Acknowledgements

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Preface

Healthy aquatic ecosystems provide clean drinking water and support economic development. For these and other reasons, maintaining and protecting healthy aquatic ecosystems is a pillar of Alberta’s Water for Life strategy. Monitoring helps to inform decisions that impact aquatic resources. Surface Materials Leases (SML) and/or Water Act approvals require that proponents monitor the impacts of operations on the aquatic environment. This document provides general recommendations and guidance for application requirements and monitoring programs, while recognizing that unique situations, sensitivities, and local variability may require flexibility and/or site-specific approaches. Application and water quality monitoring requirements for peat operations on private and public land in Alberta are outlined.

The objective of this document is to provide consistent application and approval requirements for peat operations approvals issued under the Water Act. In addition, the objectives of the water quality monitoring requirements are:

1) to determine the concentration of water quality parameters in release water from the harvest area (i.e. water released from sedimentation ponds); and

2) to assess potential impacts of peat operations to water quality in the receiving environment.

Results of monitoring will allow operators to determine changes or temporal trends in release water quality and receiving water quality resulting from peat operations.
Definitions

“weekly” means once every seven days, during the operating season.

“3x/year” means once during the spring freshet, once during mid-summer, and once in the late fall. Summer sampling must not occur during or directly after a storm event.

“release water” means water from the peat mining project’s development areas and/or activities being released into the aquatic environment via one or more identifiable final discharge point(s) beyond which the operator of the mine no longer exercise control over the quality of the water. Initial release of water from the intended mining areas, to the extent as may be necessary, for the purpose of accessing and the construction of water quality control system (such as sedimentation pond incorporating final discharge point) is excluded from the release water.

“receiving water” means the natural water feature that receives water released from a peat operation. This water feature may be a lake, river, stream or a direct tributary to a lake, river or stream that coveys water away from the peat operation.

“water body” means any location where water flows or is present, whether or not the flow or the presence of water is continuous, intermittent or occurs only during a flood, and includes but is not limited to wetlands and aquifers.

1. Background

Wetlands cover about 20 percent of the surface area in Alberta. Of this, about 90 percent is comprised of peatlands. Peatlands, like other wetlands, serve important functions on the landscape. Peatlands store carbon disproportionately, owing to the accumulation of partially decomposed vegetation. The Alberta Wetland Policy acknowledges the role of wetlands in storing water, maintaining surface water quality, providing habitat for biodiversity, and their inherent value for traditional, horticultural and recreational human uses.

Peatlands of value to the horticulture industry are typically non-permafrost bogs (Daigle and Daigle, 2001). Draining peatlands for harvest can have negative impacts to water quality in the receiving rivers, streams, lakes and wetlands. Impacts may vary depending on the soils, wetland type, climate and species that are present (Halsey et al., 1998). Peat operations can impact the local hydrology through the development of drainage networks. Peat extraction may decrease the depth of the saturated soils which may alter water storage capacity, change flow regimes and negatively impact the landscape downstream. Enhanced storage capacity reportedly decreases the magnitude of peak flows and runoff during storm events (Holden et al. 2006). Drainage can augment base flow, which can lead to increases in mean daily summer stream flows (Prevost et al., 1999).

Peat operations generally lead to increased variability in water chemistry when compared to natural peatlands (Prevost et al., 1999; Wind-Mulder et al., 1996). The degree of variability caused by peat harvesting differs between parameters and the duration can range from short- to long-term. Prevost et al. (1999) observed orders of magnitude increases in the concentrations of suspended solids during initial peatland drainage whereas increases in ions and nutrients persisted for several years. Research suggests that suspended solids, metal and nutrient exports increase with peat harvesting (Halsey et al., 1998; St. Hilaire et al., 2004; St. Hilaire et al., 2007). In addition, drainage can also increase the temperature, substrate availability and oxygen content of peat, thereby accelerating decomposition rates.
Decomposition releases nutrients previously sequestered within the peat. Because natural peatlands are rich in organic compounds, drainage and decomposition can lead to greater export of nutrients and suspended solids to receiving waters. In turn, export of suspended solids and peat can impact downstream water quality, macroinvertebrate communities and fish (Laine & Heikkinen 2000).

The impact of peat harvesting on downstream water quality is seasonal and often site-specific. Therefore monitoring both onsite and in receiving waters is needed to detect and manage potential impacts to the aquatic environment during construction, operation and closure of peat operations.

