# 2018-19 Work Plan Template

**All fields with an * are mandatory**

| Project Description Summary | | |
|---|---|---|
| Date * | Project/Work Plan Identifier (if applicable) | Program Type and Strategic Alignment * |
| 21/12/2017 | A-LTM-S-3-1819 | OSM - Long Term Monitoring |
| Program Category * | Status * | Dept. ID |
| Air/Atmosphere/Climate | Existing Project | 1104 - 03418 |

| Project Leadership / Contact information | | |
|---|---|---|
| Project Title * | Key Words (max 10) * | |
| Atmospheric Pollutant Deposition Monitoring Network – to Forest Ecosystems | Atmospheric Deposition, Forest Health, Passive Monitoring, Remote Ozone, Dry Deposition | |
| Surname * | Given Name * | Title * |
| Myrick | Bob | Director, Airshed Sciences |
| Organization * | Department | Division |
| Alberta Provincial | Alberta Environment and Parks | Environmental Monitoring and Science |
| Branch * | Section/Unit (if applicable) | Phone * |
| Science | Airshed Sciences | 7802297290 |
| Email * | Mailing Address | City |
| Bob.Myrick@gov.ab.ca | 9888 Jasper Avenue | Edmonton |
| Postal Code | EMSD Executive Owner (If Applicable) | |
| T5J 5C6 | Bill Donahue | |

| Project Information | |
|---|---|
| Project Objective(s) (Bullet Form) * | The primary monitoring objectives for the long-term atmospheric pollutant deposition monitoring network to forest ecosystems are to:<br>(1) Monitor the levels and trends of atmospheric dry deposition for specific atmospheric pollutants ($O_3$, $SO_2$, $NH_3$, $HNO_3$, $NO_2$, $PM_{2.5}$) that pose a potential risk for ecosystem health (forests, wetlands and lakes);<br>(2) Monitor the levels and trends of atmospheric bulk deposition for inorganic nitrogen ($NO_3^-$ and $NH_4^+$), sulphate ($SO_4^{2-}$) and base cations ($Mg^{2+}$, $Ca^{2+}$, and $Na^+$); and<br>(3) Provide data to evaluate the effects of atmospheric deposition on the health of forests, wetlands and aquatic ecosystems. |
| Plain Language Overview (100 words) * | The dry deposition of acidifying and nitrogen species, as well as ozone can negatively impact forest, wetland and aquatic ecosystems. Dry deposition has been shown to dominate over wet deposition for nitrogen (N) and sulphur (S) species in the Athabasca oil sands region. A recent WBEA report on Forest Health Monitoring showed that deposition of N and base cations could exceed the forest's critical load at some Forest Health Monitoring (FHM) sites (WBEA, 2015). This project provides dry and bulk deposition data necessary to evaluate the impacts of atmospheric deposition on forest ecosystems, and is fully integrated with WBEA's FHM program (B-PD-12-1819). |

| Project Duration * | Project Original Start Date * | Estimated Completion Date * |
|---|---|---|
| Multi-Year | Ongoing | Ongoing |

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|---|---|
| Specify Objectives This Project Will Address in 2018/2019. * | The monitoring objectives of the oil sands atmospheric deposition to forest ecosystems monitoring program are:<br>(1) Provide ambient air quality data that will be used, along with meteorological tower data (see project plan A-LTM-S-4-1819), to calculate dry and bulk deposition in support of determining effects on forest health (B-PD-12-1819);<br>(2) Understand the spatial variation of atmospheric deposition across the Athabasca oil sands region;<br>(3) Determine long-term trends in deposition over a large geographical area;<br>(4) Address gaps in deposition monitoring for the oil sands region;<br>(5) Understand seasonal variations of deposition over a large geographical area; and<br>(6) Assess the impact of AOSR activities on deposition and evaluate if critical loads are being exceeded.<br>An additional objective for the 2018/19 deposition monitoring program is to:<br>- Test alternative technology to traditional passive monitors for future application in the oil sands region. |
| Specify Objectives This Project Will Address Beyond 2018/19 (if multi-year). * | This is a long-term monitoring program and objectives #1 to #6 listed above will apply to subsequent years. |

| Co-Chair Decision (March 8, 2018) |
|---|
| *** Decision Pool A: Workplan approved but at a reduced funding level.**<br>*** Approved at $1,485,347**<br>* This project was underspent in 2017/18. Quarterly updates on expenditures and accurate forecasts for 18/19 are required.<br>* Deliverables for this level of funding are to be clarified and an amended workplan submitted before March 23, 2018 to the Oil Sands Monitoring Secretariat.<br>* It is a requirement of funding that key members of the project team participate in a Deposition Monitoring Integration Workshop to be informed by the Oil Sands Monitoring Secretariat.<br>*Funding beyond 2018/19 is dependent upon the findings of the Deposition Monitoring Integration Review and Workshop.<br>*Funding expectations: as a minimum an annual progress report is required by February 28, 2019. All publications or products resulting from this work requires acknowledgement of funding from the Oil Sands Monitoring Program and are to be provided to the Oil Sands Monitoring Secretariat for tracking and any programmatic communications purposes. Work funded through the Oil Sands Program will be available for public dissemination. |

