recommendations from the TEEM Publication Report "Recommendations Arising from the Analyses and Interpretations of 20 Years of Forest Health Monitoring" (Foster, 2020). The approved changes were carried out during the October 2022 fall IER changeout.

During Q1 2023-2024, the spring changeout was completed at 48 sampling sites in late April/early May 2023. The IERs were inspected for wildlife damage, and site maintenance was performed as needed. A couple sites could not be reached due to flooding/beaver activity and discussions on relocating these IERs has begun. Visual assessments of the IERs are conducted routinely between changeouts.

4.3 Evaluate remote ozone monitoring program.

Ozone is a "secondary pollutant" as it is not emitted directly into the air but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in the presence of ultraviolet radiation. As ozone is not emitted directly from a source, ozone creation and transportation can occur distances away from primary emission sources.

The Remote Ozone Monitoring (OZN) program was created to provide continuous 15-minute measurements of ozone and meteorological conditions in remote areas around the RMWB during the annual growing season - typically April through October. The TEEM Committee approved the program proposal at the September 14th, 2022 meeting.

The ozone analyzers have proven to be sensitive to cold weather temperatures. To ensure data continuity through the deployment period, the WBEA will be conducting field cold weather tests on the systems before full deployment.

i. Remote Ozone Monitoring.

The objective of the routine remote ozone monitoring is to measure the transformation of ozone that is created as a secondary pollutant from oil sands emissions. A comparison was done between the continuous analyzer at the Athabasca Valley AMS and two remote ozone analyzers from different manufacturers. Due to logistics beyond the WBEA's control, deployment of the OZN program will be delayed until 2024.

ii. Stratosphere-Troposphere Exchange (STE) Ozone Monitoring.

The objective of STE ozone monitoring is to measure the ozone intrusion from the stratosphere into the troposphere through the tropopause. STEs occur in late winter/early spring in the AOSR and WBEA's continuous data analyzer for ozone is shows the peaks and falls of this process. The aim of the study was to will help determine the extent of stratospheric ozone contributions to ambient ozone concentrations in the region. Due to logistics beyond the WBEA's control, deployment of the OZN program will be delayed until 2024.

4.4 Evaluate passive air sampling at WBEA monitoring sites.

The WBEA submitted a proposal to the TEEM committee on December 8th, 2022 to restart the passive monitoring program in 2023. After thorough assessment of the monitoring goals and the tools most effective to meet these goals, it was decided to only use passive samplers for the species that could not currently be collected via denuder.

Ogawa passive samplers were purchased, and a lab was contracted to conduct analysis and cleaning of samplers. Passives were deployed in March 2023 and all were co-located with a denuder. Initially, samplers were configured to sample for Nitrogen Dioxide (NO_2) and Ozone (O_3). During 2023-2024 Q1, the decision was made to add sulphur dioxide (SO_2) passives to denuder sites until the ASG lab develops the capacity to analyze SO_2 from denuders. An order has been placed for SO_2 samplers and deployment will begin once the samplers arrive.

4.5 Conduct tower inspections (meteorological and deposition).

Tower conditions were checked by WBEA Field Technicians during sampling and maintenance activities. Thorough checks of anchor points, guy wires, the tower structure, and the fall protection systems were completed if it was required to climb the tower structure. Tower repairs are completed by a third-party contractor; all repairs were completed in June 2023.

4.6 Maintain air and deposition sampling equipment and site infrastructure.

Routine ongoing site maintenance is done concurrently with deposition sampling activities. All maintenance is documented. Visual inspection of site infrastructure is done during routine site visits to ensure any issues are detected as early as possible.

4.7 Complete required site-specific and/or program-specific documentation as per the WBEA or AMD requirements.

The development of site-specific documentation to satisfy WBEA requirements is an ongoing activity.

4.8 Coordinate Community Engagement and Program Optimization opportunities.

On January 30th, 2023, the WBEA distributed a call for participation to its membership to re-establish the Traditional Knowledge Committee (TKC). The first TKC Committee meeting was held on April 20th, 2023. Main objectives of the TKC will be (1) information exchange with communities, (2) to be inclusive of community-driven concerns, and (3) provide strategic guidance on how WBEA can disseminate information to a broader audience. An upcoming priority will be community engagement in the Forest Health and Deposition programs in Fall 2023.

