2022-2023 OSM WORK PLAN APPLICATION

This form will be used to assess the merits of the proposed work plan and its fit with the Oil Sands Monitoring (OSM) Program mandate and strategic priorities. Applicants must complete the form in its entirety. Applicants that fail to use this form and complete all sections in the timeframe will not be considered.

OSM Work Plan Submission Deadline: The deadline for submission of proposed work plans is ***October 5, 2021 at 4:30 PM Mountain Standard time.***	***October 5, 2021*** *4:30 PM MST*
Decision Notification	*Mid to Late January 2022*

The OSM Program is governed by the Freedom of Information and Protection of Privacy Act (FOIP) and may be required to disclose information received under this Application, or other information delivered to the OSM Program in relation to a Project, when an access request is made by anyone in the public. Applicants are encouraged to familiarize themselves with FOIP. All work plans are public documents.

Work Plan Completion

Please ***Enable Macros*** *on the form when prompted.*

The applicant is required to provide information in sufficient detail to allow the evaluation team to assess the work plan. Please follow the requirements/instructions carefully while at the same time being concise in substantiating the project's merits. *The OSM Program is not responsible for the costs incurred by the applicant in the preparation and submission of any proposed work plan.*

When working on this form, please maintain Macros compatibility by always saving your draft and your final submission as a **Microsoft Word Macro-Enabled Document**, failure to do so will result in loss of form functionality**.** This form was created using Microsoft word 2016 on a PC and may not have functionality on other versions of Microsoft on PC or MACS.

All work plans under the OSM Program require either a government lead or a government coordinator. This will ensure that the financial tables (for Alberta Environment and Parks & Environment and Climate Change Canada) are completed accurately for work plan consideration. ***However,*** *if an* ***Indigenous community, environmental nongovernmental organization*** *or any other* ***external partner*** *is completing a work plan proposal, they would* ***only*** *complete the* ***grant or contract budget component*** *of the* ***Human Resources & Financials Section*** *for their project. The government coordinator within Alberta Environment & Parks would be responsible for completing the remaining components of the Human Resources and Financial Section of this Work Plan Application, as they are responsible for contract and grant facilitation of successful submissions. All other sections outside of* ***Human Resources & Financials Section*** *of this work plan proposal are to be completed in full by all applicants.*

The OSM Program recognizes that majority of work planning submissions are a result of joint effort and monitoring expertise. Should the applicant wish to submit supplemental materials in addition to their application additional resources are available in the Work Planning Form and Distribution Package, accessible here: **Work Planning Form and Distribution Package**

Should you have any ***questions*** *about completing this work planning form or uploading your final submission documents, please send all inquiries by email to:* **OSM.Info@gov.ab.ca**.

Work Plan Submission

*Upon completion of this application, please submit the appropriately named work plan (**Microsoft Word Macro-Enabled Document**) and all supporting documents to the link provided below. Failure to follow the naming convention provided may result in oversight of your application.*

*Please upload (by drag and dropping) the **WORK PLAN SUBMISSION & ALL SUPPORTING DOCUMENTS** here:*

WORK PLAN SUBMISSION LINK (CTRL+CLICK HERE)

Please use the following file naming convention when submitting your WORK PLAN:

202223_wkpln_WorkPlanTitle_ ProjectLeadLastNameFirstName

Example:

202223_wkpln_OilSandsResiduesinFishTissue_SmithJoe

If applicable, **please use the following file naming convention when submitting your supplementary or supporting files.** Please number them according to the guidance and examples provided:

202223_sup##_WorkPlanTitle_ ProjectLeadLastNameFirstName

Examples:

202223_sup01_OilSandsResiduesinFishTissue_SmithJoe

202223_sup02_OilSandsResiduesinFishTissue_SmithJoe

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202223_sup10_OilSandsResiduesinFishTissue_SmithJoe

Do not resave your work plan or documents under any other naming conventions. *If you need to make revisions and resubmit before the work planning deadline of October 5, 2021, **DO NOT** rename your submission. When resubmitting, simply resubmit with the exact naming convention so that it replaces the original submission. **DO NOT** add any additional components such as versioning or dates to the file naming convention. Please direct any questions regarding the submission or naming of submissions to **OSM.Info@gov.ab.ca**.*

Work Plan Application

PROJECT INFORMATION	
Project Title:	Core Biodiversity Monitoring – Benthic Invertebrates
Lead Applicant, Organization, or Community:	Environment and Climate Change Canada
Work Plan Identifier Number: *If this is an on-going project please fill the identifier number for 20/21 fiscal by adjusting the last four digits:* ***Example:*** *D-1-2020 would become D-1-****2022***	W-LTM-S-4-2022-23
Project Region(s):	Oil Sands Region
Project Start Year: *First year funding under the OSM program was received for this project (if applicable)*	2018
Project End Year: *Last year funding under the OSM program is requested* ***Example: 2022***	2023
Total 2022/23 Project Budget: *For the 2022/23 fiscal year*	Click or tap here to enter text.
Requested OSM Program Funding: *For the 2022/23 fiscal year*	Click or tap here to enter text.
Project Type:	Longterm Monitoring
Project Theme:	Surface Water
Anticipated Total Duration of Projects (Core and Focused Study (3 years))	Year 5
Current Year	**Focused Study:** Choose an item.
	Core Monitoring: Year 5

CONTACT INFORMATION	
Lead Applicant/ Principal Investigator: Every work plan application requires one lead applicant. This lead is accountable for the entire work plan and all deliverables.	Nancy Glozier
Job Title:	Section Manger, Arctic Athabasca Watershed
Organization:	ECCC
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Phone:	306-260-3298
Email:	Nancy.glozier@eg.gc.ca

PROJECT SUMMARY

Should your application be successful, The OSM Program reserves the right to publish this work plan application. Please check the box below to acknowledge you have read and understand:

☒ *I acknowledge and understand*

In the space below please provide a summary (300 words max) of the proposed project that includes a brief overview of the project drivers and objectives, the proposed approach/methodology, project deliverables, and how the project will deliver to the OSM Program objectives. The summary should be written in plain language.

The core long-term Benthos Monitoring component of the OSM Surface Water Quality Monitoring Program applies an adaptive monitoring design that addresses the key questions posed by OSM. The core benthos program has activities within all three Oil Sands Areas, Athabasca River, Peace River and Cold Lake, although each is currently at difference phases within the adaptive monitoring framework. OSM Benthos Monitoring focuses on benthic macroinvertebrates (BMI) as a key component of riverine food webs, because they are relatively sedentary, sensitive to multiple stressors, critical components of fish habitat, and the most common group used for aquatic bioassessments globally. After three years of baseline monitoring, the Benthos Monitoring Program revisited the initial JOSM study design and recommendations made in the 2018 Oil Sands Technical Reports. As a result, the Benthos Monitoring Programs adapted their monitoring programs, incorporating many recommendations. This adaptive monitoring design resulted in monitoring of core and rotating non-core sites to assess BMI status, temporal and spatial trends and variability (e.g., high and low water years). By associating indicators of BMI with water and sediment chemistry, physical habitat measurements, and other supporting environmental variables, this program is able to determine whether changes in ecological effects are 1) occurring; 2 caused by oil sands development; cumulative.

Monitoring, evaluation, and reporting activities are conducted and delivered jointly by Environment and Climate Change Canada (ECCC) and Alberta Environment and Parks (AEP). Key reporting activities in 2021-2022 will be focused on:

1. Review of monitoring data within the context of OSM adaptive framework
2. Leading and continue the review and development of updated approaches to establishing critical effect sizes, temporal and spatial variability, as well as key indicators of change in BMI assemblages applicable to OSM areas
3. Provide data, scientific direction, and support annually the State of Environment Report.

1.0 Merits of the Work Plan

All work plans under the OSM Program must serve the mandate of the program by determining (1) if changes in indicators are occurring in the oil sands region and (2) if the changes are caused by oil sands development activities and (3) the contribution in the context of cumulative effects. In the space below please provide information on the following:

- *Describe the key drivers for the project identifying linkages to the EEM framework particularly as it relates to surveillance, confirmation and limits of change (as per OC approved Key Questions).*
- *Explain the knowledge gap as it relates to the EEM framework that is being addressed along with the context and scope of the problem as well as the Source – pathway – Receptor Conceptual Models .*
- *Describe how the project meets the mandate of the OSM Program*
- *Discuss results of previous monitoring/studies/development and* what has been achieved to date.