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|---|---|
| List Key Questions/Hypotheses Related to Each Objective Stated Above. * | Objective 1: What are the calculated dry and bulk deposition loadings on forest ecosystems?<br>Objective 2: What is the spatial gradient in dry deposition loading in forested ecosystems in the Athabasca oil sands region?<br>Objectives 3 and 5: What are the year-to-year and seasonal trends in dry deposition to forest ecosystems in the Athabasca oil sands region?<br>Objective 4: Are there gaps or redundancies in the current dry deposition monitoring network?<br>Objective 6: Are oil sands operations causing potential exceedances of critical loads?<br>New objective: Are their alternative technologies that can provide improved data resolution at a reduced cost that can be applied to this program? |
| | |
| Main Assumptions, Constraints, Dependencies. * | - Contracts with airshed organizations can be executed by April 1, 2018<br>- WBEA will have the expertise, resources and ability to deliver the monitoring program given the challenges of site access at remote locations and the potential impacts of wildfire activity |

| Partner Categories (select all that apply) * A partner is an individual, group, agency, community etc. that is an active participant in the project and in achieving the project deliverables. | Knowledge System * | Location (select all that apply) * |
|---|---|---|
| ☐ Federal Government<br>☐ Another AEP Division<br>☐ Another GoA Department<br>☑ University/Academic Institution<br>☐ Solely delivered by GoA<br>☐ Citizen Science<br>☐ Indigenous Community or Organization<br>☐ ENGO<br>☑ Other | Classical Science | ☐ Office or Laboratory<br>☐ Sub-regional<br>☐ Transboundary (provincial/territorial)<br>☐ Lower Peace Region<br>☐ Upper Peace Region<br>☐ North Saskatchewan Region<br>☐ Red Deer Region<br>☑ Lower Athabasca Region<br>☐ Upper Athabasca Region |

**AEP ONLY:** Strategic Alignment to EMSD Outcomes

| **AEP ONLY:** Strategic Alignment to EMSD Science Plan, select 1-2 areas that apply (If Applicable) |
|---|
| Ecosystems and Predicting Change<br>Choose one |

**AEP ONLY:** Strategic Alignment to AEP Departmental Outcomes

| **AEP ONLY:** Environmental and Ecosystem Health and Integrity | **AEP ONLY:** Sustainable Economic Diversity | **AEP ONLY:** Social Well-Being |
|---|---|---|
| Air/Climate Change | No | No |

| **AEP ONLY:** Protected Public Health and Safety from Environmental |
|---|
| No |

| | |
|---|---|
| **AEP ONLY:** IMAG/IMSC Information Needs, Please Specify Which Need(s) is Being Addressed. File location M:\EMSD\Common\Portfolio Mgmt System Shared Docs | •Info Need #17 (Current and historical status of Alberta's air quality): The passive air quality monitoring that is part of this program can be used to track the status and trends of air quality in the oil sands regions.<br>•Info Need #12 (Ecosystem Services) and Info Need #37 (Long-term Soil Acidification Monitoring Program): Data from this program is used to determine the wet and dry deposition (and bulk |
| | |
| **AEP ONLY:** How This Project Will Address Each Strategic Theme Selected Above. | •Environmental and Ecosystem Health and Integrity - Atmospheric deposition data is used to assess input of acidifying substances to the forest ecosystem (see B-PD-12-1819). This is part of the TEEM (Terrestrial Environmental Effects Monitoring) program which has the purpose of determining if oil sands activities are having an impact on terrestrial ecosystems. |

