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

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

General Information		
Monitoring Category: *(From OSM long-term plan; choose from drop-down menu)*	Biotic Response Monitoring	
Strategic Monitoring Objective: *(From OSM long-term plan; choose from drop-down menu)*	Objective: Detect and report biotic response in relation to Oil Sands Developments	
Work Plan Unique Identifier:	*B-LTM-E-8-1718*	
Monitoring Activity Title:	Fish Health Monitoring	
Geographic Location (*choose from drop-down menu, if Project Location is in more than one area choose from second drop-down***)**	Lower Athabasca River	Athabasca River - Tributaries
Monitoring Site(s) Coordinates *(latitude and longitude)*	Includes the Athabasca River, its tributaries, the Peace River and the Peace/Athabasca Delta.	
Monitoring Organization and Responsible Manager:	Environment and Climate Change Canada	Mark McMaster
Date Monitoring initiated:	**2012**	
Specific Monitoring Objective: *(State the monitoring objective addressed through this monitoring)*	(1) To develop a science-based framework for the monitoring and assessment of the environmental health of the Alberta Oil Sands Region through the use of fish health assessments, water quality and contaminants levels; (2) Collection of baseline information on fish populations required for establishing predictive relationships for assessing potential cumulative effects and monitoring long-term trends at the regional scale. (3) To establish linkages between fish health and benthic invertebrates within the oil sands development region and downstream receiving environments, to examine assess status and trends, and to support integration of results with the Lower Athabasca Water Management Framework.	
Deliverables (Annual): *What Data Reports will be produced and when?*	All the data collected (either by Environment and Climate Change Canada (ECCC), Alberta Environment and Parks (AEP) or contractor) under this project plan will be provided to AEP for data management and accessibility purposes.	

Monitoring Plan Summary: *Please summarize the monitoring including relevant information such as background, objectives, monitoring area, methods/monitoring design, assumptions, outcomes, and references. These should align with the information provided in Appendix 1: Annual Monitoring Schedule.*

The monitoring questions below are divided into Long term, Focused, and Baseline studies. The operation of this three-pronged monitoring program is based on a tiered and triggered sampling design. It must be stressed here that although a large part of the fish monitoring program is in the long-term surveillance 3 year monitoring cycle, it is critical that we are integrated with the other components of the program especially water quality and benthic community monitoring. We can move sampling locations between years to ensure that water quality and benthic communities are sampled during the same time as our fish sites. This is critical for interpretation of results, triggering additional sampling and maximizing our understanding of the environment and how interactions among monitoring parameters may be driving/linked to change. We are also working closely with the Indigenous Monitoring Program to incorporate community involvement in our existing fish monitoring plan and to work with communities to identify additional concerns related to fish populations and incorporate those into the fish health monitoring plan.

Long-term (surveillance) studies form the core of the fish monitoring program. They integrate adaptive, but bounded and prescriptive steps (tiers) guided by trigger exceedances. They provide consistent monitoring of sites and indicators over a time period to evaluate trends and the state of the environment. Consistency of measurements and sites is intended to address multiple interpretative objectives, including answering site-specific, local, and regional questions. Periodic adaptation of the long-term monitoring network is required to ensure it achieves the stated monitoring objectives, but also as a mechanism to adopt new information as more is learned. Regular sampling of sites will occur once every 3-4 years.

Focused studies are typically a 2-3 year monitoring/research spatially limited activity usually triggered by signals generated by the long-term monitoring network and designed to answer a specific monitoring question related to evaluating the extent and magnitude of a change of concern, or to address specific knowledge gaps about system processes or function. Focused studies are used for special (and possibly stand-alone) topics, including feasibility of candidate monitoring tools or to resolve an unanticipated issue.

Baseline studies primarily deal with meeting minimum baseline data requirements (3 years) to more effectively evaluate the occurrence of change during the long-term studies and in areas that will be developed further in the future.

There are additional types of studies that may be triggered via long-term, focused, or baseline work:

Confirmation studies: a repeat of surveillance monitoring, on an accelerated pace, to evaluate the repeatability of a change.

Investigation of cause: are generally hypothesis-driven studies designed to characterize the potential cause or source of an issue after evidence that the change is real is obtained. IOC is a type of focused study.