4.9 Deploy surrogate surfaces to a subset of air monitoring stations, across the range of particulate deposition, to test method.

The Turf Surrogate Surface Sampling (TSSS) project was initiated to collect superior dry deposition data using a method based on trials conducted in the USA. The TSSS consists of a disk-shaped airfoil supporting an artificial turf disk. The system is designed to collect dry-depositing gases and particles without altering the existing turbulent flow field.

The WBEA contracted a lab for sample preparation and analysis. Samplers were dropped off at the lab for pre-deployment preparations on October 19th, 2022. The TSSS were returned to the WBEA and were deployed June 12th, 2023 at two locations: Bertha Ganter – Fort McKay AMS and Wapasu AMS. TSSS are co-located with both a precipitation and a dustfall collector. The first set of samples have been sent to the lab for analysis.

4.10 Analysis of lichen samples that were collected as part of the 2021 regional lichen monitoring program.

All lichen samples collected as part of the 2021 regional lichen monitoring program were cleaned through the summer (approximately 182 samples). The inorganic samples were ground and sent to respective labs for analyses. Preliminary results have been received for sulphur, nitrogen, and metals. Organic samples are currently undergoing grinding.

In the first quarter of 2023-2024, a lab was contacted to complete the organic sample analysis. To ensure comparability of results with previous lichen analyses, a trial analysis will be completed by the lab using samples from 2014. This will allow the lab to validate and confirm procedures. Once the WBEA approves results from this trial analysis, the lichen samples from 2021 will be sent to the lab for analysis.

4.11 Analysis of needle and soil samples collected in 2021-22 from newly established Forest Health Monitoring sites.

Two new Forest Health Monitoring sites were established in 2021 (sites 4015 and 4024) located in the southern portion of the network near Conklin. Results of the analysis of 2021-22 soil samples received on April 27th, 2022.

4.12 Operate the regional meteorological monitoring network.

The Regional Meteorological Network (MET) provides continuous, hourly measurements of meteorological conditions in remote areas around the Wood Buffalo region. The WBEA operates six meteorological towers. Data collected by these towers are used for deposition calculations and modelling. The data is reviewed weekly and validated monthly.

4.13 Catalogue and report data from the WBEA's integrated atmospheric deposition monitoring network.

i. Maintain the processing and validation of passive, ion exchange resin, dry deposition, and ozone data, and meta-data into WBEA's data management system.

Processing and validation of all Integrated Atmospheric Deposition Monitoring data is an ongoing activity. Table 11 lists the current data availability for each monitoring program. Datasets and details can be found at https://wbea.org/data/time-integrated-data-search/

Table 11: Passives, Ion Exchange Resin, Dry Deposition, and Ozone Dataset Availability

Dataset	Timeframe
Passives	HNO3 – April 2013 to January 2021 NH3 – December 2013 to January 2021 NO2, SO2, O3 - December 1999 to January 2021
Ion Exchange Resin	May 2008 to May 2022
Dry Deposition (Denuder)	January 2015 to December 2022
Remote Ozone Continuous Data (Beaver River, Conklin, JP213)	2015 Campaign 2016 Campaign 2017 Campaign 2018 Campaign

ii. Provide support for ongoing analysis and interpretation of deposition monitoring and modelling data.

The WBEA Science Advisors continue to support the OSM Model-Measurement Intercomparison. In addition, support for analysis and interpretation of WBEA data is provided upon request.

iii. Provide public access to program data via the WBEA website to citizens, industry members, regulatory bodies, and governments, so that it can be used to make informed decisions on health, facility compliance, and environmental management and policy. All data management and accessibility outcomes will be in alignment with the OSM Program direction.

WBEAs time-integrated data and meteorological data has been collected and centralized within a database and is available to view on the WBEA website (https://wbea.org/data/time-integrated-data-search/). A catalogue containing sample types, number of data points, and date ranges is available to view online and/or download in spreadsheet format.

iv. Any data not submitted to the Alberta Air Data Warehouse or not on the WBEA website will be provided directly to AEPA in an agreed upon format within three months of data collection.

If WBEA data is not submitted to the Alberta Data Warehouse or not posted on the WBEA website, the WBEA will provide the data to AEPA in an agreed upon format within three months of data collection.

