

5- YEAR LONG-TERM MONITORING OR OPERATIONAL ACTIVITY WORK PLAN

Changes to this Work Plan are only accepted via an Approved Addendum.

General Information		
Monitoring Category: <i>(From OSM long-term plan; choose from drop-down menu)</i>	Atmospheric Monitoring	
Strategic Monitoring Objective: <i>(From OSM long-term plan; choose from drop-down menu)</i>	Objective: Integration and Synthesis	
Work Plan Unique Identifier:	R-1-1718	
Monitoring Activity Title:	Reporting Ambient Monitoring Results – Air Evaluation Integration Synthesis and Reporting - Technical Audience	
Geographic Location <i>(choose from drop-down menu, if Project Location is in more than one area choose from second drop-down)</i>	Location Not Applicable	Location Not Applicable
Monitoring Site(s) Coordinates <i>(latitude and longitude)</i>	N/A	
Monitoring Organization and Responsible Manager:	ECCC	Stewart Cober Jaime Dawson
Date Monitoring initiated:		
Specific Monitoring Objective: <i>(State the monitoring objective addressed through this monitoring)</i>	The objective of this project is to summarize activities and report on results from OSM (Oil Sands Monitoring) air component activities. A series of synthesis reports will be produced, at a rate of 1-2 per year, with each focusing on a specific priority theme (e.g., polycyclic aromatic compounds (PACs), criteria air contaminants (CACs), remote sensing, mercury, aircraft study results, etc.) with consideration to the evaluation, integration and synthesis of published results and reports. These synthesis reports will contribute to the broader understanding of the contribution of emissions from oil sands activities to local and regional air quality and atmospheric deposition both now and in the future, and the integration of this understanding across other components.	

<p>Deliverables (Annual):</p> <p><i>What Data Reports will be produced and when?</i></p>	<p>Working collaboratively under the leadership of a designated coordinating scientist, a team of experts from Environment and Climate Change Canada (ECCC), Alberta Environment and Parks (AEP), and other partners will produce synthesis reports focused on a specific air component priority theme, as follows:</p> <p>Synthesis report #1 – 2017/2018: Polycyclic aromatic compounds (PACs) in air and deposition</p> <p>Synthesis report #2 – 2018/2019: Criteria Air Contaminants (CACs) emission and transformation as determined from 2013 aircraft study measurements</p> <p>Synthesis report #3 – 2019/2020: Remote Sensing – ground- and satellite-based</p> <p>Synthesis report #4 – 2019/2020: Mercury</p> <p>Synthesis report #5 – 2019/2020: Forest Health</p> <p>Synthesis report #6 – 2020/2021: Atmospheric Modelling and Network Analysis</p> <p>Synthesis report #7 – 2020/2021: Analysis of trends of CAC from long-term and focused studies</p> <p>Synthesis report #8 – 2020/21: Causes and effects of atmospheric deposition of multiple pollutants</p> <p>The ninth synthesis report, to be produced in 2021-22, will be confirmed with time and with consideration of ongoing activities and priorities.</p>
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Monitoring Plan Summary: *Please summarize the monitoring including relevant information such as background, objectives, monitoring area, methods/monitoring design, assumptions, outcomes, and references. These should align with the information provided in Appendix 1: Annual Monitoring Schedule.*

The production of the synthesis report will be organized by a designated coordinating scientist who will work with a team of experts (normally up to 10 scientists/staff) responsible for drafting their individual sections. The team of experts will be comprised of representatives from ECCC, AEP, and other partners as relevant to the priority theme.

The report structure will include a high level summary of approximately 25 pages of the key studies and their outcomes, followed by an annex that includes the peer-reviewed publications and/or reports containing the detailed and technical information that was used to support the summary.

The planning and production of each synthesis report will normally be facilitated by two face-to-face workshops (approximately 1.5 days each), one at the beginning of the process and one during the process. These face-to-face meetings will be supplemented by teleconferences and video conferences. The report compilation, editing, formatting, note taking and reporting will be coordinated with the support of a junior researcher, who will be supervised at ECCC.

The following synthesis reports are proposed on a scheduled basis starting in 2017/18. There is flexibility in this schedule to accommodate shifts in field work/laboratory analysis and in-year priorities.

Synthesis report #1 – 2017/2018: Polycyclic aromatic compounds (PACs) in air and deposition

This synthesis report will be prepared during 2017-18 to summarize activities carried out to assess levels of PACs in air and their deposition. The tentative organization for the synthesis report is as follows:

Executive Summary

Introduction

PACs in air

Passives

Active

Active

PAC deposition to surfaces

Snow

Bulk deposition

Precipitation

Lichens

Tree cores

Modelling PAC deposition in the Alberta Oil Sands Region (AOSR)

Key outcomes and science questions

Synthesis report #2 – 2018/2019: Criteria Air Contaminants (CACs) emission and transformation as determined from aircraft measurements

This synthesis report will be prepared during 2018-19 to summarize activities carried out to assess emissions of CACs from the major surface mining operations, their atmospheric transport and transformation, and deposition. The tentative organization for the synthesis report is as follows:

Executive Summary

Introduction

Top-down emission rate algorithm (TERRA) development

TERRA development and validation

Emissions from the oil sands surface mining facilities

VOCs (volatile organic compounds)

SO₂ (sulfur dioxide), NO_x (nitrogen oxide), CO (carbon monoxide)

CH₄ (methane)

Black carbon and other particulate chemical constituents

PM_{2.5} (fine particles), PM₁₀ (coarse dust particles)

Organic acids

Transformation and Transport

Secondary organic aerosol formation

Secondary gaseous pollutant formation

Sulphate and nitrate formation

Impact on ozone formation

CAC dry deposition

Sulphur and nitrogen dry deposition fluxes

PM_{2.5} (fine particles), PM₁₀ (coarse dust particles) dry deposition fluxes

Remote sensing product validation

Satellite retrieval

Ground-based remote sensing

Model evaluation

(this part may be addressed in the separate synthesis report on air quality modelling)

Key outcomes and science questions

Synthesis report #3 – 2019/2020: Remote Sensing – Ground- and Satellite-Based

This synthesis report will be prepared during 2019-20 to summarize activities carried out to assess levels of air pollutants, short lived climate pollutants (SLCPs), and carbon dioxide (CO₂) arising from or influenced by the mining operations in the region. The tentative organization for the synthesis report is as follows:

Executive Summary

Introduction

LIDAR (Light Detection and Ranging) Remote Sensing

PM LIDAR (Light Detection and Ranging) Measurements

Ozone LIDAR Measurements

CO₂ (carbon dioxide) and CH₄ (methane) LIDAR Measurements

Satellite Remote Sensing

Retrieval algorithm development

Validation of satellite products and algorithms

Pollutant Mapping (trends, climatologies, and events)

Top-down emissions estimates

Satellite estimates of dry deposition fluxes

Other Remote Sensing Technologies

Passive/Solar Measurements

- Pandora spectrometer
- FTIR (Fourier Transform Infrared) spectrometer
- MAX DOAS (Multi axis differential optical absorption spectroscopy)
- Cimel sunphotometer
- Sky camera

WIND RASS (Radio Acoustic Sounding system) Measurements

Model Evaluation

Air Quality Model-Satellite comparisons

Key outcomes and science questions

Synthesis report #4 –2019/2020: Mercury

This synthesis report will be prepared during 2019-20 to provide a comprehensive and cohesive summary of studies that have been conducted through the oil sands program to understand mercury cycling, deposition and impact to the ecosystem around the oil sands (OS) environment. The tentative organization for the synthesis report is as follows:

Executive Summary

Highlights of scientific results and prominent issues relating to mercury studies in the oil sands environment

Scientific responses to key policy questions

Introduction

Why looks at mercury in the OS environment?

Overall summary of the Hg (mercury) cycle in this area

Scientific hypotheses and policy questions about mercury in the OS environment

Mercury in the atmosphere

Program development and measurements

Atmospheric mercury modelling in the atmosphere

Atmospheric mercury trends

Transformation and Transport

Understanding how mercury cycles in the OS environment

Mercury deposition and uptake**Mercury in aquatic ecosystems****Mercury uptake in wildlife****Mercury modelling from air to wildlife – future predictions****Communicating mercury science in the OS region****Key results****Information Gaps****Synthesis report #5 –2019/2020: Forest Health**

This synthesis report will be prepared during 2019-20 to provide comprehensive results of the long term forest health monitoring program for the Athabasca oil sands region. This program was initiated in 1998 and involved intensive monitoring every six years (1998, 2004, 2010 (delayed to 2011), and 2017). The tentative organization for the synthesis report is as follows:

Executive Summary

Assessment of forest health based on long-term monitoring

Introduction

Description/discussion of forest health.

History of the monitoring program

Description of Monitoring Program

Monitoring methods used for various components of the program

- *Atmospheric deposition monitoring*

- *Meteorological monitoring*

- *Intensive forest health monitoring*

Atmospheric Deposition of nitrogen and sulphur

Calculation methods for deposition

Meteorological monitoring

Deposition results

Intensive Forest Health Monitoring

Data assessment methods

Forest health results

**Assessment of Forest Health
Conclusions and Recommendations**

Synthesis report #6 – 2020/2021: Atmospheric Modelling and Network Analysis

This synthesis report will be prepared during 2020-21 to summarize air quality modelling activities. The tentative organization for the synthesis report is as follows:

Executive Summary

Introduction

Emissions Inventories for Model Input

AEP-ECCC Joint Oil Sands Emissions Inventory Summary

Updates to the Joint Inventory

AEP CEM (continuous emissions monitoring) data

ECCC aircraft estimates of emissions

GEM-MACH model development for OSM

Description of the Experimental Forecast setup for GEM-MACH (Global Environmental Multi-scale - Modelling Air quality and Chemistry)