This work plan serves the mandate of the OSM program by addressing the three key OSM Program questions (above) with a focus on the use of benthic macroinvertebrate indicators to assess aquatic ecosystem health by detecting change in benthic macroinvertebrate indicators; if changes are caused by oil sands development activities; and the contribution in the context of cumulative effects. The geographic scope of this program covers all three oil sands deposits (the Cold Lake Deposit, the Athabasca Deposit, and the Peace River Deposit). Any watersheds impacted by either in-situ or open-pit (or both) bitumen extraction activities are similarly in scope for this program. The Benthos Monitoring Program is an adaptive monitoring approach that uses benthic macroinvertebrate indicators to detect change from Reference or Baseline relative to oil sands development. Benthos Monitoring is part of the Response component of the Surface Water Conceptual Model of the OSM Program. This program aligns with the "Source-Pathway-Receptor" or Pressure-Stressor-Pathwas-Response" Surface Water Conceptual Model. The specific design of this OSM Benthos Monitoring program assesses if changes in benthic macroinvertebrate indicators (Response) relative to the Pressure/Stressor components (landscape disturbance, air emissions, spills, production, seepage; sediments, nutrients, inorganic and organic substances) and the associated Pathways or routes of exposure (overland flow, atmospheric deposition, fluvial transport) exist. The study design of the Benthos Monitoring program will directly provide information toward a transition to the conceptual model of an Adaptive Monitoring approach, such as EEM, for OSM. For example, existing and newly acquired data has been able to establish Baseline conditions and is currently used for Surveillance monitoring to detect change, determine Confirmation of change, and calculate Critical Effect Sizes of indicators of benthic macroinvertebrates. Benthos Monitoring will continue to link pressures/stressors and the associated pathways on responses of indicators of benthic macroinvertebrates. We have detected changes in benthic macroinvertebrate indicators relative to at oil sands development with more pollution tolerant taxa at those oil sands development sites (Culp et al. 2018; Culp et al. 2020).

2.0 Objectives of the Work Plan

List in point form the Objectives of the 2022/23 work plan below

The objective of this work plan is to collect the data necessary to answer the three key OSM questions as they relate to Benthos Monitoring component of the OSM Surface Water Quality Monitoring Program. With respect to monitoring, these objectives are:

1. Collect benthic macroinvertebrate samples at eleven existing long-term (core) Mainstem Athabasca River monitoring sites (M0, M0A, M1A, M2A, M3, M3B, M4, M6, M8 & M9 plus one rotational site of M7 or M7C, see attached monitoring file OSM Program Field Monitoring Schedule_Benthos.xlx for the list of sites planned in 2022.

2. Collect benthic macroinvertebrate samples annually at the existing long-term (core and rotational) Tributary Benthos monitoring sites to track temporal changes in reference and test areas that include; up to 40 sites in the tributaries of the Athabasca River and Birch Hills area; up to 30 sites in the Christina River watershed; see attached monitoring file OSM Program Field Monitoring Schedule_Benthos.xlx for the list of sites planned in 2022.

3. Completion of benthic macroinvertebrate and water chemistry data acquisitions and quality assurance/quality control for upload to the Oil Sands Data Portal.
4. Review potential indicators of benthic macroinvertebrate health in relation to Benthos Monitoring of the OSM Surface Water Quality Monitoring Program to enhance baseline, assess confirmation, evaluate limits of change, and develop critical effect sizes for Reference areas and accumulated state for potentially impacted areas
- Develop critical effect sizes for the Mainstem Benthos Monitoring program;
- Develop critical effect sizes for the Tributaries and Birch Hill areas;
- Establish baseline for the Christina River

5. Contribute expertise to the OSM team in the advancement of an adaptive monitoring framework.
6. Provide support, technical and scientific expertise as need to the CBM work plan

3.0 Scope

Evaluation of Scope Criteria (Information Box Only- No action required)
Your workplan will be evaluated against the criteria below. A successful workplan would:

- be in scope of the OSM Program (e.g., regional boundaries, specific to oil sands development, within boundaries of the Oil Sands Environmental Monitoring Program Regulation)
- integrate western science with Indigenous Community-Based Monitoring
- addresses the EEM framework particularly as it relates to surveillance, confirmation and limits of change as per approved Key Questions.

have an experimental design that addresses the Pressure/Stressor, Pathway/Exposure, Response continuum

- produce data/knowledge aligned with OSM Program requirements and is working with Service Alberta
- uses Standard Operating Procedures/ Best Management Practices/ Standard Methods including for Indigenous Community-Based Monitoring

3.1 Sub Theme

Please select from the dropdown menu below the theme(s) your monitoring work plan relates to:

Surface Water

3.2 Core Monitoring or Focused study

Please select from the dropdown menu below if the monitoring in the work plan is "core monitoring" and/or a "focused study". Core monitoring are long term monitoring programs that have been in operation for at least 3 years, have been previously designated by the OSM program as core, and will continue to operate into the future. Focused studies are short term projects 1-2 years that address a specific emerging issue. For the purposes of 2022/23 work planning all Community Based Monitoring Projects are Focused Studies.

Core Monitoring

3.3 Sub Theme Key Questions

Please select from the dropdown menus below the sub-theme(s) your monitoring work plan relates to and address the Key Questions:

3.3.1 Surface Water Theme

3.3.1.1. Sub Themes:

Biological

3.4.1.2 Surface Water Key Questions

Explain how your surface water monitoring program addresses the key questions below.

1. Are changes occurring in water quality, biological health (e.g., benthos, fish) and/or water quantity/flows, to what degree are changes attributable to oil sands activities, and what is the contribution in the context of cumulative effects?

Benthic monitoring in the LAR and tributaries revealed that most assemblages are associated with good ecological condition. However, benthic macroinvertegrate assemblages in areas with increasing oil sands industrial activity exhibited divergence from similar reference areas that may be associated with mild environmental stress. In the Athabasca River, adaptive monitoring design of the OSM Mainstem Benthos core monitoring program is to assess if changes in benthic macroinvertebrate indicators (response) relative to the pressure/stressor (landscape disturbance, air emissions, spills, production, seepage; sediments, nutrients, inorganic and organic substances) and the associated pathways or routes of exposure (overland flow, atmospheric deposition, fluvial transport) exist. For example, sampling sites exist inside and outside of natural exposure to bitumen, but upstream areas of sewage effluent from municipal sources and oil sands development areas i.e., Reference sites). Additional sites are located within areas of municipal sewage effluent and oil sands development areas, which includes sewage effluent derived from oilsands development. Lastly, sites exist downstream of oil sands development activity, i.e., recovery sites, to further assess cumulative effects. The established Mainstem Benthos adaptive monitoring design is capable of detecting change associated with oil sands development and cumulative effects. We have detected changes in benthic macroinvertebrate indicators at oil sands development and municipal sewage sites compared to Reference and Recovery sites (Culp et al. 2018; Culp et al. 2020). Oil sands development and municipal sewage effluent sites had a higher abundance of pollution tolerant taxa than Reference or Recovery sites. Moreover, these indicators differ between oil sands development and municipal sewage effluent sites. Lastly, signs of cumulative effects have been shown with changes in benthic macroinvertebrate indicators as you progress from Reference through areas of human activity, and finally Recovery areas of municipal sewage and oil sands development in the Lower Athabasca River. Changes in benthic macroinvertebrate indicators are associated with sediment metal, total polycyclic aromatic compounds (PACs) nnd nutrient concentrations. In three major tributaries of the Lower Athabasca River, the Steepbank, Ells and MacKay rivers, sites from upstream Reference areas within the same tributary had different invertebrate assemblages from downstream, potentially impacted (i.e., test) areas. In general, test areas further away from the reference area had greater differences in aquatic invertebrate assemblages, while several adjacent test areas had similar assemblages in the Steepbank River, test group 1 was similar to test group 2, while in the Ells, test groups 2 and 3 were similar. Test area assemblages tended to have higher abundances of pollution tolerant taxa.

2. Are changes in water quality and/or water quantity and/or biological health informing Indigenous key questions and concerns?

We are monitoring benthic macroinvertebrates, which are an ideal indicator of the ecological health of the riverine ecosystems. In addition, benthic macroinvertebrates are critical food items for fish. We expect that local communities will have questions regarding the activities and results of the Benthos

Monitoring Program especially in regards to the ecological health of these important systems. Therefore, engagement with communities has already begun. However, we will coordinate engagement with the CBM Program to initiate and/or continue discussions with Indigenous communities regarding their questions or concerns around all aspects of the Benthos Monitoring program.

3. Are data produced following OSM Program requirements and provided into the OSM Program data management system?

Yes. The benthic macroinvertebrate data through 2017 has been uploaded to the Oil Sands Data Portal and is available to the public at http://donnees.ec.gc.ca/data/substances/monitor/benthic-invertebrates-oil-sands-region/. Similarly, the supporting water quality data through March 2018 is also available at the same link. We will continue to add data to the Oil Sands Data Portal annually. In addition, upon request unverified/unvalidated data is provided to partners and public.

4. Do methodologies use relevant Standard Operating Procedures/ Best Management Practices/ Standard Methods?

Yes. Information on Standard Operating Procedures and Best Management Practices are available at the following link http://environmentalmonitoring.alberta.ca/resources/standards-and-protocols/
As well, the national CABIN field and laboratory manual are publically available at https://www.canada.ca/en/environment-climate-change/services/canadian-aquatic-biomonitoring-network/resources.html.
In addition to those links above, the following Standard Operating Procedure is available internally and upon request.
1) Luiker, E., D. Halliwell, R.B. Brua, D. Hryn and J.M. Culp. 2018. Benthic macroinvertebrate biomonitoring program: Mainstem Athabasca River. Environment and Climate Change Canada, Water Science & Technology, Watershed Hydrology and Ecosystem Research Division, Saskatoon, SK, Canada. 17pp.