4.14 Participate in Oil Sands Monitoring (OSM) Program related to optimizing and improving the atmospheric deposition monitoring network in the Athabasca Oil Sands Region (AOSR).

i. Participate in OSM Program Committees, activities, workshops, and webinars.

From April to June 2023, the WBEA participated in the OSM Air and Deposition TAC meetings, as required.

ii. Implement any additions, deletions, or any other changes to the WBEA atmospheric deposition monitoring network consistent with approved OSM Program workplan(s).

There were no changes to the WBEA atmospheric deposition monitoring network during this quarter that were not indicated previously.

iii. Document any additions, deletions, or any other changes to the WBEA atmospheric deposition monitoring network not indicated previously. Identify and describe any deviations from the approved OSM Program.

There were no changes to the WBEA atmospheric deposition monitoring network that were not indicated previously.

iv. Participate in development of Adaptive Monitoring Approach for Atmospheric Deposition Monitoring Network.

The WBEA Deposition Program has continued to employ adaptive monitoring philosophies by using recent scientific findings to inform best practices.

5. Appendix A – Adhering to Contract Clauses

Clause 9

As per Clause 9, Personnel Replacement, of the WBEA Contracts with AEPA, the WBEA is required to report any changes to the list of key personnel. The WBEA made no changes to its key personnel list during this reporting period. Any changes would be communicated to the AEPA within five business days of the change.

Clause 12

As per Clause 21, Conflicts of Interest and Ethical Conduct, of WBEA's Contracts with Alberta Environment and Protected Areas, the WBEA is required to report all potential or perceived conflicts of interest. The WBEA noted the following potential or perceived conflicts of interest during this reporting period (Table 12). These conflicts are communicated to the AEPA via email within five business days of each meeting.

Table 12: Declared Conflicts of Interest in Q1 2023-2024

Date	Meeting	Member	Member Organization	Declared Conflict of Interest
Thursday April 20, 2023	TK	Chris Heavyshield	Chipewyan Prairie Dene First Nation	Participates on the OSM Oversight Committee
		Lori Cyprien	Athabasca Chipewyan First Nation	Participates on OSM Indigenous Community Based Monitoring Advisory Committee (ICBMAC)
Friday April 21, 2023	GC Meeting	Ryan Abel	Fort McKay First Nation	Participates on OSM Air and Deposition TAC and OSM Oversight Committee as alternate and OSM Indigenous Caucus
		Adi Adiele	Fort McKay Métis Nation	Participates on all six OSM TACs
		Janais Turuk	McMurray Métis	Works with Cold Lake First Nation (regarding item related to the OSM Program direction for CLFN to integrate with WBEA Berry Project)
		Curtis Brock	EPA	Works for EPA
Friday May 19, 2023	GC Meeting	Ryan Abel	Fort McKay First Nation	Participates on OSM Air and Deposition TAC and OSM Oversight Committee as alternate and OSM Indigenous Caucus
		Adi Adiele	Fort McKay Métis Nation	Participates on all six OSM TACs
		Janais Turuk	McMurray Métis	Works with Cold Lake First Nation (regarding item related to the OSM Program direction for CLFN to integrate with WBEA Berry Project)
Tuesday June 13, 2023	TEEM	Carla Davidson	Fort McKay First Nation	OSM Oversight Committee
		Charles Grimm	Suncor	Participates on OSM Air and Deposition TAC
		Nerissa Hernani	Syncrude	Participates on Air and Deposition TAC
		David Spink	Fort McKay First Nation	Participates on OSM Air and Deposition TAC, participated in two Indigenous CBM project submissions that involve the WBEA (Fort McKay Metis Nation - odour project & Fort McKay First Nation - dust project)
		Courtney Brown	Canadian Natural	Participates on OSM Air and Deposition TAC