General approach for fish program

The long term cyclical fish health program will eventually rotate between mainstem (Athabasca and Peace), Athabasca tributaries, and southern and Peace tributaries using an Enivronmental Effects Monitoring (EEM) fish health approach combined with a hybrid fish assemblage/inventory assessment on tributaries. The design of the EEM sampling on the mainstem Athabasca of white sucker and trout-perch will follow a surveillance program once every three years after the initial three-year baseline period. When the Peace River design is complete it will be integrated into the regular mainstem EEM design. At the current time, the Peace areas are still in an EEM baseline/study design phase, as are three of the Athabasca tributaries (Clearwater, Tar and

Calumet). Tributary sample design has merged the EEM fish health approach with the fish assemblage protocol used in the last year of JOSM (RAMP 2016). The assemblage protocol will be used at each tributary site with the sentinel species collected for that site being kept for the EEM fish health sampling. If sufficient numbers of the sentinel are not capture during the assemblage sampling, additional fishing will occur to obtain sufficient numbers of fish. At sites where sufficient numbers of a sentinel species cannot be captured, the assemblage data will be used to evaluate health in that watershed. These sites are also in the long-term program, will be sampled every three years and have been divided into groups to maximize our understanding (all sculpin sites sampled in the same year) and minimize the number of sites requiring sampling in any one year. Focused studies will be prioritized based on analyses of previous data and the specific study design.

Monitoring questions and framework

Monitoring questions originate from three sources: controlling known stressors, documenting expected or unexpected effects, or protecting valued components. Controlling known stressors is addressed here with a stressor-based design intended to document change associated primarily with known stressors and exposure-response pathways. Documenting unexpected effects is addressed with an effects-based design intended to measure the growth, survival, and reproduction of selected sentinel species of fish. Finally, protecting valued components should be achieved through both the fish assemblage assessments (biodiversity program) intended to measure fish abundance, population structure and diversity and the involvement of stakeholders of which we will work directly with the Indigenous Monitoring Program group on delivery on aspects of the fish program.

Design of future monitoring activities will depend on the results of the studies used to address the questions described below. Observations that are 'different than expected' will be flagged by the definition of expected normal ranges, or triggers (baseline). Monitoring triggers can be designed to initiate more detailed studies (tiers) at specific locations, more locations, more detailed questions using information from multiple species, etc. Triggers can be developed from existing data where adequate, or from the published literature as an interim if local data are not available. They can also be based on time-since-last sampling (time triggers aka regular site rotation), applied randomly where neither data nor time triggers have been exceeded (in a surveillance/confirmation mode), or triggered in by findings in another component (ie. changes in water quality or benthic communities). To develop a baseline, a minimum of three years of data are needed; during these baseline years, spatial comparisons will predominate. Following the baseline collection period, test years will focus on testing for change within a location, locally and regionally. These analyses require continuity.

The stressor based approach requires data to address broad, basic, and initial questions about known stressors and pathways. This basic question is:

Are the concentrations of contaminants associated with Oil Sands development approaching or exceeding expected values? In the case of existing issues this question is specifically dealing with whether Polycyclic aromatic compound (PAC) concentrations in walleye (pike) are changing, but will also be used as a mechanism to address community concerns about Hg. This sampling will occur during the EEM sampling on the maintem rivers as Walleye or Pike are also captured using that capture method.

When change exists, it is a priority to address whether the change was expected or unexpected, and whether it is stable or getting worse. When changes are higher than expected (exceed a trigger), confirmation monitoring is triggered, and then Focused monitoring to examine the extent and magnitude are conducted. If change is of sufficient concern, studies can proceed directly to Investigation of Cause.

The basic and primary effects-based questions are:
Are growth, survival, and reproduction of sentinel species captured in the mainstem rivers different than expected? In the case of existing issues these questions are specifically dealing with whether fall EEM sampling programs are detecting changes in the system.
Are growth, survival, and reproduction of sentinel species captured in the region's tributaries different than expected? In the case of existing issues, these questions are whether fall species assemblages or fall EEM sampling programs are detecting changes in the system.

A key component of the long term monitoring program will be to establish exposure of potential sentinel species (currently established via liver detoxification enzymes) and to track if and when that exposure changes. Changes in exposure rates can be used to trigger sites into a full EEM sampling design.