5. How does the monitoring identify integration amongst projects, themes or with communities?

The core long-term Benthos adaptive monitoring program is integrated with the surface water quality and fish health core monitoring programs. This integration is used to inform and synthesize results of each monitoring program. This program also integrates with the atmospheric program as deposition of contaminants potentially impacts benthic macroinvertebrate health as the mainstem Athabasca River and tributaries are receiving bodies of these contaminants through deposition and overland runoff. Results of this program integration from 2012-2014 has been recently published (Culp et al. 2021). In addition, linkages exist between the Mainstem Benthos program and the Enhanced Monitoring Program. We will continue to add data to the Oil Sands Data Portal annually.

6. 7.6. Where does the monitoring fit on the conceptual model within the EEM framework for the theme area and relative to the conceptual model for the OSM Program theme area? How will this work advance understanding transition towards of the conceptual model EEM framework?

Benthos Monitoring is part of the Response component of the Surface Water Conceptual Model of the OSM Program. The specific design of this OSM Benthos Monitoring program assesses if changes in benthic macroinvertebrate indicators (Response) relative to the Pressure/Stressor components (landscape disturbance, air emissions, spills, production, seepage; sediments, nutrients, inorganic and organic substances) and the associated Pathways or routes of exposure (overland flow, atmospheric deposition, fluvial transport) exist. The study design of the Benthos Monitoring program will directly provide information toward a transition to the conceptual model of an Adaptive Monitoring approach, such as EEM, for OSM. For example, existing and newly acquired data has been able to establish Baseline conditions and is currently used for Surveillance monitoring to detect change, determine Confirmation of change, and calculate Critical Effect Sizes of indicators of benthic macroinvertebrates. Benthos Monitoring will continue to link Pressures/Stressors and the associated Pathways on Responses of indicators of benthic macroinvertebrates.

7. Is the work plan contributing to Programmatic State of Environment Reporting?

Yes, Benthos Monitoring data from 2012-2017 was used to calculate indicators of benthic macroinvertebrates used in the Programmatic State of Environment (SoE) reporting. In addition, we will continue to develop indicators, and critical effects sizes for benthic macroinvertebrates used in the adaptive monitoring framework. Project team members from this work plan contributed data, analyses, figures, and text to the 2021 SoE report, and will continue to do as required.

3.3.2 Groundwater Theme

3.3.2.1 Sub Themes:

Choose an item.

3.3.2.2 Groundwater Key Questions

Explain how your groundwater monitoring program addresses the key questions below.

1.Are changes occurring in groundwater quality and/or quantity, to what degree are changes attributable to oil sands activities, are changes affecting other ecosystems, and what is the contribution in the context of cumulative effects?

Click or tap here to enter text.

2. 2. Are changes in groundwater quality and/or quantity informing Indigenous key questions and concerns Indigenous concerns and health?

Click or tap here to enter text.

3. Are data produced following OSM Program requirements and provided into the OSM Program data management system?

Click or tap here to enter text.

4. Do methodologies use relevant Standard Operating Procedures/ Best Management Practices/ Standard Methods?

Click or tap here to enter text.

5. How does the monitoring identify integration amongst projects, themes or with communities?

Click or tap here to enter text.

6. Where does the monitoring fit within the EEM framework and relative to the theme area? How will this work advance transition towards the EEM framework?

Click or tap here to enter text.

7. Where does the monitoring fit on the conceptual model for the theme area and relative to the conceptual model for the OSM Program? How will this work advance understanding of the conceptual model?

Click or tap here to enter text.

8. Is the work plan contributing to Programmatic State of Environment Reporting?

Click or tap here to enter text.

3.3.3 Wetlands Theme

3.3.3.1 Sub Themes:

Choose an item.

3.3.3.2 Wetland - Key Questions

Explain how your wetland monitoring program addresses the key questions below.

1. Are changes occurring in wetlands due to contaminants and hydrological processes, to what degree are changes attributable to oil sands activities, and what is the contribution in the context of cumulative effects?

Click or tap here to enter text.

2. Are changes in wetlands informing Indigenous key questions and concerns?

Click or tap here to enter text.

3. Are data produced following OSM Program requirements and provided into the OSM Program data management system?

Click or tap here to enter text.

4. Do methodologies use relevant Standard Operating Procedures/ Best Management Practices/ Standard Methods?

Click or tap here to enter text.

5. How does the monitoring identify integration amongst projects, themes or with communities?

Click or tap here to enter text.

6. Where does the monitoring fit within the EEM framework and relative to the theme area? How will this work advance transition towards the EEM framework?

Click or tap here to enter text.

7. Where does the monitoring fit on the conceptual model for the theme area and relative to the conceptual model for the OSM Program? How will this work advance understanding of the conceptual model?

Click or tap here to enter text.

8. Is the work plan contributing to Programmatic State of Environment Reporting?

Click or tap here to enter text.

3.3.4 Air Theme

3.3.4.1 Sub Themes:

Choose an item.

3.3.4.2 Air & Deposition - Key Questions

Explain how your air & deposition monitoring program addresses the key questions below.

1. Are changes are occurring in air quality, to what degree are changes attributable to oil sands emissions, and what is the contribution in the context of cumulative effects?

Click or tap here to enter text.

2. Are changes informing Indigenous key questions and concerns?

Click or tap here to enter text.

3. Are data produced following OSM Program requirements and provided into the OSM Program data management system?

Click or tap here to enter text.

4. Do methodologies use relevant Standard Operating Procedures/ Best Management Practices/ Standard Methods?

Click or tap here to enter text.

5. How does the monitoring identify integration amongst projects, themes or with communities?

Click or tap here to enter text.

6. Where does the monitoring fit within the EEM framework and relative to the theme area? How will this work advance transition towards the EEM framework?

Click or tap here to enter text.

7. Where does the monitoring fit on the conceptual model for the theme area and relative to the conceptual model for the OSM Program? How will this work advance understanding of the conceptual model?

Click or tap here to enter text.

8. Is the work plan contributing to Programmatic State of Environment Reporting? (Answer Box)

Click or tap here to enter text.

3.3.5 Terrestrial Biology Theme

3.3.5.1 Sub Themes:

Choose an item.

3.3.5.2 Terrestrial Biology - Key Questions

Explain how your terrestrial biological monitoring program addresses the key questions below.

1. Are changes occurring in terrestrial ecosystems due to contaminants and landscape alteration, to what degree are changes attributable to oil sands activities, and what is the contribution in the context of cumulative effects?

Click or tap here to enter text.

2. Are changes in terrestrial ecosystems informing Indigenous key questions and concerns?

Click or tap here to enter text.

3. Are data produced following OSM Program requirements and provided into the OSM Program data management system?

Click or tap here to enter text.

4. Do methodologies use relevant Standard Operating Procedures/ Best Management Practices/ Standard Methods?

Click or tap here to enter text.

5. How does the monitoring identify integration amongst projects, themes or with communities?

Click or tap here to enter text.

6. Where does the monitoring fit within the EEM framework and relative to the theme area? How will this work advance transition towards the EEM framework?

Click or tap here to enter text.

7. Where does the monitoring fit on the conceptual model for the theme area and relative to the conceptual model for the OSM Program? How will this work advance understanding of the conceptual model?

Click or tap here to enter text.

8. Is the work plan contributing to Programmatic State of Environment Reporting?

Click or tap here to enter text.

3.3.6 Cross-Cutting Across Theme Areas

3.3.6.1 Sub Themes:

Choose an item.

If "Other" was selected from the drop down list above please describe below:

Click or tap here to enter text.

3.3.6.2 Cross-Cutting - Key Questions

Explain how your cross-cutting monitoring program addresses the key questions below.

1. Is data produced following OSM Program requirements and provided into the OSM Program data management system?

Click or tap here to enter text.

2. Do methodologies use relevant Standard Operating Procedures/ Best Management Practices/ Standard Methods?

Click or tap here to enter text.

3. How does the monitoring identify integration amongst projects, themes or with communities?

Click or tap here to enter text.

4. Where does the monitoring fit within the EEM framework and relative to the theme area? How will this work advance transition towards the EEM framework?

Click or tap here to enter text.

5. Where does the monitoring fit on the conceptual model for the theme area and relative to the conceptual model for the OSM Program? How will this work advance understanding of the conceptual model?

Click or tap here to enter text.

6. Is the work plan contributing to Programmatic State of Environment Reporting?

Click or tap here to enter text.

4.0 Mitigation

Evaluation of Mitigation Criteria (Information Box Only- No action required)
Your workplan will be evaluated against the criteria below. A successful workplan would potentially inform:

- efficacy of an existing regulation or policy
- an EPEA approval condition
- a regional framework (i.e., LARP)
- an emerging issue

Explain how your monitoring program informs management, policy and regulatory compliance. As relevant give consideration for the EEM framework and the approved Key Questions.