		Greg Wentworth	EPA	Works for EPA, Co-Lead for OSM Air and Deposition TAC, and Project Lead on the Atm. Pollutant Active Monitoring Network and Integrated Atmospheric Deposition Monitoring work plans
Friday June 16, 2023	GC Meeting	Adi Adiele	Fort McKay Métis Nation	Participates on all six OSM TACs
		Curtis Brock	EPA	Works for EPA
Thursday June 22, 2023	GM Meeting	Peter Fortna	CRDAC	Participates on OSM ICBMAC and Indigenous Caucus
		Luc White	ECCC	Works for ECCC
		Ryan Abel	Fort McKay First Nation	Participates on OSM Air and Deposition TAC and Oversight Committee as alternate, and Indigenous Caucus
		Adi Adiele	Fort McKay Métis Nation	Participates on all six OSM TACs
		Queenie Gray	Parks Canada	Participates on Wetlands TAC
		Curtis Brock	EPA	Works for EPA
		Greg Wentworth	EPA	Works for EPA and Co-Lead for OSM Air and Deposition TAC
Wednesday June 28, 2023	AATC/OMP	Ryan Abel	Fort McKay First Nation	Participates on the Oil Sands Monitoring (OSM) Program Air and Deposition TAC as alternate, member of the WBEA's Governance Committee, participates on the OSM Oversight Committee as an alternate, and participates on the OSM Indigenous Caucus
		David Spink	Fort McKay First Nation	Participates on OSM Air and Deposition TAC, participated in two Indigenous Community Based Monitoring (ICBM) project submissions that involve the WBEA (Fort McKay Métis Nation – odour project & Fort McKay First Nation – dust project)
		Danlin Su	Fort McKay First Nation	Participated in two ICBM project submissions that involve the WBEA (Fort McKay Métis Nation – odour project & Fort McKay First Nation – dust project)
		Nerissa Hernani	Syncrude	Represents COSIA on the Air and Deposition TAC
		Charles Grimm	Suncor	Participates on OSM Air and Deposition TAC
		Courtney Brown	Canadian Natural	Participates on OSM Air and Deposition TAC

6. Appendix B – Summary of Air Monitoring Stations & Parameters in the WBEA Network

Continuous Analysis Measurements

Table 13 provides a listing of stations with their names and corresponding WBEA identification number and the air quality parameters measured by continuous methods at each site. Parameters measured include sulphur dioxide (SO_2), nitric oxide/nitrogen dioxide (NO/NO_2), ozone (O_3), $PM_{2.5}$, total reduced sulphur (TRS), hydrogen sulphide (H_2S), total hydrocarbons (THC), methane (CH_4), non-methane hydrocarbons (NMHC), carbon monoxide (CO), carbon dioxide (CO_2) and ammonia (NH_3).

Table 13: Summary of stations and continuously measured parameters at WBEA Air Monitoring stations

Station name	SO_2	$NO/NO_2/NO_X$	O_3	$PM_{2.5}$	TRS	H_2S	THC	CH_4/ NMHC	CO	CO_2	NH_3
BERTHA GANTER-FORT MCKAY	x	x	x	x	x	x	x	x	x	x	x
MILDRED LAKE	x					x	x	x			
BUFFALO VIEWPOINT	x	x	x	x		x	x	x			
MANNIX	x					x	x	x			
PATRICIA MCINNES	x	x	x	x	x		x	x			x
ATHABASCA VALLEY	x	x	x	x	x		x	x	x		
FORT CHIPEWYAN	x	x	x	x	x				x	x	
BARGE LANDING	x	x		x	x		x	x			
LOWER CAMP	x					x	x	x			
FORT MCKAY SOUTH	x	x	x	x	x		x	x			
ANZAC	x	x	x	x	x		x	x			
WAPASU	x	x	x	x		x	x				
STONY MOUNTAIN	x	x	x	x	x		x	x	x	x	
FIREBAG	x	x				x	x				
MACKAY RIVER	x	x				x	x				
CONKLIN	x	x	x	x	x		x	x			
JANVIER	x	x	x	x	x		x	x			
FORT HILLS	x	x		x	x		x	x			
WASKOW OHCI PIMATISIWIN	x					x					
CHRISTINA LAKE	x	x				x					
JACKFISH 2/3	x	x				x					
SURMONT 2	x	x		x		x	x				
ELLS RIVER	x	x		x	x		x	x			
LEISMER	x	x				x					
SAWBONES BAY	x	x				x					
JACKFISH 1	x	x				x					

KIRBY SOUTH	x	x				x	x				
KIRBY NORTH	x	x				x	x				

Continuous Meteorological Measurements

Table 14 provides a listing of stations and meteorological parameters measured by continuous methods. Parameters measured include ambient temperature (Temp), relative humidity (RH), barometric pressure (BP), wind speed (WS), wind direction (WD), vertical wind speed (VWS), solar radiation, precipitation, and leaf wetness.