## Project Methodology

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|---|---|
| List the Key Project Phases and Provide Bullets for Each Major Task Under Each Project Phase. * | The WBEA Deposition Monitoring Program is ongoing (i.e., no distinct phases) and includes:<br>(1) Monitoring for ozone ($O_3$), sulphur dioxide ($SO_2$), nitrogen dioxide ($NO_2$), ammonia ($NH_3$) and nitric acid ($HNO_3$) concentrations using passive samplers at 32 sites throughout the Athabasca Oil Sands region. Samples will be collected on a monthly basis and used to calculate dry deposition.<br>(2) Active measurements of $O_3$ as well as $NH_3$, $HNO_3$ and $PM_{2.5}$ composition at 3 sites and 4 sites, |
| | |
| Describe How Changes in Environmental Condition Will Be Assessed. * | Some methods that will be used to assess changes in environmental condition include: (1) comparing the calculated dry and bulk deposition loadings with critical load information available for the region; (2) determining the locations where critical loads may be exceeded based on calculated dry deposition loadings; and (3) determining long-term changes or trends in deposition loadings and comparing these to critical loads. |
| | |
| Are There Benchmarks (e.g., objectives, tiers, triggers, limits, reference conditions, thresholds, etc.) Being Used to Assess Changes in Environmental Condition? If So, Please Describe, If Not, State "NONE". * | Acid critical loads have been determined for the oil sands region (WBEA, 2015; Makar et al., 2017); however, critical loads for nitrogen and base cations have yet to be developed. |
| | |
| Provide a Brief Description of the Methods By Project Phase. * | **Passive Sampling:** Monthly integrated passive samples will be collected for ozone, sulphur dioxide, nitrogen dioxide, ammonia and nitric acid. Passive air sampling uses a permeate or diffusive membrane to allow for the physical uptake of gas or vapour sample. They have no moving parts and require no power making them a cost-effective monitoring method, especially for remote locations.<br>**Remote Ozone Monitoring:** Active sampling uses a pump to provide a known volume of air to a |
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| List the Key Indicators Measured. * | Key indicators include the calculation of deposition of suphate, nitrate, phosphate, ammonium and base cations. Dry deposition is calculated based on these indicators. |
| | |
| Describe Sample Handling Procedures, If Not Applicable, State N/A. * | Sample handling procedures are provided in standard operating procedure documents located at http://www.wbea.org/resources/quality-assurance/standard-operating-procedures.<br>SOPs for passive air samplers, and IERs are available by request. |
| | |
| List SOPs that Will Be Used, If Not Applicable, State N/A.* | Sample handling procedures are provided in standard operating procedure documents located at http://www.wbea.org/resources/quality-assurance/standard-operating-procedures. |
| | |
| Describe the QA/QC Plan, If Not Applicable, State N/A. * | Quality assurance and quality control needs to be conducted in accordance with the Air Monitoring Directive and SOPs for data QA/QC developed by AEP and each airshed. Specific quality assurance plans are available from AEP and each airshed. |
| | |
| Describe How Indigenous Communities are Involved in the Project Design, Data Collection, and Analysis (Knowledge Co-creation) and How is their Consent Sought. If Not Applicable, State N/A.* | Indigenous communities are involved through inclusion in WBEA. |
| | |
| **Components Delivered by Others** | |
| List by Project or Project Phase Each Component That Will Be Delivered by An External Party (including analytical laboratories) and Name the Party. State None if Not Required. * | All monitoring in this project plan is delivered by the Wood Buffalo Environmental Association (WBEA). |
| | |
| Will These Components be Delivered Under Grant or Contract or Both? Please Describe and Name the Associate Work Plan/Grant/Contract for These Services if Not Included Within This Work Plan. * | All monitoring in this project plan is delivered by WBEA through a contract with AEP. |
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| **Monitoring Site Locations and Coordinates (for all sites, please add them to the Monitoring Site Location tab - a separate excel sheet)** | |
| | |
| Attach Map of Locations. Distinguish Indicators by Station if Necessary. Distinguish Sampling Frequency by Station if Necessary. | Maps of air monitoring in each airshed are available. See "Deposition Monitoring Sites" tab. This map shows the locations of the Forest Health Monitoring sites (see B-PD-12-1819), passive monitoring sites, portable ozone monitoring sites and long-term meteorological towers (see A-LTM-S-4-1819). |
| | |
| **Project Schedule** | |
| **FOR OIL SANDS MONITORING PROJECTS ONLY**: A coordinated field monitoring schedule for the OSM Program is required. Please complete the attached document named "OSM Program Field Monitoring Schedule" in addition to this work plan. Fill as much as you can recognizing that scheduling changes will occur and the scheduling document will be updated regularly. Please note the scheduling document will be shared with stakeholders. | Monitoring is ongoing. Monitoring sites are indicated in the tab called "WBEA Stations". |
| **FOR OIL SANDS MONITORING PROJECTS ONLY**: Have You Coordinated With Other Project Leads On Field Logistics? If So, Please Specify. * | Monitoring field logistics are coordinated by WBEA. |
| | |
| **Other** | |
| Additional Details. | This project is fully integrated with A-LTM-S-4-1819 (Meteorological Network) and B-PD-12-1819 (Forest Health Monitoring Program) to provide a source-to-sink approach for evaluating the effects of atmospheric pollutant deposition to forest ecosystems. |
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| Will Capacity Building and Training be a Component of the Project and If So, Explain How. If Not, State N/A.* | N/A |
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| Environmental Impact and Considerations. | N/A |

| Data Management and Digital Assets | | |
|---|---|---|
| Will Data be Produced as a Result Of This Project? * | Type of Quantitative Data Variables | Frequency Of Collection |
| Yes | Discrete | Monthly |

| Data Collection Period:<br>Start Date - End Date | Timeline For Upload Period:<br>Start Date - End Date |
|---|---|
| Ongoing | Ongoing |

| | |
|---|---|
| Is There a Data Sharing Agreement? (Yes or No). | No |
| Will the Data Include Traditional Knowledge as Defined by and Provided by an Indigenous Representative, Community or Organization (Yes / No). | No |
| Platform/Location of Data Storage. | http://www.wbea.org/resources/reports-and-publications/ambient-air-monitoring-reports/integrated-samples-lab-results |

## Project Deliverables

**Proposed 2018-19 Deliverable Type (for each deliverable outline document, presentation, meeting, etc.)**

| ☑ Peer-reviewed Journal Publication | ☐ Peer-reviewed Conference Proceeding | ☐ Non-peer reviewed Conference Proceeding |
|---|---|---|
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | Q1 - Deliverable, Comments |
| Atmospheric deposition data will be included in several of the manuscripts described in project plan B-PD-12-1819 Forest Health Monitoring Program. | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | Q2 - Deliverable, Comments |
| | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | Q3 - Deliverable, Comments |
| | | |
| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | Q4 - Deliverable, Comments |
| | | |
| ☐ Technical Report | ☐ Book Chapter | ☐ Public Dissemination Document |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | Q1 - Deliverable, Comments |
| | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | Q2 - Deliverable, Comments |
| | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | Q3 - Deliverable, Comments |