Changes associated with oil sands development in benthic macroinvertebrate indicators (See State of Environment report for some examples) derived from the Benthos Monitoring Program can be used to inform management decisions regarding oil sands development activities. When indicators differ from Baseline or Reference areas, are confirmed, and exceed some critical effect size suggesting that environmental health is decreasing, changes to management styles can be made. In addition, changes in benthic macroinvertebrate indicators can be used to evaluate cumulative effects of current and future developments. Moreover, these benthic macroinvertebrate indicators could be used to assess effects of future developments and mine expansions, as well as for future discharges of treated OSPW into the Athabasca River. Once baseline is established in additional areas (Peace River, Christina River, Cold Lake), similar assessments will be possible.
Lastly, data collected as part of the Benthos Monitoring Program will be used to assess the impact of emerging issues with respect to aquatic ecosystem health. A recent example of this is the use of OSM data in assessments of the impact of the 2016 Horse River Wildfire on the benthic macroinvertebrate assemblages and ecosystem health in the Lower Athabasca River (draft manuscript).

5.0 Indigenous Issues

Evaluation of Indigenous Issues Criteria (Information Box Only- No action required)
Your workplan will be evaluated against the criteria below. A successful workplan would potentially:

- Investigate Indigenous communities key questions and concerns
- Includes culturally relevant receptor(s) and indicator(s)
- Include or be driven by Indigenous communities (participatory or collaborative)
- Develop capacity in Indigenous communities
- Include a Council Resolution or Letter of Support from one or more Indigenous communities
- Describe how ethics protocols and best practices regarding involvement of Indigenous peoples will be adhered to
- Provide information on how Indigenous Knowledge will be collected, interpreted, validated, and used in a way that meets community Indigenous Knowledge protocols

Explain how your monitoring activities are inclusive and respond to Indigenous key questions and concerns and inform the ability to understand impacts on concerns and inform Section 35 Rights

In the Benthos Monitoring Program indicators of benthic macroinvertebrates are evaluated to detect changes in the ecological health of aquatic ecosystems. Thus, monitoring of benthic macroinvertebrates are directly related to water quality and health of aquatic organisms inhabiting aquatic ecosystems of concern to Indigenous communities.
As needed and requested the activities in this workplan will link Indigenous Community-Based Monitoring (ICBM) projects. Benthos monitoring team members will participate in all activities as appropriate and as availability allows identified in the ICBM work plan. This engagement will aim to develop and increase capacity in Indigenous communities throughout the OSM area. Working directly with communities and community representatives to ensure Indifenous Knowledge is collected, interpreted, validated and used in a way that meets each community's protocols would also be an outcome of engagement with Indigenous communities.

Does this project include an Integrated Community Based Monitoring Component?

No

6.0 Measuring Change

Evaluation of Measuring Change Criteria (Information Box Only- No action required)
Your workplan will be evaluated against the criteria below. A successful workplan would potentially:

- assess changes in environmental conditions compared to baseline (e.g., validation of EIA predictions)
- report uncertainty in estimates and monitoring is of sufficient power to detect change due to oil sands development on reasonable temporal or spatial scales
- include indicators along the spectrum of response (e.g., individual, population, community)
- focus on areas of highest risk (where change is detected, where change is greater than expected, where development is expected to expand (collection of baseline)
- measure change along a stressor gradient or a stressor/reference comparison

Explain how your monitoring identifies environmental changes and can be assessed against a baseline condition. As relevant give consideration for the EEM framework and the approved Key Questions.

This work plan will generate the benthic invertebrate monitoring data necessary to assess environmental condition relative to baseline or Reference areas. In the Mainstem Athabasca River, the rigorous, EEM-style, gradient study design used in the JOSM program to collect Baseline data and to compare with Reference Areas was able to document spatially confirmed changes in BMI assemblages. The study design for the tributary biomonitoring followed that outlined in the JOSM recommendations and included replicate sites within Reference and Test areas with an extensive gradient within tributaries rather than a simple upstream downstream approach as in previous studies. In the recent State of Environment reporting, aquatic invertebrate data was used to report results spanning 6 years (2012-2017), thus advancing the assessments by an additional 3 years from those previously reported (Culp et al., 2018, 2020). Brief examples of changes reported in the draft State of Environment report include:
In the Lower Athabasca River, assemblages of aquatic invertebrates at oil sands development, municipal sewage and Recovery sites were all different from assemblages from Reference areas.
o As well, benthic macroinvertebrate assemblages at oil sands development sites differed from all other potentially impacted areas (municipal sewage effluent and Recovery).
o Assemblages at oil sands development and municipal sewage effluent sites were comprised of more pollution tolerant taxa than reference sites
In two major tributaries of the Lower Athabasca River, the Steepbank and Ells rivers, sites from upstream Reference areas within the same tributary had different invertebrate assemblages from downstream, potentially impacted (i.e., test) areas.
o In general, test areas further away from the Reference area had greater differences in aquatic invertebrate assemblages, while several adjacent test areas had similar assemblages; in the Steepbank River, test group 1 was similar to test group 2, while in the Ells, test groups 2 and 3 were similar.
o Test area assemblages tended to have higher abundances of pollution tolerant taxa.
Further examples are provided in the draft State of Environment report. It is clear that the study designs (including sampling sites, sampling frequency and indicators) provide sufficient statistical power to detect changes in key benthic macroinvertebrate indicators.
As a confirmed change has be documented, the next phase, and a key priority for the 2022-23 work plan, includes the continued review and development of updated approaches to establishing critical effect sizes, natural temporal and spatial variability, as well as key indicators of change in benthic macroinvertebrate assemblages applicable to OSM areas.
The Benthos Monitoring team, having reviewed several presentations on proposed approached for moving forward with refining an Adaptive Monitoring approach for OSM, have worked through several scenarios. For both the Mainstem and Tributary programs, the following was concluded based on the 2018 Technical Reports and more recent data analysis for the State of Environment reporting; both the Mainstem Athabasca River and Tributary Biomonitoring OSM program have:

1) Established Baseline for Reference and accumulated state in exposure areas (e.g., oil sands development areas);
2) Demonstrated statistically significant differences (i.e., changes) among Reference and exposure areas;
3) Have confirmed these effects (over 6 years);
4) Have established the geographical extent of these changes (i.e., study designs included sites within the entire basin(s) from upstream of all oil sands activities in the Athabasca River or upper headwaters in the tributaries to at or near the mouth.

Thus, both of these established adaptive monitoring programs are continueing to move forward with investigating new and updated approaches to setting critical effect sizes and normal ranges of variability. This work will include a scientific review, validation (i.e., does it capture known effects of concern), consultation with the Adaptive Monitoring work plan and consultations with partners, stakeholders and Indigenous communities through the ICBMAC.
Once critical effect sizes can be established, the Benthos Monitoring programs will continue in the Adaptive Monitoring framework to determine if changes to sites/frequency are warranted while continuing to assess future results (i.e., assess if new change appears or current changes continue or are getting worse/better).
The In-situ Biomonitoring in the Peace River, Christina River and Cold Lake oil sands monitoring areas are continuing to establish baseline and evaluate study design options

7.0 Accounting for Scale

Evaluation of Accounting for Scale Criteria (Information Box Only- No action required)
Your workplan will be evaluated against the criteria below. A successful workplan would potentially be:

- appropriate to the key question and indicator of interest
- relevant to sub-regional and regional questions
- relevant to organism, population and/or community levels of biological organization
- where modelled results are validated with monitored data
- where monitoring informs on environmental processes that occur at a regional scale. e.g. Characterizing individual sources to gain a regional estimate of acid deposition and understand signal from individual contributing sources.

Explain how your monitoring tracks regional and sub-regional state of the environment, including cumulative effects. As relevant give consideration for the EEM framework and the approved Key Questions.

This work plan collects the data necessary to inform evaluation and reporting activities focused on answering the key OSM questions. The robus benthic macroinvertebrate long-term core monitoring programs were designed for regional, sub-regional and cumulative effects assessments. Sampling sites are located inside and outside of the bitumen deposit. Sites outside and inside the deposit are considered Reference sites. In addition, sites located in the oil sands development region were located upstream and downstream of major tributary inputs to capture any change associated with those activities. This design also can capture cumulative effects as sampling locations are situated along the Athabasca River exposed to natural factors as well as oil sands development and municipal discharge.

The similarly robust tributary benthic macroinvertebrate monitoring plan was designed to assess the status of invertebrate communities regionally (several major tributaries in each of the Athabasca, Peace, and Cold Lake oil sands deposit areas) and sub-regionally (watershed scale), with sites located in Reference areas outside and inside oil sands geology as well as within areas of oil sands development. The program was designed to assess benthic macroinvertebrate community changes along a stressor gradient and inform on cumulative effects from natural and human sources.
Thus, the program design spans multiple spatial scales, from small watersheds like the Steepbank River watershed, up to collecting the information on the gradient of the Athabasca River from upstream of all oil sands development activities through to the downstream river reaches just prior to entering the Peace-Athabasca Delta

8.0 Transparency

Evaluation of Transparency Criteria (Information Box Only- No action required)
Your workplan will be evaluated against the criteria below. A successful workplan would potentially include:

- a plan for dissemination of monitoring data, including appropriate timing, format, and aligns with OSM program data management plan
- demonstrated transparency in past performance
- identified an annual progress report as a deliverable
- reporting of monitoring results occurs at timing and format that is appropriate for recipient audience.

Explain how your monitoring generates data and reporting that is accessible, credible and useful. As relevant give consideration for the EEM framework and the approved Key Questions.