Table 14: Summary of stations and meteorological parameters measured continuously at WBEA Air Monitoring Stations.

Station name	Temp	RH	BP	WS	WD	VWS	Solar Radiation	Precipitation	Leaf Wetness
BERTHA GANTER-FORT MCKAY	X	X		X	X		X	X	X
MILDRED LAKE	X	X		X	X				
LOWER CAMP MET TOWER	X	X		X	X	X			
BUFFALO VIEWPOINT	X	X		X	X				
MANNIX	X	X		X	X	X			
PATRICIA MCINNES	X	X		X	X				
ATHABASCA VALLEY	X	X	X	X	X				
FORT CHIPEWYAN	X	X		X	X		X	X	X
BARGE LANDING	X	X	X	X	X				
LOWER CAMP	X	X	X	X	X				
FORT MCKAY SOUTH	X	X		X	X				
ANZAC	X	X		X	X			X	X
WAPASU	X	X		X	X			X	
STONY MOUNTAIN	X	X		X	X		X	X	X
FIREBAG	X	X		X	X				
MACKAY RIVER	X	X		X	X			X	
CONKLIN	X	X		X	X				
JANVIER	X	X		X	X				
FORT HILLS	X	X		X	X				
WASKOW OHCI PIMATISIWIN	X	X		X	X				
CHRISTINA LAKE	X	X		X	X				
JACKFISH 2/3	X	X		X	X				
SURMONT 2	X	X		X	X				
ELLS RIVER	X	X		X	X		X		
LEISMER	X	X		X	X				
SAWBONES BAY	X	X		X	X				
JACKFISH 1	X	X		X	X				
KIRBY NORTH	X	X		X	X				

Time-Integrated Analysis Measurements

Table 15 provides a listing of stations and air quality parameters measured by integrated methods. Parameters measured include volatile organic compounds (VOC), particulate matter less than 2.5 µm aerodynamic diameter ($PM_{2.5}$) and associated metals and ions, elemental carbon-organic carbon (EC/OC), particulate matter less than 10 µm aerodynamic diameter (PM_{10}) and associated metals and ions, polycyclic aromatic hydrocarbons (PAH), precipitation samples, dustfall, and total suspended particulates (TSP).

Table 15: Summary of parameters measured using integrated methods at WBEA Air Monitoring Stations

Station name	VOC	$PM_{2.5}$	EC/OC	PM_{10}	PAH	Precip	Dustfall	TSP
BERTHA GANTER-FORT MCKAY	X	X	X	X	X	X	X	
PATRICIA MCINNES	X	X		X	X		X	
ATHABASCA VALLEY	X	X		X	X		X	
FORT CHIPEWYAN	X	X	X	X	X			
BARGE LANDING	X							
FORT MCKAY SOUTH	X			X				
ANZAC	X	X		X	X		X	
WAPASU			X			X	X	
STONY MOUNTAIN			X			X		
CONKLIN	X	X		X	X		X	
JANVIER	X	X		X	X		X	
FORT HILLS	X			X				
ELLS RIVER	X			X				X

Additional Continuous/Semi-continuous Measurements

Table 16 provides a list of stations and continuous/semi-continuous methods that are additional to standard monitoring techniques. Parameters measured include AE33 aethalometer (measures black carbon), visibility sensor, reduced sulphur compounds (RSC) gas chromatography (GC), volatile organic compounds (VOC) GC, triggered VOC, and triggered RSC.

Table 16: Summary of stations and continuous/semi-continuous methods at WBEA Air Monitoring Stations

Station name	AE33 Aethalometer	Visibility Sensor	RSC GC	VOC GC	Triggered VOC	Triggered RSC
BERTHA GANTER-FORT MCKAY	X		X	X	X	X
BUFFALO VIEWPOINT		X				
LOWER CAMP		X				
STONY MOUNTAIN	X					

Research and Development Measurements

Table 17 provides a list of stations and studies conducted by the WBEA for research and development purposes. Current studies conducted at WBEA Air Monitoring Stations include the Continuous Hydrocarbon Instrument Evaluation Study, the Continuous Particulate Instrument Evaluation Study, and the Turf Surrogate Surface Sampler study.