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|---|---|---|
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| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | Q4 - Deliverable, Comments |
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| ☐ **Conference Presentation(s)** | ☐ **Stakeholder Presentation** | ☐ **Key Engagement/Participation Meeting *** |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | Q1 - Deliverable, Comments |
| Choose one | Choose one | Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants. |
| | | |
| | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | Q2 - Deliverable, Comments |
| Choose one | Choose one | Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants. |
| | | |
| | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | Q3 - Deliverable, Comments |
| Choose one | Choose one | Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants. |
| | | |
| | | |
| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | Q4 - Deliverable, Comments |
| Choose one | Choose one | Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants. |
| | | |
| | | |
| ☐ **EMSD Strategic & Operational Publication** | ☐ **Other Documents** | |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | |
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| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | |
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| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | |
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| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | |
| | | |
| | | |
| **Proposed Deliverables After 2018/2019 for the project funds received in 2018/2019** | | |
| ☐ **Peer-reviewed Journal Publication** | ☐ **Peer-reviewed Conference Proceeding** | ☐ **Non-peer reviewed Conference Proceeding** |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | Q1 - Deliverable, Comments |

| | | |
|---|---|---|
| | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | Q2 - Deliverable, Comments |
| | | |
| | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | Q3 - Deliverable, Comments |
| | | |
| | | |
| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | Q4 - Deliverable, Comments |
| | | |
| | | |
| ☐ **Technical Report** | ☐ **Book Chapter** | ☐ **Public Dissemination Document** |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | Q1 - Deliverable, Comments |
| | | |
| | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | Q2 - Deliverable, Comments |
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| | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | Q3 - Deliverable, Comments |
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| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | Q4 - Deliverable, Comments |
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| | | |
| ☐ **Conference Presentation(s)** | ☐ **Stakeholder Presentation** | ☐ **Key Engagement/Participation Meeting *** |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | Q1 - Deliverable, Comments |
| Choose one | Choose one | Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants. |
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| | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | Q2 - Deliverable, Comments |
| Choose one | Choose one | Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants. |
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| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | Q3 - Deliverable, Comments |
| Choose one | Choose one | Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants. |
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| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | Q4 - Deliverable, Comments |

| Choose one | Choose one | Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants. |
|---|---|---|
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| | | |
| ☐ **EMSD Strategic & Operational Publication** | ☐ **Other Documents** | |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | |
| | | |
| | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | |
| | | |
| | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | |
| | | |
| | | |
| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | |
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| **All Completed Products** if a multi-year project, specify all completed products to date (consistent format for the fields below). Add rows as required. |
|---|
| **Journal Paper** |
| Required Format: Author (follow APA citation format), Year, Title, Journal, Volume, Page Numbers, Open or Closed and Document Location |
| Example: Jacoby, W. G. (1994). Public Attitudes Toward Government Spending. American Journal of Political Science, 38(2), 336-361.<br>Fearon, J. D., & Laitin, D. D. (2003). Ethnicity, Insurgency, and Civil War. American Political Science Review, 97(01), 75. doi: 10.1017/S0003055403000534 |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| **Technical Report** |
| Required Format: Author, Year, Title, Publisher Location, Name of Publisher, Publisher, Document Location |
| Example: Author, F.M. (Publication Year). Title of Report (Report No. XXX). Publisher City, State: Publisher |
| 1) Wood Buffalo Environmental Association. 2015. Assessing Forest Health in the Athabasca Oil Sands Region. http://wbea.org/resources/reports-and-publications/terrestrial-monitoring-reports. |
| 2) Yayne-abeba Aklilu, Laura Blair, Julian Aherne, Gordon Dinwoodie. DRAFT 2017. Determining Critical Loads of Acidity for Terrestrial Ecosystems in Alberta. Environmental Monitoring and Science |
| 3) Additional WBEA Technical reports – Please list of WBEA reports provided in available excel spreadsheet and available on the WBEA website at http://www.wbea.org/resources/reports-and-publications |
| 4) |
| 5) |
| **Book Chapter** |
| Required Format: Author, Year, Title of Paper, Editors, Title of Book, Page Numbers, Location of Publisher, Name of Publisher, Document Location |
| Example: Hemingway, E. (1999). The Killers. In J. Updike & K. Kenison (Eds.), The Best American Short Stories of the Century (pp.78-80). Boston, MA: Houghton Mifflin) |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| **Conference Proceeding** |
| Required Format: Author, Year, Title of Paper, Editors, Title of Proceedings, Name of Conference Location of Conference, Publisher Location, Name of |
| Example: Author of Paper, A., & Author of Paper, B. (Year, Month date). Title of Paper. In A. Editor, B. Editor, & C. Editor. Title of Published Proceedings. Paper Presented at Title of Conference: Subtitle of Conference, Location (inclusive page numbers). Place of Publication: Publisher.) |
| 1) |
| 2) |