Stakeholder (values-based) questions can also be integrated into the monitoring program. These are yet to be determined by community groups and integrated into community-based monitoring, but may include sampling similar to that done by the Slave River Environmental Effects Program (SWEEP) in the Slave River, sampling fish in lakes, measuring additional contaminants (i.e., Hg), or as a mechanism to address concerns emerging via Traditional Ecological Knowledge (TEK). We are working in collaboration with the Indigenous Monitoring Program staff to move forward on this part of the program in 2017.

Athabasca Mainstem
The Athabasca Mainstem is now in a long-term monitoring surveillance program with the various aspects of the fish program being evaluated on a three year cycle. Mainstem trout perch EEM health is scheduled in 2018 and 2021 and Mainstem white sucker health and Walleye contaminants in 2019. Wherever possible, we are working with the Indigenous Monitoring Program to incorporate First Nations into this monitoring program and with the benthic and water quality program to ensure integration of the three.

Athabasca Tributaries
The majority of the Athabasca tributaries are now in a long-term monitoring surveillance program with the various aspects of the fish program being evaluated on a three year cycle. We have merged the fish assemblage sampling with the EEM fish health sampling to maximize our understanding of the potential influence of oil sands development on fish populations. With the program on a three year cycle we have separated tributaries by year and can now manage the program efficiently. Three tributaries are in baseline data collection so require collections for the next three years (Clearwater, Tar and Calumet Rivers).

Athabasca Delta
Limited work has been done on fish health and biodiversity in the Athabasca delta and we are working collaboratively with the Indigenous Monitoring Program to deliver on this program with local community input.

Peace River Mainstem
The Peace River is still in baseline data collection (trout perch and longnose sucker health, walleye contaminants) and is included here as it will move directly into the long-term surveillance monitoring program once baseline is complete. Sampling is scheduled for 2017 and 2018 with long-term surveillance starting in 2020.

Lake Sampling
In collaboration with the provincial FWIN program and the Indigenous Monitoring Program group we will work with communities to identify lakes of concern for fish populations and to address these concerns with the fish monitoring programs adaptive design.

Focused Studies

Focused studies to date have been used to address specific concerns or questions generated by the fish monitoring program. We have adapted our tributary fish assemblage collections from results generated by a focused study and incorporated them into our EEM fish health collections to maximize understanding and efficiency. In collaboration with AEP and the Indigenous Monitoring Program we are continuing to evaluate mainstem fish community assessments and hope to include TEK in interpreting analysis of change identified in historical data.

We also hope to develop over time a data management program that will allow fish data to be inputted, evaluated and compared to baseline data rapidly to identify when exceedances are triggered. This will allow much better control of triggers and tiers to increase our speed in responding to change within the system that we interpret as important. We hope this data management program will expand into the other components of the program so that they can also trigger change within the fish monitoring program. If this is not initiated in 2017-18 by the data management group, we will submit as a focused study for the fish program next fiscal.

Table Fish-1: Athabasca River sites, species collected, samples collected, coordinates.

Site Location	Species Sampled	Samples Collected	Years Collected	Co-ordinates
Athabasca M0	White Sucker	Fish Health, Contaminants	2019	**54.74200°N 113.33488°W**
	Trout Perch	Fish Health, Contaminants	2018, 2021	
	Walleye	Contaminants	2019	
Poacher's Landing (AR DS M0)	White Sucker	Fish Health, Contaminants	2019	**54.96342°N 112.85211°W**
	Trout Perch	Fish Health Contaminants	2018, 2021	
	Walleye	Contaminants	2019	
Water Treatment (M2)	Trout Perch	Fish Health, Contaminants	2018, 2021	**56.72450°N 111.40242°W**
Northlands (AR DS M3)	White Sucker	Fish Health, Contaminants	2019	**56.86214°N 111.43447°W**
	Trout Perch	Fish Health, Contaminants	2018, 2021	
	Walleye	Contaminants	2019	
Suncor (AR US M4)	White Sucker	Fish Health, Contaminants	2019	**57.01061°N 111.47469°W**
	Trout Perch	Fish Health, Contaminants	2018, 2021	
	Walleye	Contaminants	2019	
Muskeg (AR DS M4)	White Sucker	Fish Health, Contaminants	2019	**57.13633°N 111.61119°W**
	Trout Perch	Fish Health, Contaminants	2018, 2021	
	Walleye	Contaminants	2019	
Ells (M7)	Trout Perch	Fish Health, Contaminants	2018, 2021	**57.30741°N 111.67246°W**
Firebag (M8)	Trout Perch	Fish Health,	2018, 2021	**57.76650°N**

		Contaminants		**111.36153°W**
M9	Trout Perch	Fish Health, Contaminants	2018, 2021	**54.96122°N 112.82681°W**

Table Fish-2: Clearwater River Tributary sites, Calumet and Tar River Tributary sites all in baseline monitoring including species collected, samples collected, years collected in.