Table 17: Summary of stations and studies for research and development purposes at WBEA Air Monitoring Stations

Station name	Continuous Hydrocarbon Instrument Evaluation Study	Continuous Particulate Instrument Evaluation Study	Turf Surrogate Surface Sampler
BERTHA GANTER – FORT MCKAY			X
MANNIX	Awaiting deployment		
FORT MCKAY SOUTH		X	
WAPASU			X

7. Appendix C – Maps of the WBEA Network

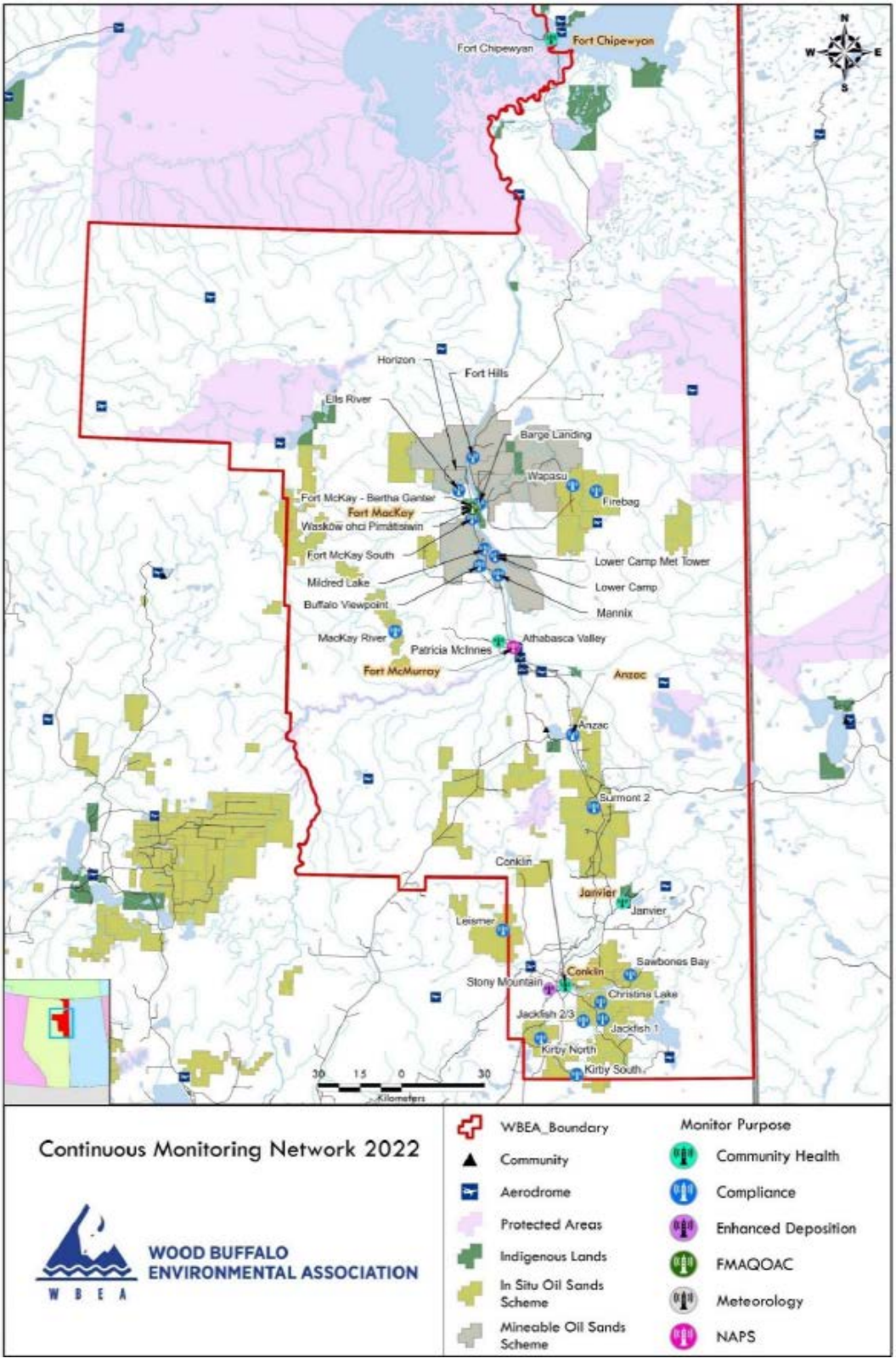

Figure 1. The WBEA Continuous Monitoring Network 2022.