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| 3) |
| 4) |
| 5) |
| **Public Dissemination Document** |
| Required Format: Author, Year, Title, Journal / Report, Volume, Publisher, Page Number, Number of Pages, Document Location |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| **AEP ONLY: EMSD Strategic and Operational Publication** |
| Required Format: Author, Year, Title, Publisher Location, Name of Publisher, Publisher, Document Location |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| **Other Documents** |
| Detailed Information of Other Documents |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| **Conference Presentation** |
| Required Format: Presenter, Date, Location, Title, Platform or Poster, Conference Name |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| **Stakeholder Presentation** |
| Required Format: Presenter, Date, Location, Title, Platform or Poster, Name of Meeting |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| **Key Engagement/Participation Meeting** |
| Required Format: Meeting Host, Date, Location |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |

## Human Resources / Staffing Plan (roles and responsibilities)

| Name & Role | Organization | Responsibilities |
|---|---|---|
| Sanjay Prasad | Wood Buffalo Environmental Association | Project Leadership |
| Bob Myrick | Alberta Environment and Parks | AEP Project Administrator |
| Zheng Yang | Alberta Environment and Parks | Evaluation of alternative monitoring technology |
| Greg Wentworth | Alberta Environment and Parks | Science Advisor and participation in WBEA planning |
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| **AEP ONLY: Additional Human Resources Required from EMSD** | | |
|---|---|---|
| Name & Role | Branch - Section | Estimated time (% of annual FTE) |

| | | |
|---|---|---|
| Bob Myrick | Science | 10 |
| Zheng Yang | Science | 30 |
| Greg Wentworth | Science | 10 |
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| Financial Details and Budget Request | | |
|---|---|---|
| **Source of Funding Requested Year 1 - 2018/19** | | |
| | AEP ONLY: EMSD | OSM |
| Salaries and Benefits - AEP Chargeback | | $60,000 |
| Salaries and Benefits - New OSM Staff | | $0 |
| Operations and Maintenance | | |
| Consumable materials and supplies | | |
| Conferences and meetings travel | | |
| Field work travel | | |
| Project-related travel | | |
| Engagement | | |
| Reporting | | |
| External Contracts - Organization/Vendor/Suppliers (WBEA) | | $1,425,347 |
| Overhead | | |
| Grants | | |
| Capital | | |
| Total budget request for the year | 0 | $1,485,347 |
| Total budget approved | | |
| | | |
| **Source of Funding Requested Year 2 - 2019/20** | | |
| | AEP ONLY: EMSD | OSM |
| Salaries and Benefits - AEP Chargeback | | $60,000 |
| Salaries and Benefits - New OSM Staff | | $0 |
| Operations and Maintenance | | |
| Consumable materials and supplies | | |
| Conferences and meetings travel | | |
| Field work travel | | |
| Project-related travel | | |
| Engagement | | |
| Reporting | | |
| External Contracts - Organization/Vendor/Suppliers (WBEA) | | $1,500,000 |
| Overhead | | |
| Grants | | |
| Capital | | |
| Total budget request for the year | | $1,560,000 |
| Total budget approved | | |
| | | |
| **Source of Funding Requested Year 3 - 2020/21** | | |
| | AEP ONLY: EMSD | OSM |
| Salaries and Benefits - AEP Chargeback | | $60,000 |
| Salaries and Benefits - New OSM Staff | | $0 |
| Operations and Maintenance | | |
| Consumable materials and supplies | | |
| Conferences and meetings travel | | |
| Field work travel | | |
| Project-related travel | | |
| Engagement | | |
| Reporting | | |
| External Contracts - Organization/Vendor/Suppliers (WBEA) | | $1,500,000 |
| Overhead | | |
| Grants | | |
| Capital | | |
| Total budget request for the year | | $1,560,000 |
| Total budget approved | | |
| | | |
| **Source of Funding Requested Year 4 - 2021/22** | | |
| | AEP ONLY: EMSD | OSM |
| Salaries and Benefits - AEP Chargeback | | $60,000 |
| Salaries and Benefits - New OSM Staff | | $0 |
| Operations and Maintenance | | |
| Consumable materials and supplies | | |
| Conferences and meetings travel | | |
| Field work travel | | |
| Project-related travel | | |
| Engagement | | |
| Reporting | | |
| External Contracts - Organization/Vendor/Suppliers (WBEA) | | $1,500,000 |
| Overhead | | |
| Grants | | |
| Capital | | |
| Total budget request for the year | | $1,560,000 |
| Total budget approved | | |
| | | |
| **Budget Request for the Entire Project** | 0 | $6,165,347 |

## Project Approval(s)

**Proposal Submitted by**

| Surname | Given Name | Organization |
|---|---|---|
| Myrick | Bob | AEP |

| Signature | Date |
|---|---|
| X<br>Bob Myrick<br>Director, Airshed Sciences | 12-Feb-18 |

**Proposal for OSM Reviewed by**

| AEP Administrator/Coordinator - Review | Signature | Date |
|---|---|---|
| | X<br>for Bill Donahue<br>Executive Director, Science | 2/12/2018 |

| ECCC Administrator/Coordinator - Review | Signature | Date |
|---|---|---|
| | | |