Site Location	Species Sampled	Samples Collected	Years Collected	Co-ordinates
CR1. CR1A, CR1B	White sucker, trout perch, northern pike,	Fish Health, Contaminants	2017, 2018, 2019	**56.7466855976°N 110.515144013°W**
CR2, CR2A, CR2B, CR2C	White sucker, trout perch, northern pike,	Fish Health, Contaminants	2017, 2018, 2019	**56.6798662118°N 110.808760418°W**
CR3, CR3A, CR3B	White sucker, trout perch, northern pike,	Fish Health, Contaminants	2017, 2018, 2019	**56.672783401°N 111.1114519°W**
Calumet River (CAR-F1)	Sentinel species and diversity	Fish Health, Contaminants	2017, 2018, 2019	**57.40978°N 111.6525°W**
Tar River (TAR-F2)	Sentinel species and diversity	Fish Health, Contaminants	2017, 2018, 2019	**57.39451°N 111.9928°W**

Table Fish-3: Athabasca River Tributary sites (mostly east), species collected, samples collected, years collected in.

Site Location	Species Sampled	Samples Collected	Years Collected	Co-ordinates
Steepbank RAMP	Slimy Sculpin	Fish Health, Contaminants	2019	**56.82183°N 110.98225°W**
Steepbank Upper EC	Slimy Sculpin	Fish Health, Contaminants	2019	**56.86375°N 111.12505°W**
Steepbank Middle EC	Slimy Sculpin	Fish Health, Contaminants	2019	**56.97939°N 111.30016°W**
Steepbank Lower	Slimy Sculpin	Fish Health, Contaminants	2019	**57.02289°N 111.47336°W**
Firebag Upper	Slimy Sculpin	Fish Health, Contaminants	2019	**57.33428°N 110.47247°W**
Firebag Middle	Slimy Sculpin	Fish Health Contaminants	2019	**57.43564°N 110.89336°W**
Firebag Lower	Slimy Sculpin	Fish Health, Contaminants	2019	**57.51789°N 111.10953°W**
Dunkirk River	Slimy Sculpin	Fish Health, Contaminants	2019	**56.85981°N 112.71198°W**
Horse River	Slimy Sculpin	Fish Health, Contaminants	2019	**56.36131°N 112.17625°W**
High Hills River	Slimy Sculpin	Fish Health, Contaminants	2019	**56.75364°N 110.50839°W**

Muskeg River	Slimy Sculpin	Fish Health, Contaminants	2019	**57.13388°N 111.6023°W**

Table Fish-4: Athabasca River Tributary sites (mostly west), species collected, samples collected, years collected in.

Site Location	Species Sampled	Samples Collected	Years Collected	Co-ordinates
Hangingstone River (HAR-F1)	Longnose Dace	Fish Health, Contaminants	2018, 2021	**56.6535 -111.3589**
McKay River Lower	Longnose dace	Fish Health, Contaminants	2018, 2021	**57.2126°N 111.7014°W**
McKay River Middle	Longnose dace	Fish Health, Contaminants	2018, 2021	**57.0080 °N 111.8482 °W**
McKay River Upper	Longnose dace	Fish Health, Contaminants	2018, 2021	**56.9227 °N 112.1485°W**
Dover Creek Lower	Lake Chub	Fish Health Contaminants	2018, 2021	**57.1743°N 111.8073°W**
Dover Creek Middle	Lake Chub	Fish Health, Contaminants	2018, 2021	**57.1592°N 111.8644°W**
Dover Creek Upper	Lake Chub	Fish Health, Contaminants	2018, 2021	**57.1218°N 112.0139°W**
Ells River Lower	Lake Chub	Fish Health, Contaminants	2018, 2021	**57.2663°N 111.7342°W**
Ells River Middle	Lake Chub	Fish Health, Contaminants	2018, 2021	**57.2327°N 111.7429°W**
Ells River Upper	Lake Chub	Fish Health, Contaminants	2018, 2021	**57.2293°N 111.8904°W**
Alice Creek Upstream	Lake Chub	Fish Health, Contaminants	2018, 2021	**58.2883°N 113.2004°W**
Alice Creek Downstream	Lake Chub	Fish Health, Contaminants	2018, 2021	**58.2153°N 113.1873°W**
Pierre River	Sentinel species. Biodiversity	Fish Health, Contaminants	2018, 2021	**57.44855°N 111.6297°W**
Eymundson Creek	Sentinel species. Biodiversity	Fish Health, Contaminants	2018, 2021	**57.49406°N 111.5711°W**
Red Clay Creek	Sentinel species. Biodiversity	Fish Health, Contaminants	2018, 2021	**57.69724°N 111.4065°W**
Big Creek	Sentinel species. Biodiversity	Fish Health, Contaminants	2018, 2021	**57.63137°N 111.4778°W**
Poplar Creek (mouth)	Sentinel species. Biodiversity	Fish Health, Contaminants	2018, 2021	**56.91633°N 111.4591°W**
Beaver River	Sentinel species. Biodiversity	Fish Health, Contaminants	2018, 2021	**56.94386°N 111.5673°W**