The data resulting from the robust Benthos Monitoring programs for the Mainstem and Tributaries is disseminated through the publicly accessible Oil Sands Data Portal. The Oil Sands Data Portal houses all of our benthic macroinvertebrate and water chemistry data associated with all sampling sites. Data through 2018 is available on the portal with data through 2019 to be uploaded in 2022. Some data takes up to 12 months post data-collection to receive the data back from the laboratories. It then needs to be QA/QC'ed and transformed into an acceptable format for the portal. Therefore, data collected in the previous year is being loaded onto the data portal typically in the 3rd Quarter of the subsequent year

9.0 Efficiency

Evaluation of Efficiency Criteria (Information Box Only- No action required)
Your workplan will be evaluated against the criteria below. A successful workplan would include:

- appropriately addressed a risk-informed allocation of resources
- identified the role and justification for each staff member on the proposed work plan
- identified in-kind and leveraged resources (e.g., resources and approaches are appropriately shared with other OSM projects where possible)
- established partnerships (value-added) and demonstrated examples of coordinated efficiencies (e.g., field, analytical)
- identified co-location of monitoring effort
- demonstrated monitoring activities and information collected are not duplicative
- considered sampling/measurement/methods compatibility to other data sources (e.g., AER)

Explain how your monitoring is integrated with other OSM projects and incorporates community-based participation and/or engagement in proposed monitoring activities. As relevant give consideration for the EEM framework and the approved Key Questions.

The Benthos Monitoring program work plan includes benthic invertebrate and water chemistry sampling. This program was initially designed with co-location of study sites among monitoring programs (e.g., water quality, fish health) for study efficiency, maximum power, and synthesis of interpretation (Culp et al. 2018, 2021), which continues in this work plan. In addition, we have highlighted in the Field Monitoring Schedule the Benthos Monitoring sites that are integrated with other OSM programs Our teams have identified specific roles of personnel in section 15.0 in this work plan. In addition, the Benthos Monitoring program is in communication with the Community Based Monitoring Program to enhance the ability to answer key OSM questions and to reduce the potential for duplication of programs. This Community Based Monitoring Program work plan may include community meetings, engagement, training, and potential initial sample collection.

10.0 Work Plan Approach/Methods

10.1 List the Key Project Phases and Provide Bullets for Each Major Task under Each Project Phase *

1. Data Collection
1.1. Preparation for field work (ordering supplies, procuring helicopter support, etc.)
1.2. Collection of samples, field measurements, and observations recorded
1.3. Shipping and submission to designated laboratory

2. Laboratory analyses
2.1. Acknowledgement of sample arrival from labs
2.2. Analysis of sample for requested parameters
2.3. Laboratory specific quality assurance and quality control
2.4. Delivery of results as both electronic data file and laboratory report (PDF)

3. Data Management
3.1. Field and lab data received and uploaded to database
3.2. Review of results including matching with sample metadata and verification and validation of data
3.3. Preparation of data release files in machine readable format (e.g., CSV format)
3.4. Review and approval for data release
3.5. Public data release
4. State of Environment Reporting
4.1. Data organization, data analysis
4.2. Review of benthic macroinvertebrate indicators
4.3. Evaluation of Baseline, Reference, exposure areas
4.4. Evaluation of change, confirmation, limits of change, magnitude of change, and critical effect size
4.5. Prepare State of Environment report

5) Prepare additional deliverable items, presentations, peer-reviewed articles

10.2 Describe how changes in environmental Condition will be assessed *

Indicators of benthic macroinvertebrates are used to assess aquatic ecosystem health. Change will be evaluated first for statistical differences relative to Reference areas or Baseline. If statistical change is observed and confirmed, then further investigation will be implemented to examine natural variability and critical effect size of benthic macroinvertebrate indicators. Please note, that Baseline is still being developed and evaluated for Christina River, Peace River, and Cold Lake regions. In addition, Baseline/Reference indicators of benthic macroinvertebrates are continually being evaluated to develop more detailed effect sizes to aid in making more informed adaptive monitoring and management decisions.

10.3 Are There Benchmarks Being Used to Assess Changes in Environmental Condition? If So, Please Describe, If Not, State "NONE" *****

Benthic macroinvertebrate indicators of ecosystem health are used to assess change relative to Reference areas. These Reference areas include sites outside natural bitumen exposure, inside natural bitumen exposure, sites exposed to oil sand development, and, if applicable, sites of municipal and oil sands development sewage effluent. All of these monitoring sites can provide Baseline information against which benthic macroinvertebrate indicators of change (spatial or temporal change) can be assessed

(e.g., objectives, tiers, triggers, limits, reference conditions, thresholds, etc.)

10.4 Provide a Brief Description of the Western Science or Community-Based Monitoring Indigenous Community-Based Monitoring Methods by Project Phase *

1) The Benthos Monitoring program for the Tributary sites in the Lower Athabasca River and Birch Mountains, Christina River, and Peace River and Cold Lake Oil Sands Regions will focus on kick sampling

and expanded CABIN protocol in erosional habitats (these methods can be found at Standards and Quality Program and Resources for Conducting Aquatic Biomonitoring). Laboratory methods will be provided by contracted labs and reviewed by AEP and ECCC staff to ensure they are appropriate for the parameters measured.
It is intended that primary sites outlined below will be sampled annually to track temporal changes in Reference and test sites. Additional Reference and test sites will be sampled on a rotational basis with particular attention to those years when hydrologic conditions are outside of the normal range (extreme high or low flows).
2) Greater than 100 sampling locations were established between 2011-2016 in the Athabasca Oil Sands Region. From these locations a total of 40-50 erosional sites will be sampled annually from autumn of 2017-2021 in the Lower Athabasca River Oil Sands Mineable Area and Birch Mountains. To date, more than 30 sites have been established in the Peace River OSR and Christina River watershed, and reconnaissance has occurred in the Cold Lake OSR that has identified sampling sites. In 2022/23 sampling will occur in the Christina River and field reconnaissance will occur to identify additional sites in the Peace River OSR.
3) Benthos samples collected in autumn will be sorted, identified and enumerated along with QA/QC analysis according to Environment Canada (2012, 2014) by a contractor. Water quality and SPMD samples collected in autumn of the previous year will be analysed, verified and validated. Water samples collected in the autumn will be submitted to contracted labs for analysis. SPMD samples collected in autumn will be submitted to the contractor for analysis. Chl-a samples collected in autumn will be analysed and QA/QC completed.
4) Data analysis of all data collected in the autumn of the previous year will be undertaken and placed into context of the previous sampling years for State of Environment reporting. Analysis of data for additional benthic macroinvertebrate indicators will be performed.
5) Data analysis will continue for deliverable items, presentations, peer-reviewed articles.

1) The Benthos Monitoring program for the Mainstem Athabasca River focus on kick sampling in cobble habitats. Detailed methods can be found in Luiker et al. 2018 (See section 4 above for the reference).
2) Monitoring includes annual sampling of 10 core, cobble locations (M0, M0A, M1A, M2A, M3, M3B, M4, M6, M8 & M9) with another 2 cobble sites (M7, M7C) that rotate every 2 years to enhance the data for the oil sands development activity sites and to assess cumulative effects. Please note, that part of the adaptive nature of the Benthos Monitoring Program, sampling of sand reaches has been discontinued as the assessment of 2012-2015 JOSM data indicated these sites have low biodiversity and high variability.
3) Benthos samples collected in autumn will be sorted, identified and enumerated along with QA/QC analysis according to Environment Canada (2012, 2014) by a contractor. Water quality and SPMD samples collected in autumn of the previous year will be analysed, verified and validated. Water samples collected in the autumn will be submitted to contracted labs for analysis. SPMD samples collected in autumn will be submitted to the contractor for analysis. Chl-a samples collected in autumn will be analysed and QA/QC completed.
4) Analysis of all data collected in the autumn of the previous year will be undertaken and placed into context of the previous sampling years for State of Environment reporting. Analysis of data for additional benthic macroinvertebrate indicators will be performed.
5. Data analysis will continue for deliverable items, presentations, peer-reviewed articles.

10.5 List the Key Indicators Measured, If Not Applicable, State N/A *****

All key indicators used in the Benthos Monitoring program were identified in the initial 2011 Integrated Monitoring Plan for the Oil Sands: Expanded Geographic Extent for Water Quality and Quantity, Aquatic Biodiversity and Effects, and Acid Sensitive Lake Component. Key indicators that continue to be used and evaluated in the Benthos Monitoring Program include the benthic macroinvertebrate assemblage, EEM benthic macroinvertebrate endpoints (total abundance, Simpson's Diversity, Simpson's Evenness, Taxa Richness and Bray-Curtis), and additional endpoints, such as Trichoptera (caddisfly) Abundance. Several of these were included in the State of Environment report produced by the principal investigators of this work plan. The metabolome (collection of all small molecules), as identified as an indicator in the 2011 Integrated Monitoring Plan for the Oil Sands, is another key benthic macroinvertebrate indicator and has been incorporated into the Benthos Monitoring Program. This indicator has shown to be quite sensitive to environmental stressors, such as naphthenic acids (Pomfret et al. 2021), oil sands

development and wastewater (Brua et al. 2021; Brua, in preparation), and has been identified as a good indicator for biomonitoring (Pomfret et al. 2020). Moreover, changes in the metabolome can be indicative of changes in biological fitness, such as survival, growth and reproductive capacity, which have implications for ecological effects on benthic macroinvertebrate populations and communities. Evaluation of additional indicators identified in the 2011 Integrated Monitoring Plan for the Oil Sands continues for potential incorporation into the Benthos Monitoring program.