Description of the Monitoring Intensive setup for GEM-MACH

Innovations and additions to GEM-MACH during the course of OSM

GEM-MACH Evaluation

Comparisons to surface monitoring network data

Comparisons to aircraft observations

Comparisons to satellite observations

Improvements and/or gaps identified resulting from the evaluation

GEM-MACH process and emissions investigations

Aircraft-based emissions estimates as model inputs – impact on model results

Acid deposition estimates, and the role of anion versus base cation deposition

Estimates of human health impacts of oil sands emissions

Atmospheric mercury simulations

Organic aerosol formation simulations

Model resolution: comparison of 2.5km (kilometre), 1km resolution GEM-MACH versus observations

Network Analysis

Methodological description of ECCC and AEP approaches for network evaluation

ECCC Network Analysis results

Evaluation of existing AEP monitoring stations

Synthesis report #7 – 2020/2021: Analysis of trends of CAC from long-term and focused studies

Details are to be confirmed

Synthesis report #8 – 2020/21: Causes and effects of atmospheric deposition of multiple pollutants

Details are to be confirmed pending outcome of fall 2017 workshop under A-MD-6-1718 - Evaluation and Integration of Deposition Studies

Synthesis report #9 – 2021/22

Details are to be confirmed with consideration of ongoing activities and priorities

For each of the synthesis reports proposed, the annual timeline for delivery would be as follows. Note that the start month will shift during any given year based on research and monitoring efforts:

Month 1: Inception workshop for the report

Month 2-4: Drafting of report sections by experts

Month 5:	First draft of the report available to group for review
Month 6:	Second workshop: finalizing the report content and key messages
Month 9:	Second draft of the report for review by management
Month 10-11:	Revision and finalization of report

Appendix 1 – Annual Monitoring Schedule

(Please provide detailed information on the specifics of your monitoring schedule including – **locations, schedule, methods, SOPs, QA/QC data release, references**)

<u>Sampling Locations/Sites</u>	<u>Sampling Schedule (timing/frequency)</u>	<u>Compounds to be Analyzed</u>	<u>SOPs to be Consulted</u> <i>(hyperlinks accepted)</i>	<u>QA/QC Complete & Date Data to be Released</u>
NOT APPLICABLE				

References:

Not applicable

Appendix 2 – Detailed Multi-Year Financial Breakdown: if changes are to be made then an Addendum must be Complete and Approved.

(Complete the following detailed financial breakdown; add or delete categories as required)

Budget requirements	Year 1 (2017- 2018) APPROVED		Year 2 (2018- 2019) ESTIMATE, PENDING APPROVAL		Year 3 (2019- 2020) ESTIMATE, PENDING APPROVAL		Year 4 (2020- 2021) ESTIMATE, PENDING APPROVAL		Year 5 (2021- 2022) ESTIMATE, PENDING APPROVAL	
	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding
1) Salaries and benefits										
a) Appendix 3 - Totals	\$71,173	\$105K	\$71,173	\$105K	\$71,173	\$82.5K	\$71,173	\$105K	\$71,173	\$105K
2) Operations and Maintenance										
a) Vehicles and Transportation										
b) Helicopter										
c) Lab analysis										
d) Data management										
e) Field work										
3) Consumable Materials and supplies										
a) Publication costs for annual synthesis report	\$30,000		\$30,000		\$30,000		\$30,000		\$30,000	
4) Travel										
a) Conferences and meetings <i>(two workshops annually for coordinating team)</i>	\$40,000		\$40,000		\$40,000		\$40,000		\$40,000	
b) Field work - travel										

c) Project-related travel										
5) External Contracts										
a) <i>(Describe External Contractor)</i>										
Grand Total* (before other related costs)	\$141,173	\$105K								

* Total Salary for ECCC (\$71,173) in 2017-18 with other related costs is \$97,877. Total O&M for ECCC (\$70,000) in 2017-18 with other related costs is \$82,122. **The Grand Total for ECCC in 2017-18 is \$180,000.**

Appendix 3 – Staffing Plan

(Complete the following detailed staffing plan; add or delete categories as required)

Responsible Role	Year 1 – Budget Allocation (Approved)		Year 2 – Budget Allocation (Estimate, Pending Approval)		Year 3 – Budget Allocation (Estimate, Pending Approval)		Year 4 – Budget Allocation (Estimate, Pending Approval)		Year 5 – Budget Allocation (Estimate, Pending Approval)	
	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding
Science Expertise		\$105K		\$105K		\$105K		\$105K		\$105K
Technical/Field Staff										
Administrative and Program Coordination	\$71,173		\$71,173		\$71,173		\$71,173		\$71,173	
Grand Total <i>(inserted into Appendix 2)</i>	\$71,173	\$105K	\$71,173	\$105K	\$71,173	\$105K	\$71,173	\$105K	\$71,173	\$105K

Appendix 4 - Approvals

Project Submitted by:		
Name: Stewart Cober		
Organization: ECCC	Signature:	Date:
Project Approved by:		
Dr. Monique Dubé (AEP)		Dr. Kevin Cash (ECCC)
Signature 		Signature 
Date		Date