Table Fish-5: Athabasca River Tributary sites (mostly west), species collected, samples collected, years collected in.

Site Location	Species Sampled	Samples Collected	Years Collected	Co-ordinates
Christina River (CHR-F1)	Sentinel species. Biodiversity	Fish Health, Contaminants	2017, 2020	**56.66713°N 111.0672°W**
Christina River (CHR-F2)	Sentinel species. Biodiversity	Fish Health, Contaminants	2017, 2020	**55.87668°N 110.812°W**
Jackfish River (JAR-F1)	Slimy Sculpin. Biodiversity	Fish Health, Contaminants	2017, 2020	**56.6535°N 111.3589°W**
Sunday Creek (SUC-F1)	Slimy Sculpin. Biodiversity	Fish Health, Contaminants	2017, 2020	**55.5842°N 110.8935°W**
Sunday Creek (SUC-F2)	Slimy Sculpin. Biodiversity	Fish Health, Contaminants	2017, 2020	**55.56127°N 111.0906°W**
Christina River (CHR-F3)	Sentinel species. Biodiversity	Fish Health, Contaminants	2017, 2020	**55.71967°N 111.2199°W**
Christina River (CHR-F4)	Sentinel species. Biodiversity	Fish Health, Contaminants	2017, 2020	**55.88878°N 111.5421°W**
Unnamed Creek (UNC-F2)	Sentinel species. Biodiversity	Fish Health, Contaminants	2017, 2020	**55.61816°N 110.7188°W**
Unnamed Creek (UNC-F3)	Sentinel species. Biodiversity	Fish Health, Contaminants	2017, 2020	**55.58467°N 110.8234°W**
Birch Creek (BRC-F1)	Sentinel species. Biodiversity	Fish Health, Contaminants	2017, 2020	**55.61464°N 111.1248°W**
Sawbones Creek (SAC-F1)	Sentinel species. Biodiversity	Fish Health, Contaminants	2017, 2020	**55.65043°N 110.8178°W**

Table Fish-6: Peace River sites, species collected, samples collected, coordinates.

Site Location	Species Sampled	Samples Collected	Years Collected	Co-ordinates
Dunvegan	Longnose Sucker	Fish Health, Contaminants	2017, 2018, 2021	**55°55'08.86"N 118°36'16.09"W**
	Trout Perch	Fish Health, Contaminants	2017, 2020	
	Walleye	Contaminants	2017, 2021	
Shaftsbury Ferry	Longnose Sucker	Fish Health, Contaminants	2017, 2018, 2021	**56°.05'40.88"N 117°34'18.28"W**
	Trout Perch	Fish Health Contaminants	2017, 2020	
	Walleye	Contaminants	2017, 2021	
Upstream Peace River	Longnose Sucker	Fish Health, Contaminants	2017, 2018, 2021	**56°16'30.10"N 117°16'29.53"W**
	Trout Perch	Fish Health, Contaminants	2017, 2020	
	Walleye	Contaminants	2017, 2021	
Downstream Peace River	Longnose Sucker	Fish Health, Contaminants	2017, 2018, 2021	**56°23'50.26"N 117°10'36.41"W**
	Trout Perch	Fish Health, Contaminants	2017, 2020	
	Walleye	Contaminants	2017, 2021	
Fort Vermillion	Longnose Sucker	Fish Health, Contaminants	2017, 2018, 2021	**57°58'40.05"N 117°07'55.69"W**
	Trout Perch	Fish Health, Contaminants	2017, 2020	**58°24'03.72"N 115°59'22.73W**
	Walleye	Contaminants	2017, 2021	**57°58'40.05"N 117°07'55.69"W**