11.0 Knowledge Translation

In the space below, please provide the following:

- *Describe the plan for knowledge transfer and distribution of learnings from the project. This could include workshops, publications, best practice documentation, marketing plan, etc.*
- *Demonstrate that the knowledge transfer plan is appropriate for the intended end-users.*

Over the past several years, standard operating procedures have been developed to sample benthic macroinvertebrates and supporting variables, such as water quality data. These documents are available (see section 3.4.1.2 #4) and can be used by other monitoring groups to ensure consistency in sampling regimes and data used to assess change in benthic macroinvertebrate indicators in the Oil Sands Areas of Alberta. We have published a Benthos Monitoring integration document from the first 3 years of JOSM (Culp et al. 2018). Pomfret et al. 2020; Klemt et al. 2021; Brua et al. 2021; Musetta-Lambert et al. in prep, Luiker et al. in prep).

12.0 External Partners

List by project or project phase each component that will be delivered by an external party (including analytical laboratories) and name the party. Describe and name the associate work plan/grant/contract for these services. * state none if not required

Contracts with helicopter providers will be established according to ECCC procurement processes.

A number of contracts will be established with external analytical laboratories according to AEP and ECCC procurement processes. This process is ongoing currently and it is anticipated to be complete by the end of this fiscal year.

University of Calgary (contact Dr. Fred Wrona). A grant focused on supporting a graduate student(s) as a collaborative effort between Nancy Glozier and Bob Brua (Environment and Climate Change Canada (ECCC), Justin Hanisch (AEP) and Dr Fred Wrona (University of Calgary) and are of mutual interest to all parties. Each project will help contribute to an improved understanding of biological processes in the Athabasca Oil Sands Region and will be of benefit to the Oil Sands Monitoring Program (OSM). The potential first project would include a Masters student (UofC) who would build on a historical dataset collected by ECCC in the Christina Lake Watershed, along the Christina River, and link to the contemporary sampling being conducted through the core biomonitoring program. This project will focus on identifying how benthic community composition may have changed since historical sampling in the mid-1990s in the tributaries to the Christina River. A second potential project would include historical datasets collected by ECCC and Dr Wrona in tributaries of the Athabasca River, the student will be focused on identifying spatio-temporal patterns in autotrophic production (i.e., chlorophyll-a concentrations). A focus will be on determining if observed patterns can be predicted statistically along pre-defined landscape/development related disturbance gradients within the tributary watersheds. Additionally, the student will conduct a limited field campaign to evaluate the efficiency and biases associated with sampling method on productivity estimates.

*To ensure complete work plan proposal submission, all grants and contracts listed in this section should also be captured in Grants & Contracts.

13.0 Data Sharing and Data Management

For 2022-23 the following approach will be taken by the OSM Program related to data sharing.

For all work plans of a **western science** nature funded under the OSM Program, data sharing is a condition of funding and must align with the principle of **"Open by Default"**. In this case, all data is to be shared with the OSM Program as directed by the OSM Program Data Management work plan.

For all work plans involving **Indigenous Knowledge** as defined below and funded under the OSM Program, data sharing is a condition of funding and the Indigenous Knowledge components of the work plan must align with the principle of **"Protected by Default".** In this case, all data as defined as Indigenous Knowledge, are to be retained by the Indigenous community to which the Indigenous Knowledge is held.

Indigenous Knowledge is defined as:

> "The knowledge held by First Nations, Inuit and Métis peoples, the Aboriginal peoples of Canada. Traditional knowledge is specific to place, usually transmitted orally, and rooted in the experience of multiple generations. It is determined by an Aboriginal community's land, environment, region, culture and language. Traditional knowledge is usually described by Aboriginal peoples as holistic, involving body, mind, feelings and spirit. Knowledge may be expressed in symbols, arts, ceremonial and everyday practices, narratives and, especially, in relationships. The word tradition is not necessarily synonymous with old. Traditional knowledge is held collectively by all members of a community, although some members may have particular responsibility for its transmission. It includes preserved knowledge created by, and received from, past generations and innovations and new knowledge transmitted to subsequent generations. In international or scholarly discourse, the terms traditional knowledge and Indigenous knowledge are sometimes used interchangeably."

This definition was taken from the Canadian Government's Tri-council Policy Statement for Ethical Research involving Humans (Chapter 9, pg. 113) and is an interim definition specific to the Oil Sands Monitoring Program.

Data Sharing and Data Management Continued

13.1 Has there, or will there be, a Data Sharing Agreement established through this Project? *

YES

13.2 Type of Quantitative Data Variables:

Both

13.3 Frequency of Collection:

Other

13.4 Estimated Data Collection Start Date:

2022-08-15

13.5 Estimated Data Collection End Date:

2022-10-31

13.6 Estimated Timeline For Upload Start Date:

2023-02-01

13.7 Estimated Timeline For Upload End Date:

2023-03-31

13.8 Will the data Include traditional knowledge as defined by and provided by an Indigenous representative, Community or Organization?

NO

TABLE 13.9 Please describe below the Location of Data and Data Type:

Add a Data Source by clicking on the table and then clicking on the blue "+" symbol on the bottom right side of table

Name of Dataset	Location of Dataset (E.g.: Path, Website, Database, etc.)	Data File Formats (E.g.: csv, txt, API, accdb, xlsx, etc.)	Security Classification
Mainstem and Tributary Biomonitoring	ECCC OS Portal	Various including csv	Open by Default
AEP Water Quality Data	AEP Data Portal	Various including csv	Open by Default

14.0 2022/23 Deliverables

Add an additional deliverable by clicking on the table and then clicking on the blue "+" symbol on the bottom right side of table.

Type of Deliverable	Delivery Date	Description
Peer-reviewed Journal Publication	Q4	Glozier & Ritcey – Submit Shifts in benthic invertebrate communities in tributaries to the Athabasca River, in the Oil Sands Region of Canada
Technical Report	Q4	Brua & Glozier – Finalizing draft indicators of change in BMI communities applicable in the OSM program
Technical Report	Q4	Glozier & Brua - Finalizing draft Assessment of critical effect sizes for BMI communities applicable in the OSM program
OSM Program Annual Progress Report (required)	Q4	Glozier & Brua – quarterly and annual reporting as required
Choose an item.	Choose an item.	Click or tap here to enter text.
Key Engagement/Participation Meeting	Q4	TAC participation for PIs and component leads as required (Q1-Q4)
Key Engagement/Participation Meeting	Q4	As needed and determined in the CBM work plan, PIs and work plan team members be available for engagement meetings, training and other community engagement requests, Q1-Q4
Condition of Environment Report	Q4	As needed in the SOER work plan, PIs and work plan team members provide data, advice, analysis and interpretation for 2023 SOER updates
Other (Describe in Description Section)	Q4	As needed in the Adaptive Framework Development work plan, PIs and work plan team members provide advice to the development workshops as invited.

Other (Describe in Description Section)	Q4	Glozier & Ritcey – review confirmed drivers from tributary manuscript and investigate approaches for determing cause in the Steepbank River

Other (Describe in Description Section)	Q4	ECCC & AEP – provide data for surface water quality and benthic invertebrates as available to Internal and OSM data systems.

15.0 Project Team & Partners

In the space below please provide information on the following:

- *Describe key members of the project team, including roles, responsibilities and expertise relevant to the proposed project.*
- *Describe the competency of this team to complete the project.*
- *Identify any personnel or expertise gaps for successful completion of the project relative to the OSM Program mandate and discuss how these gaps will be addressed.*
- *Describe the project management approach and the management structure.*

Mainstem Benthos Monitoring (ECCC; in-kind & VNR)

Primary Scientific Staff:

Robert Brua (Research Scientist): Co-PI and study Lead for all Mainstem biomonitoring studies – Design of mainstem study, field work, analysis of data, data interpretation, providing presentations, and preparation of reports and publications;
Eric Luiker (Biologist): Contribution to administration, field work, data preparation, data analysis, and preparation of reports and publications;

Primary Technical Staff:

Daryl Halliwell (Field Technician): Field logistics and delivery of field work and lab analyses, data preparation, and preparation of reports and publications;
Co-op Student – Assistance of field work preparations, field work, lab analyses, data preparation;

It was identified in previous a previous Surface Water Work Planning workshop that assistance was needed by the core biomonitoring program for data preparation and analysis, and preparation of deliverables, including State of Environment report. As a result, additional personnel have been identified to address these gaps and successfully meet the reporting deliverables of the Mainstem Benthos Monitoring program. To meet these deliverables the following personnel have been identified and would include a Technician (Casual employment) and term Physical Scientist for 12 months and a casual Physical Scientist for 6 months.