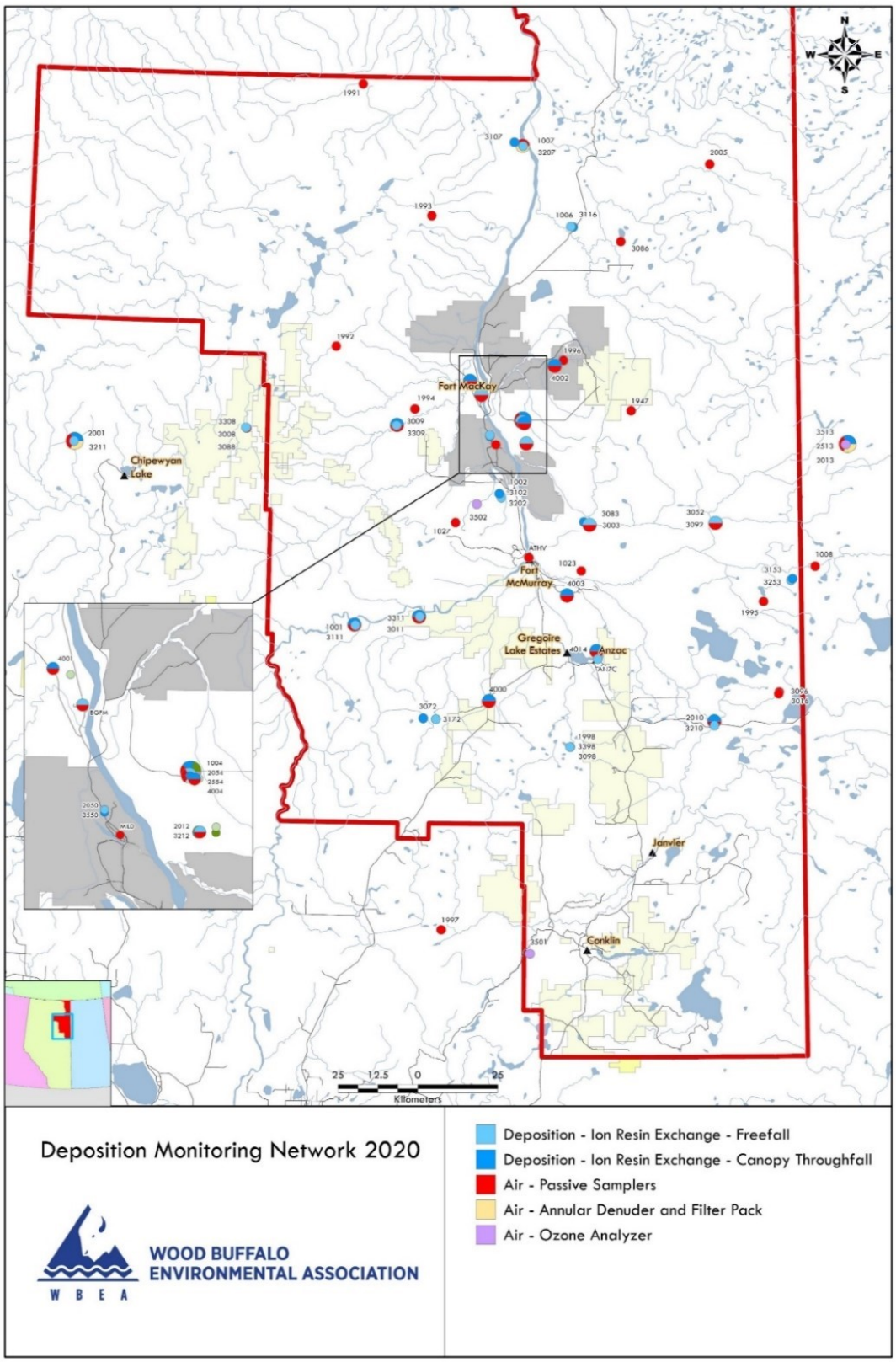

Figure 2. The WBEA Integrated/Deposition Monitoring Network 2020.