Appendix 1 – Annual Monitoring Schedule

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

Sampling Locations/Sites	**Sampling Schedule** *(timing/frequency)*	**Compounds to be Analyzed**	**SOPs to be Consulted** (*hyperlinks accepted*)	**QA/QC Complete & Date Data to be Released**
Athabasa Mainstem Trout Perch EEM Health (9 sites)	Fall 2018 and 2021 on the three year long-term monitoring cycle	EEM fish health endpoints and exposure evaluations, tissue archive	http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=4B14FBC1-1	March 31 of each year
Athabasca Mainstem White Sucker EEM Health and Walleye contaminants	Fall 2019 on the three year long-term monitoring cycle	EEM fish health endpoints and exposure, tissue archive, Walleye PACs	http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=4B14FBC1-1	March 31 of 2019
Clearwater River EEM baseline	Fall 2017, 2018 and 2019	EEM fish health endpoints and exposure, tissue archive, Pike PACs	http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=4B14FBC1-1	March 31 of each year
Athabasca Tributaries Steepbank, Firebag, Muskeg, High Hills, Dunkirk and Horse	2019 on the three year long-term monitoring cycle	EEM fish health endpoints and exposure evaluations, tissue archive, assemblage	http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=4B14FBC1-1 http://www.ramp-alberta.org/ramp/design+and+monitoring/ components/fish+populations.aspx	March 31 of each year
Athabasca Tributaries McKay, Dover, Ells and Alice Poplar, Beaver, Pierre, Eymundson, Red Clay, Big	2018 and 2021 on the three year long-term monitoring cycle	EEM fish health endpoints and exposure evaluations, tissue archive, assemblage	http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=4B14FBC1-1 http://www.ramp-alberta.org/ramp/design+and+monitoring/ components/fish+populations.aspx	March 31 of each year
Athabasca Tributaries Southern Operators	2017 and 2020 on the three year long-term monitoring cycle	EEM fish health endpoints and exposure evaluations, tissue archive, assemblage	http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=4B14FBC1-1 http://www.ramp-alberta.org/ramp/design+and+monitoring/ components/fish+populations.aspx	March 31 of each year
Athabasca Tributaries Tar, Calumet,	Complete baseline monitoring 2017, 2018, 2019	EEM fish health endpoints and exposure evaluations,	http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=4B14FBC1-1	March 31 of each year

Jackpine		tissue archive, assemblage	http://www.ramp-alberta.org/ramp/design+and+monitoring/ components/fish+populations.aspx	
Peace River Mainstem (5 sites)	Complete baseline monitoring 2017, 2018. Move into long-term monitoring 2020	EEM fish health endpoints and exposure, tissue archive, Walleye PACs	http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=4B14FBC1-1	March 31 of each year
Peace River Tributaries	Develop baseline monitoring program	EEM fish health endpoints and exposure evaluations, tissue archive, assemblage	http://www.ec.gc.ca/esee-eem/default.asp?lang=En&n=4B14FBC1-1 http://www.ramp-alberta.org/ramp/design+and+monitoring/ components/fish+populations.aspx	March 31 of each year
Athabasca Delta	Develop baseline monitoring program in collaboration with Indigenous Monitoring Program and community input.	Fish Inventory, contaminants, abnormalities and other community concerns		March 31 of each year.

References:

Arciszewski, T.J. and Munkittrick, K.R. (2015) 'Development of an adaptive monitoring framework for long-term programs: An example using indicators in fish', *Integrated Environmental Assessment and Management,* 11(4), pp. 701-718.