Mainstem Technician (Casual) - Lab analyses, preparation and analysis of data, preparation of publications
Physical Scientist (Term)– Data preparation, analysis, and interpretation, writing of State of Environment report, manuscript

Tributary Benthos Monitoring - including FMM, Peace, Christina and Cold Lake areas (ECCC; in-kind & VNR)

Primary Scientific Staff:

Nancy Glozier (Arctic-Athabasca Section Manager) – Co-PI for work plan and study Lead for all tributary biomonitoring studies;
Allison Ritcey (Aquatic Ecologist) – FMM, Christina and Cold lake areas co-lead;
Lucie Levesque (Senior Aquatic Scientist) – Lead ECCC link to CBM work plan
Julie Roy (Aquatic Scientist) – guidance for SPMD data processing;
Emily McIvor (Aquatic Scientist) – support to the biomonitoring programs for training and fieldwork as required;
Minzhen Su (Data Scientist) – Water Quality Database management and distribution

Primary Technical Staff:

Jim Syrgiannis, Erica Keet, Jennifer Maines, Leah Dirk (Aquatic Technicians) – primary field technicians to support biomonitoring sampling

Vijay Tumber (Senior Aquatic Data Technician) – WQ data tracking and QA

It was identified in previous Surface Water Work Planning workshops, that there is a requirement by the core biomonitoring program for temporary assistance to ensure data distribution, analysis, interpretation and writing of reports including the SOER are timely. Additional personnel have been identified to address these gaps and successfully meet the reporting deliverables for the benthos program. Specifically a term Physical Scientist will be hired for 12 months to work on water quality and biomonitoring gaps identified for reporting.

Physical Scientist (Term)– Data preparation, analysis, and interpretation, writing of State of Environment report, manuscript

Mainstem Benthos Monitoring & Tributary Benthos Monitoring – including FMM, Peace, Christina and Cold Lake areas (AEP)

Primary Scientific Staff:

Kristin Hynes – Invertebrate Monitoring Biologist: AEP lead for Mainstem biomonitoring

Justin Hanisch – Invertebrate Monitoring Biologist: AEP lead for Peace River, Christina River, and Cold Lake areas

Primary Technical Staff:

Aquatic Technologist - Conducts field work and assists with analyses and reporting
Surface Water Quality Technologist – member of field sampling crew
Surface Water Quality Technologist – member of field sampling crew
Surface Water Quality Technologist – member of field sampling crew
Surface Water Quality Technologist – member of field sampling crew
Surfact Water Quality Technologist – part time member of fiels samping crew

16.0 Project Human Resources & Financing

Section 16.1 Human Resource Estimates

Building off of the competencies listed in the previous section, please complete the table below. Add additional rows as necessary. This table must include **ALL staff involved** in the project, their role and the % of that staff's time allocated to this work plan. The AEP calculated amount is based on an estimate of $120,000/year for FTEs. This number cannot be changed. The OSM program recognizes that this is an estimate.

Table 16.1.1 AEP

Add an additional AEP Staff member by clicking on the table and then clicking on the blue "+" symbol on the bottom right side of table. The total FTE (Full Time Equivalent) is Auto Summed (in Table 16.2.1) and converted to a dollar amount.

Name (Last, First)	Role	% Time Allocated to Project
Invertebrate Moniotoring Biologist	AEP co-lead of program. Leads a field monitoring crew and conducts analyses and reporting.	100%
Invertebrate Monitoring Biologist	AEP co-lead of program. Leads a field monitoring crew and conducts analyses and reporting.	100%
Biologist or Technician- new hire	Member of field sampling crew and support for support	50%
Click or tap here to enter text.	Click or tap here to enter text.	0
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Table 16.1.2 ECCC

Add an additional ECCC Staff member by clicking on the table and then clicking on the blue "+" symbol on the bottom right side of table. The total FTE (Full Time Equivalent) is Auto Summed in Table 16.2.2

Name (Last, First)	Role	% Time Allocated to Project
Brua, Robert	In-kind, Co-PI, Research Scientist Study Lead	40%
Luiker, Eric	In-Kind, Biologist	10%
Halliwell, Daryl	In-kind, Field Technician	40%
Physical Scientist (TBD)	VNR, Mainstem Data preparation, analysis, reporting	100%
Physical Scientist (TBD)	VNR, Mainstem Data preparation, analysis, reporting	50%
Biology Lab Technician	VNR, Lab support, data preparation, analysis	35%
Glozier, Nancy	In-kind, Co-PI, Section Manager and Ecosystem Scientist	25%
Ritcey, Allison	VNR, Co-lead FMM, Christina River, Cold Lake	100%
Levesque, Lucie	In-kind, Lead for CBM work plan and SPMD analysis	55%
McIvor, Emily	In-kind, CABIN training for CBM and field support	20%
Su, Minzhen	In-kind, WQ database management	5%
Roy, Julie	In-kind, SPMD analysis	10%

Syrgiannis, Jim	In-kind, Lead Field Technician	5%
Tumber, Vijay	In-kind, WQ data tracking and QC	5%
Click or tap here to enter text.	Click or tap here to enter text.	0
Pippy, Kerry	In-kind, field monitoring	5%
Keet, Erica	VNR, Primary Field Technician	30%
Maines, Jennifer	VNR, Primary Field Technician	25%
Dirk, Leah	VNR, Primary SPMD Technician	20%
Armstrong, Brittany	VNR, Support Field Technician	10%
Kean Steeves	VNR, data analysis	50%
Click or tap here to enter text.	Click or tap here to enter text.	0%
NLET Lab Technician	VNR, WQ laboratory analysis	100%
NLET Lab Technician	VNR, laboratory analysis	86%

The tables below are the financial tables for Alberta Environment & Parks (AEP) and Environment & Climate Change Canada. All work plans under the OSM Program require either a government lead or a government coordinator.

Section 16.2 Financing

The OSM Program recognizes that many of these submissions are a result of joint effort and monitoring initiatives. A detailed "PROJECT FINANCE BREAKDOWN" must be provided using the Project Finance Breakdown Template provided, accessible here (ctrl + click the link below). Please note that completion of this Project Finance Breakdown Template is mandatory and must be submitted along with each workplan.

PROJECT FINANCE BREAKDOWN TEMPLATE (CTRL+CLICK HERE)

Table 16.2.1 Funding Requested BY ALBERTA ENVIRONMENT & PARKS

Organization – Alberta Environment & Parks ONLY	Total % time allocated to project for AEP staff	Total Funding Requested from OSM
Salaries and Benefits *(Calculated from Table 16.1.1 above)*	**250.00%**	**$300,000.00**
Operations and Maintenance		
Consumable materials and supplies		$28,655.14
Conferences and meetings travel		$6,987.60
Project-related travel		$42,719.20
Engagement		$6,914.00
Reporting		$0.00
Overhead		$12,900
Total All Grants *(Calculated from Table 16.4 below)*		**$96,600.00**
Total All Contracts *(Calculated from Table 16.5 below)*		**$304,923.00**
Sub- TOTAL *(Calculated)*		**$799,698.94**
Capital*		$0.00
AEP TOTAL *(Calculated)*		**$799,698.94**

* The Government of Alberta Financial Policies (*Policy # A600*) requires that all **capital asset** purchases comply with governmental and departmental legislation, policies, procedures, directives and guidelines. **Capital assets** (*Financial Policy # A100*, Government of Alberta, January 2014) are tangible assets that: have economic life greater than one year; are acquired, constructed, or developed for use on a continuing basis; are not held for sale in ordinary course of operations; are recorded and tracked centrally; have a cost greater than $5,000.

Some **examples of capital asset equipment include:** laboratory equipment, appliances, boats, motors, field equipment, ATV's/snowmobiles, stationary equipment (pier/sign/weather), fire/safety equipment, pumps/tanks, heavy equipment, irrigation systems, furniture, trailers, vehicles, etc. (*Financial Policy # A100*, Government of Alberta, January 2014).

Table 16.2.2 Funding Requested BY ENVIRONMENT & CLIMATE CHANGE CANADA

Organization – Environment & Climate Change Canada ONLY	Total % time allocated to project for ECCC staff	Total Funding Requested from OSM
Salaries and Benefits FTE *(Please manually provide the number in the space below)*		
Salaries and Benefits		$716,361.00
Operations and Maintenance		
Consumable materials and supplies		$711,959.00
Conferences and meetings travel		$5,000.00
Project-related travel		$94,800.00
Engagement		$36,000.00
Reporting		$10,000.00
Overhead		$99,155.00
ECCC TOTAL *(Calculated)*		**$1,673,275.00**

* ECCC cannot request capital under the OSM program. Any capital requirements to support long-term monitoring under the OSM program should be procured by Alberta and captured in that budget table.

Table 16.3

Complete ONE table per Grant recipient.

Add a Recipient by clicking on the table and then clicking on the blue "+" symbol on the bottom right side of table. The total of all Grants is Auto Summed in Table 16.2.1

GRANT RECIPIENT - ONLY: Name	Dr. Fred Wrona
GRANT RECIPIENT - ONLY: Organization	University of Calgary – Year 2
Category	**Total Funding Requested from OSM**
Salaries and Benefits	$62,000.00
Operations and Maintenance	
Consumable materials and supplies	$7,000.00
Conferences and meetings travel	$0.00
Project-related travel	$15,000.00
Engagement	$0.00
Reporting	$0.00
Overhead	$12,600.00
GRANT TOTAL *(Calculated)*	**$96,600.00**

Table 16.4

Complete ONE table per Contract recipient.