**OSM Project Approved by**

| AEP Co-Lead for OSM | Signature | Date |
|---|---|---|
| | | |

| ECCC Co-Lead for OSM | Signature | Date |
|---|---|---|
| | | |

**AEP ONLY: Proposal for EMSD Reviewed by**

| EMSD Director | Signature | Date |
|---|---|---|
| | | |

**AEP ONLY: EMSD Project Approved by**

| EMSD Executive Director | Signature | Date |
|---|---|---|
| | | |

| EMSD Chief Scientist | Signature | Date |
|---|---|---|
| | | |

**OSM / EMSD Project Has Not Been Approved**

| Project Status | Date Notified | Date Required |
|---|---|---|
| The project is conditionally approved. The following conditions are required before approval is granted. | | |

| List the Condition(s) | |
|---|---|

| Condition(s) Addressed / Approval Granted |
|---|
| Choose one |

**OSM / EMSD Approval Post Removal of Condition(s)**

| Name & Title | Signature | Date |
|---|---|---|
| | | |

| Budget Item | Description | Total Cost |
|---|---|---|
| **CORE Subtotal** | | **$1,425,347** |
| **1. Tower Inspections** | | **$0** |
| Inspection | Contract for professional tower inspector. ** Deferred* | $0 |
| Helicopter | Based on 2 flight hours over 4 days per year. ** Deferred* | $0 |
| **2. Ion Exchange Resins** | | **$241,250** |
| Laboratory | Based on 696 units. Includes column packing, extraction, and analysis. | $200,000 |
| Helicopter | Based on 44 flight hours over 20 days per year. | $41,250 |
| **3. Denuders** | | **$191,860** |
| Technical Specialist | Provide guidance on this type of technology. | $15,000 |
| Maintenance and Repair | As needed. | $5,000 |
| Laboratory Analysis | Based on 6 samples collected 12 times a year. | $100,000 |
| Helicopter | Based on 48 flight hours over 12 days per year. | $71,860 |
| **4. Remote Ozone Monitoring** | | **$38,700** |
| Technical Specialist | Provide guidance on this type of technology. | $8,000 |
| Maintenance and Repair | As needed. | $5,000 |
| Helicopter | Based on 13 flight hours over 7 days per year. | $22,200 |
| Telemetry | Monthly data, modem costs. | $3,500 |
| **5. Passive Air Monitoring** | | **$274,780** |
| Laboratory | Based on monthly collection at 32 sites. (Total 696 samples). | $160,080 |
| Helicopter | Based on 74 flight hours over 24 days a year. | $114,700 |
| **6. Passive Air Monitoring - New Technology Testing** | | **$10,717** |
| Infrastructure | Sensor housing, equipment related to installation and power. | $2,500 |
| Equipment | Based on 5 monitoring sites. | $8,217 |

| | | |
|---|---|---|
| **CORE Operating Costs** | | **$668,040** |
| Deposition Field Costs | Field Staff/Benefits | $285,809 |
| | Deposition Vehicle | $13,482 |
| | Safety (Mandatory) | $13,482 |
| | Deposition Training | $13,482 |
| | Materials and Consumables | $10,111 |
| | Information Technology (cell phone | $10,111 |

| | | |
|---|---|---|
| | Site Maintenance | $3,370 |
| | Stakeholder Engagement | $6,741 |
| | Professional fees for Science Advic | $16,852 |
| WBEA Administration | Data Management Systems | $72,000 |
| | Administration Salary and Benefits | $84,419 |
| | External Professional Fees | $42,099 |
| | Insurance Expense | $4,443 |
| | Office Equipment Lease & Expense | $3,332 |
| | Thickwood Occupancy Cost | $29,991 |
| | Office expenses Telephone/Fax/int | $17,772 |
| | Safety/Mandatory Training | $1,666 |
| | Travel - Program Work | $6,665 |
| | Conferences, Training and meeting | $3,332 |
| | Stakeholder Honourariums | $3,332 |
| | Financial Audit and Legal Fees | $6,665 |
| | Emergent Items | $18,883 |