Environment Canada (1998) *Pulp and paper technical guidance for aquatic environmental effects monitoring*: National EEM Office, Environment Canada, Ottawa, Ontario. (http://www.ec.gc.ca/eem/pdf_publications/English/TGD_e.pdf

Regional Aquatics Monitoring Program (RAMP) (2016) http://www.ramp-alberta.org/RAMP.aspx

Alberta Environmental Monitoring, Evaluation and Reporting Agency (2016) *Regional aquatics monitoring in support of the Joint Oil Sands Monitoring Plan: 2015 Final Program Report*. Prepared for AEMERA by Hatfield Consultants, Kilgour & Associates Ltd. and Water Resources Solutions.

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

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

Budget requirements	Year 1 (2017- 2018)		Year 2 (2018- 2019)		Year 3 (2019- 2020)		Year 4 (2020- 2021)		Year 5 (2011- 2012)	
	OSM Funding APPROVED	External Funding	OSM Funding NOT APPROVED	External Funding	OSM Funding NOT APPROVED	External Funding	OSM Funding NOT APPROVED	External Funding	OSM Funding NOT APPROVED	External Funding
1) Salaries and benefits	New ECCC	Existing ECCC	New ECCC	Existing ECCC	New ECCC	Existing ECCC	New ECCC	Existing ECCC	New ECCC	Existing ECCC
a) Appendix 3 - Totals	270,000	105,717	270,000	105,717	270,000	105,717	270,000	105,717	270,000	105,717
2) Operations and Maintenance										
a) Vehicles and Transportation	15K		15K		15K		15K		15K	
b) Helicopter	32K		32K		32K		32K		32K	
c) Lab analysis	38K PACs 92.785K MFO 26K Aging 20K Hg Co-op 12K		38K PACs 100K MFO 26K Aging 20K Hg Co-op 12K		38K PACs 100K MFO 26K Aging 20K Hg Co-op 12K		38K PACs 50K MFO 26K Aging 20K Hg Co-op 12K		38KPACs 100K MFO 26K Aging 20K Hg Co-op 12K	

d) Data management	20K		20K		20K		20K		20K	
e) Field work	65K		65K		65K		65K		65K	
f) Training	8K		8K		8K		8K		8K	
g) Boat certification	5K		5K		5K		5K		5K	
h) Personnel related O&M Costs	25K		25K		25K		25K		25K	
i) Storage	6K		6K		6K		6K		6K	
3) Consumable Materials and supplies										
a) (*Describe Consumable Supply*)	60.887K		60K		60K		60K		60K	
4) Travel										
a) Conferences and meetings (*identify conference/meeting*)	20K		20K		20K		20K		20K	
b) Field work - travel	15K		15K		15K		15K		15K	
c) Project-related travel	10K		10K		10K		10K		10K	
5) External Contracts										
a) (*Describe External Contractor*)	62K Clearwater EEM 124K trib EEM		110K trout perch 62 K Clearwater EEM 200 K Trib EEM		62K Clearwater EEM 200 K Trib EEM		124K trib EEM		110K trout perch 200 K Trib EEM	

Grand Total* (Before other related costs)	926,672		1,119,000		1,009,000		821,000		1,057,000	

*The total salary costs for ECCC ($270,000) in 2017-2018 with other related costs is $371,304. The total O&M costs for ECCC ($656,672) with other related costs is $718,696. **The Grand Total for ECCC ($926,672) with other related costs is $1,090,000**

Appendix 3 – Staffing Plan

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

	Year 1 – Budget Allocation APPROVED		Year 2 – Budget Allocation NOT APPROVED		Year 3 – Budget Allocation NOT APPROVED		Year 4 – Budget Allocation NOT APPROVED		Year 5 – Budget Allocation NOT APPROVED	
Responsible Role	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding
Science Expertise		105,717		105,717		105,717		105,717		105,717
Technical/Field Staff (Including OT)	210,000		210,000		210,000		210,000		210,00	
Internal Analytical Support	60,000		60,000		60,000		60,000		60,000	
Grand Total (*inserted into Appendix 2*)	**$270,000**	**$105,717**	**$270,000**	**$105,717**	**$270,000**	**$105,717**	**$270,000**	**$105,717**	**$270,000**	**$105,717**

Appendix 4 - Approvals

Project Submitted by:		
Name: Mark McMaster		
Organization: ECCC	Signature:	Date: Oct 19, 2016

Project Approved by:		
Dr. Monique Dubé (AEP)		**Dr. Kevin Cash (ECCC)**
Signature 		Signature 
Date		Date