Add a Recipient by clicking on the table and then clicking on the blue "+" symbol on the bottom right side of table. This section is only to be completed should the applicant intend to contract components or stages of the project out to external organizations. The total of all Contracts is Auto Summed in Table 16.2.1

CONTRACT RECIPIENT - ONLY: Name	Click or tap here to enter text.
CONTRACT RECIPIENT - ONLY: Organization	Cordillera Consulting Inc Contract # 20AEM804 – Benthic Invertebrate processing & ID
Category	**Total Funding Requested from OSM**
Salaries and Benefits	$0.00
Operations and Maintenance	
Consumable materials and supplies	$56,000.00
Conferences and meetings travel	$0.00
Project-related travel	$0.00
Engagement	$0.00
Reporting	$0.00
Overhead	$0.00
CONTRACT TOTAL *(Calculated)*	**$56,000.00**
CONTRACT RECIPIENT - ONLY: Name	Click or tap here to enter text.
CONTRACT RECIPIENT - ONLY: Organization	Bureau Veritas Canada (2019)- Contract #22RSD851 – WQ nutrients & Ions $0?
Category	**Total Funding Requested from OSM**
Salaries and Benefits	0
Operations and Maintenance	
Consumable materials and supplies	0
Conferences and meetings travel	0
Project-related travel	0
Engagement	0
Reporting	0
Overhead	0
CONTRACT TOTAL *(Calculated)*	**$0.00**
CONTRACT RECIPIENT - ONLY: Name	Click or tap here to enter text.
CONTRACT RECIPIENT - ONLY: Organization	SGS AXYS Analytical Services Ltd. – Contract #22RSD853 – WQ PACs
Category	**Total Funding Requested from OSM**
Salaries and Benefits	0
Operations and Maintenance	
Consumable materials and supplies	$65,270.00
Conferences and meetings travel	0
Project-related travel	0
Engagement	0

Reporting	0
Overhead	0
CONTRACT TOTAL *(Calculated)*	**$65,270.00**
CONTRACT RECIPIENT - ONLY: Name	Click or tap here to enter text.
CONTRACT RECIPIENT - ONLY: Organization	InnoTech Alberta Inc. – Contract #22RSD852 – WQ trace metals
Category	**Total Funding Requested from OSM**
Salaries and Benefits	0
Operations and Maintenance	
Consumable materials and supplies	$8,640.00
Conferences and meetings travel	0
Project-related travel	0
Engagement	0
Reporting	0
Overhead	0
CONTRACT TOTAL *(Calculated)*	**$8,640.00**
CONTRACT RECIPIENT - ONLY: Name	Click or tap here to enter text.
CONTRACT RECIPIENT - ONLY: Organization	InnoTech Alberta Inc. – Contract # 22RSD919 – Sed Quality trace metals
Category	**Total Funding Requested from OSM**
Salaries and Benefits	0
Operations and Maintenance	
Consumable materials and supplies	$4,608.00
Conferences and meetings travel	0
Project-related travel	0
Engagement	0
Reporting	0
Overhead	0
CONTRACT TOTAL *(Calculated)*	**$4,608.00**
CONTRACT RECIPIENT - ONLY: Name	Click or tap here to enter text.
CONTRACT RECIPIENT - ONLY: Organization	SGS AXYS Analytical Services Ltd. – Contract #22RSD950 – Sed Quality PACs
Category	**Total Funding Requested from OSM**
Salaries and Benefits	0
Operations and Maintenance	
Consumable materials and supplies	$69,030.00
Conferences and meetings travel	0
Project-related travel	0
Engagement	0
Reporting	0
Overhead	0
CONTRACT TOTAL *(Calculated)*	**$69,030.00**
CONTRACT RECIPIENT - ONLY: Name	Click or tap here to enter text.

CONTRACT RECIPIENT - ONLY: Organization	SGS AXYS Analytical Services Ltd. Contract #22TDRRSD866 – SPMD Films PACs
Category	**Total Funding Requested from OSM**
Salaries and Benefits	0
Operations and Maintenance	
Consumable materials and supplies	$101,375.00
Conferences and meetings travel	0
Project-related travel	0
Engagement	0
Reporting	0
Overhead	0
CONTRACT TOTAL *(Calculated)*	**$101,375.00**
CONTRACT RECIPIENT - ONLY: Name	Click or tap here to enter text.
CONTRACT RECIPIENT - ONLY: Organization	Click or tap here to enter text.
Category	**Total Funding Requested from OSM**
Salaries and Benefits	0
Operations and Maintenance	
Consumable materials and supplies	0
Conferences and meetings travel	0
Project-related travel	0
Engagement	0
Reporting	0
Overhead	0
CONTRACT TOTAL *(Calculated)*	**$0.00**

Table 16.5 GRAND TOTAL Project Funding Requested from OSM Program

The table below is auto calculated, please do not try to manually manipulate these contents.

Category	Total Funding Requested from OSM
Salaries and Benefits ***Sums totals for salaries and benefits from AEP and ECCC ONLY***	$1,016,361.00
Operations and Maintenance	
Consumable materials and supplies *Sums totals for AEP and ECCC ONLY*	$740,614.14
Conferences and meetings travel *Sums totals for AEP and ECCC ONLY*	$11,987.60
Project-related travel *Sums totals for AEP and ECCC ONLY*	$137,519.20
Engagement *Sums totals for AEP and ECCC ONLY*	$42,914.00
Reporting *Sums totals for AEP and ECCC ONLY*	$10,000.00
Overhead *Sums totals for AEP and ECCC ONLY*	$112,055.00
Total All Grants (from table 16.2.1 above) *Sums totals for AEP Tables ONLY*	$96,600.00
Total All Contracts (from table 16.2.1 above) *Sums totals for AEP Tables ONLY*	$304,923.00
Sub- TOTAL	$2,472,973.94
Capital* *Sums total for AEP*	$0.00
GRAND PROJECT TOTAL	$2,472,973.94

Some **examples of capital asset equipment include:** laboratory equipment, appliances, boats, motors, field equipment, ATV's/snowmobiles, stationary equipment (pier/sign/weather), fire/safety equipment, pumps/tanks, heavy equipment, irrigation systems, furniture, trailers, vehicles, etc. (*Financial Policy # A100*, Government of Alberta, January 2014).

17.0 FINANCIAL MANAGEMENT

The OSM Program reserves the right to reallocate project funding during the current fiscal year on the basis of project performance and financial overspend or underspend.

☐ *Please check this box to acknowledge you have read and understand*

In the space below please describe the following:

- *Discuss how potential cost overruns and cost underruns will be managed.*
- *If this is a continuing project from last year, identify if this project was overspent or underspent in the previous year and explain why.*
- *Describe what risks and/or barriers may affect this project.*

Glozier and Brua will perform quarterly reviews of budgets and deliverables. Deviations from the proposed work plan will be reported to the OSM program office, and management actions may be taken to facilitate meeting of budget and deliverable expectations.

Foreseeable risks to the program include delays in hiring, grants, and contracts.

18.0 Alternate Sources of Project Financing – In-Kind Contributions

Table 18.1 In-kind Contributions

Add an In Kind Contribution by clicking on the table and then clicking on the blue "+" symbol on the bottom right side of table.

DESCRIPTION	SOURCE	EQUIVALENT AMOUNT ($CAD)
Science Expertise - Mainstem	ECCC	$55,175.00
Science Expertise - Tributaries	ECCC	$116,235.00
Technical Expertise - Mainstem	ECCC	$34,109.00
Technical Expertise - Tributaries	Click or tap here to enter text.	$10,395.00
	TOTAL	**$215,914.00**

19.0 Consent & Declaration of Completion

Lead Applicant Name

Nancy Glozier

Title/Organization

Secton Manager Arctic Athabasca Watershed ECCC

Signature

Click or tap here to enter text.

Date

2021-10-05

Government Lead / Government Coordinator Name (if different from lead applicant)

Click or tap here to enter text.

Title/Organization

Environment and Climate Change Canada

Signature

Click or tap here to enter text.

Date

Click or tap to enter a date.

PROGRAM OFFICE USE ONLY

Governance Review & Decision Process

this phase follows submission and triggers the Governance Review

TAC Review (Date):

Click or tap to enter a date.

ICBMAC Review (Date):

Click or tap to enter a date.

SIKIC Review (Date):

Click or tap to enter a date.

OC Review (Date):

Click or tap to enter a date.

Final Recommendations:

Decision Pool:

Choose an item.

Notes:

Click or tap here to enter text.

Post Decision: Submission Work Plan Revisions Follow-up Process

This phase will only be implemented if the final recommendation requires revisions and follow-up from governance

ICBMAC Review (Date):

Click or tap to enter a date.

SIKIC Review (Date):

Click or tap to enter a date.

OC Review (Date):

Click or tap to enter a date.

Comments:

Decision Pool:

Choose an item.

Notes & Additional Actions for Successful Work Plan Implementation:

Click or tap here to enter text.