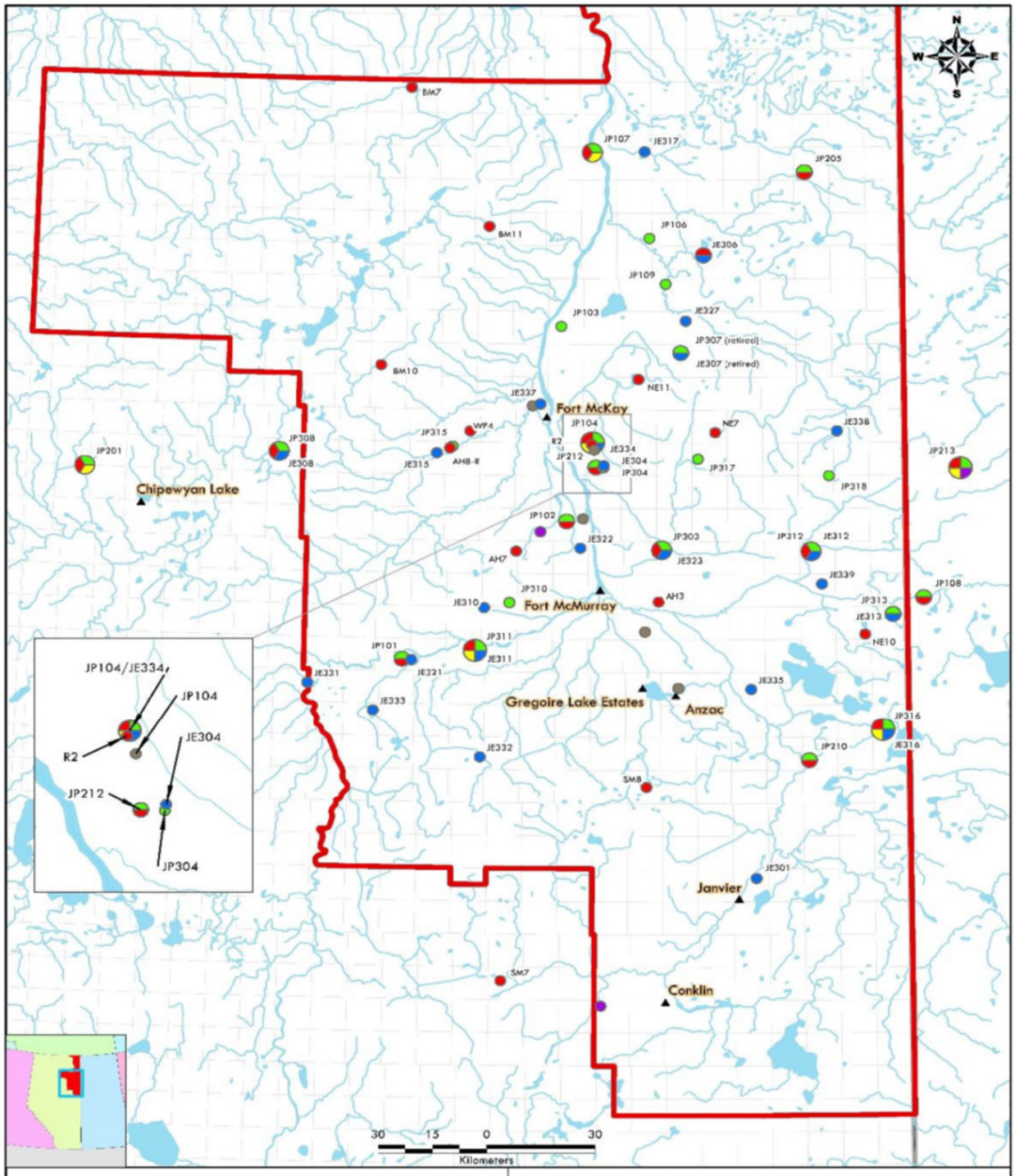
| SamplingLocations/Sites | Sampling Schedule (*timing/frequency*) | Compounds to be Analyzed | SamplingLocations/Sites | SamplingLocations/Sites | Airshed |
|---|---|---|---|---|---|
| AMS01 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.189428 | -111.640583 | WBEA |
| AMS02 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.050006 | -111.564147 | WBEA |
| AS103 (AH3) | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.696417 | -111.122283 | WBEA |
| AS107 (AH7) | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.829817 | -111.767833 | WBEA |
| BM10 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.320050 | -112.396967 | WBEA |
| BM11 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.691317 | -111.909517 | WBEA |
| BM7 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 58.058200 | -112.281433 | WBEA |
| JE306 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.6188 | -110.9181 | WBEA |
| JE308 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.0859 | -112.8556 | WBEA |
| JE312 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.8300 | -110.4348 | WBEA |
| JE316 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.3533 | -110.1188 | WBEA |
| JE323 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.8332 | -111.1091 | WBEA |
| JP101 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.5399 | -112.2766 | WBEA |
| JP102 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.9103 | -111.5383 | WBEA |
| JP104 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$<br>NH¬3, HNO3, and PM2.5 composition (Mg2+, Na+, Cl-, Ca2+, K+, NO3-, NH4+, SO42-, U, Sm, Be, Pr, Nb, Tl, Th, Cs, Bi, W, La, Ag, Nd, Sb, Ce, Co, Cd, Sn, As, Se, Sr, Mo, Cr, Rb, Pb, Ni, Ca, Li, Cu, Mn, V, Ti, Zn, Mg, Na, Ca, Fe, Al, K, Si) | 57.1209 | -111.4242 | WBEA |
| JP107 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$<br>NH¬3, HNO3, and PM2.5 composition (Mg2+, Na+, Cl-, Ca2+, K+, NO3-, NH4+, SO42-, U, Sm, Be, Pr, Nb, Tl, Th, Cs, Bi, W, La, Ag, Nd, Sb, Ce, Co, Cd, Sn, As, Se, Sr, Mo, Cr, Rb, Pb, Ni, Ca, Li, Cu, Mn, V, Ti, Zn, Mg, Na, Ca, Fe, Al, K, Si) | 57.8895 | -111.4337 | WBEA |
| JP108 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.7093 | -109.9273 | WBEA |
| JP201 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.0322 | -113.7332 | WBEA |
| JP205 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.8402 | -110.4464 | WBEA |
| JP210 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.2761 | -110.4520 | WBEA |
| JP212 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.0536 | -111.4066 | WBEA |
| JP213 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$<br>NH¬3, HNO3, and PM2.5 composition (Mg2+, Na+, Cl-, Ca2+, K+, NO3-, NH4+, SO42-, U, Sm, Be, Pr, Nb, Tl, Th, Cs, Bi, W, La, Ag, Nd, Sb, Ce, Co, Cd, Sn, As, Se, Sr, Mo, Cr, Rb, Pb, Ni, Ca, Li, Cu, Mn, V, Ti, Zn, Mg, Na, Ca, Fe, Al, K, Si) | 57.0465 | -109.7488 | WBEA |
| JP309 (AH8-R) | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.1018 | -112.0725 | WBEA |
| JP311 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.5658 | -111.9474 | WBEA |
| JP316 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.3533 | -110.1188 | WBEA |
| NE10 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.6084 | -110.1929 | WBEA |
| NE11 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.2880 | -111.2170 | WBEA |
| NE7 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.1468 | -110.8661 | WBEA |
| POMS Beaver River | 15 minute averages | $O_3$ | 56.8825 | -111.6591 | WBEA |
| POMS Conklin | 15 minute averages | $O_3$ | 55.62053 | -111.37685 | WBEA |
| POMS JP213 | 15 minute averages | $O_3$ | 57.04568 | -109.75962 | WBEA |
| R2 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.1145 | -111.4290 | WBEA |
| SM7 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 55.6855 | -111.8154 | WBEA |
| SM8 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 56.2016 | -111.1753 | WBEA |
| WF4 | Monthly | $SO_2$, $NO_2$, $O_3$, $NH_3$ and $HNO_3$ | 57.1479 | -111.9840 | WBEA |

## Ion Exchange Resins

| SamplingLocations/Sites | Sampling Schedule (*timing/frequency*) | Compounds to be Analyzed | Latitude | Longitude | Airshed |
|---|---|---|---|---|---|
| AMS01_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.1895 | -111.6405 | WBEA |
| AMS14_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.4493 | -111.0372 | WBEA |

| | | | | | |
|---|---|---|---|---|---|
| JE313_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.6673 | -110.0514 | WBEA |
| JE313_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.6713 | -110.0429 | WBEA |
| JE323_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.8257 | -111.0793 | WBEA |
| JE323_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.8328 | -111.1087 | WBEA |
| JE332_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.2773 | -111.8560 | WBEA |
| JE332_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.2791 | -111.9195 | WBEA |
| JP101_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.5375 | -112.2710 | WBEA |
| JP101_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.5396 | -112.2764 | WBEA |
| JP102_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.9016 | -111.5334 | WBEA |
| JP102_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.9127 | -111.5442 | WBEA |
| JP104_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.1200 | -111.4252 | WBEA |
| JP106_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.6640 | -111.1797 | WBEA |
| JP106_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.6620 | -111.1684 | WBEA |
| JP107_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.8896 | -111.4326 | WBEA |
| JP107_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.9002 | -111.4789 | WBEA |
| JP201_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0319 | -113.7387 | WBEA |
| JP201_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0321 | -113.7340 | WBEA |
| JP210_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.2611 | -110.4480 | WBEA |
| JP210_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.2726 | -110.4491 | WBEA |
| JP212_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0537 | -111.4067 | WBEA |
| JP212_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0540 | -111.4090 | WBEA |
| JP213_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0459 | -109.7594 | WBEA |
| JP213_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0464 | -109.7501 | WBEA |
| JP308_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0860 | -112.8547 | WBEA |
| JP308_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0859 | -112.8555 | WBEA |
| JP309_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.1009 | -112.0778 | WBEA |
| JP309_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.1022 | -112.0745 | WBEA |
| JP311_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.5645 | -111.9437 | WBEA |
| JP311_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.5645 | -111.9471 | WBEA |
| JP312_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_3$., $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.8300 | -110.4345 | WBEA |

| | | | | | |
|---|---|---|---|---|---|
| JP312_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_{3-}$, $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.8302 | -110.4328 | WBEA |
| Lysimeter_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_{3-}$, $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0773 | -111.5953 | WBEA |
| Lysimeter_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_{3-}$, $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.0745 | -111.5948 | WBEA |
| R2_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_{3-}$, $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.1144 | -111.4290 | WBEA |
| R2_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_{3-}$, $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 57.1144 | -111.4271 | WBEA |
| SM08_IERopen | 6 months | bulk deposition of $NH_4^+$, $NO_{3-}$, $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.2015 | -111.1772 | WBEA |
| SM08_IERthru | 6 months | bulk deposition of $NH_4^+$, $NO_{3-}$, $PO_4^{3-}$, $SO_4^{2-}$, $Ca_2^+$, $Mg_2^+$, $Na^+$ | 56.2011 | -111.1763 | WBEA |




# Wood Buffalo Environmental Association
# Terrestrial Monitoring Network 2017

W B E A

Legend

- Community
- Regional Municipality of Wood Buffalo
- Forest Health Interior Plot
- Passive Monitor
- Meteorological Tower
- Forest Health Edge Plot
- Bog Site
- Portable Ozone Monitor