To manage downstream impacts, the operations must include strategies to manage downstream impacts based on best management practices, which may include both sedimentation ponds and overland flow areas. When adequately maintained, sedimentation ponds can effectively remove suspended sediments. Overland flow areas can remove additional suspended solids, metals, and nutrients through biological assimilation, adsorption, nitrification and denitrification. Overland flow areas can mitigate the export of dissolved nutrients not otherwise captured in sedimentation ponds (Halsey et al., 1998; Huttunen et al., 1996).

It is anticipated that peat operations conducted on private and public lands in Alberta will include strategies to manage downstream impacts such as sedimentation ponds and overland flow areas. Site-dewatering plans will be required to be included in the Water Act application package along with the required information, if applicable, for an approval under the Water Act. If the peat operations (on private and public lands) will be using or retaining water during operational or reclamation phases, an application for a water diversion licence under the Water Act will be required.

Contact the respective regional office to discuss the additional details about the requirements of a complete Water Act application.

2. Surface Water Quality Monitoring Requirements

Surface water quality monitoring for peat operations has two major phases: baseline monitoring, and monitoring as part of approval requirements (Figure 1). Monitoring to be completed prior to submitting an application is considered baseline monitoring. Baseline monitoring is in addition to the requirements outlined in the Wetland Regulatory Requirements Guide1. The baseline water quality monitoring program is part of an information requirement at the time of application. The purpose of baseline monitoring is to collect sufficient data during the exploration activity to characterize local hydrology and water quality for the proposed peat operations and potential area of impact, including areas that will receive release water from the site of operations.

Ongoing surface water quality monitoring is required over the life of a peat operation, and is determined by Alberta Environment and Parks through regulatory approval conditions. Surface water quality monitoring requirements begin with primary monitoring requirements through conditions set out in the approval. Due to complexity of potential impacts of peat operations to surface water quality, primary water quality monitoring includes a wide variety of parameters. The purpose of primary monitoring is to:

a) determine the concentration of water quality parameters in release water from the peat operation (i.e., water released from sedimentation ponds);

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1 https://open.alberta.ca/dataset/0e75c480-a3b6-4df8-a382-e252518c0e70/resource/89ba6574-c72d-407b-95dd-dbe56a22bc69/download/2015-wetland-regulatory-requirements-guide-june-01-2015.pdf
b) to evaluate peat operation-related changes to water quality in the receiving environment; and
c) to make a risk management decision or to decide whether it is necessary to proceed to the next
level of detail.

Continuous improvement is a key principle underlying resource management in Alberta. Monitoring should be outcomes-focused and performance-based. Monitoring requirements within approvals are not necessarily static over the life of a project and instead may be amended to allow for a more flexible and adaptive management of the operation. For example, if the results of the Primary Monitoring Program indicate a reduction of site-specific and cumulative environmental impacts over time, amendments could be made to the conditions in the approval to reduce monitoring and reporting frequencies (Level 1 Monitoring).

In this example the Primary Monitoring Program may be reduced to a Core Monitoring Program. However, increases in environmental impacts over time (e.g., exceedance of water quality guidelines) may necessitate an amendment for Enhanced Monitoring Program (Level 2 Monitoring) and for initiating preventive/mitigation measures to protect Alberta’s aquatic environments. This risk-based approach will better focus the water quality monitoring program and provide flexibility and site specificity.

In the event that construction stages (sedimentation pond construction, perimeter ditching, production field ditching, etc.) occur in parts of the bed and banks of a water body that are both with and without terrestrial vegetation, construction monitoring will be required as part of the approval requirements. Construction monitoring is intended to ensure that activities will not cause elevated turbidity levels.

![Figure 1. Phases and levels of surface water quality monitoring programs for peat operations in Alberta.](image-url)
2.1. Baseline Surface Water Quality Monitoring Requirements

Baseline water quality monitoring requirements for Public Lands are outlined in detail in the Guide to Surface Materials Lease Information Requirements for Peat Operations\(^2\). Data collected during the baseline monitoring program should be sufficient to characterize baseline hydrology and water quality within the operating area and potential areas of impact, and should be used to inform the development of the primary monitoring program.

Laboratory analysis of all samples that are required for the purpose of water quality monitoring must be conducted in a laboratory accredited pursuant to ISO/IEC 17025.

Quality assurance and quality control practices should in general meet the intent and purpose of the Guidelines for Quality Assurance and Quality Control in Surface Water Quality Programs in Alberta, Alberta Environment, 2006\(^3\), as amended.

2.2. Primary Surface Water Quality Monitoring Requirements

Subject to the Water Act Approval conditions:

a) the parameters listed in Table 1 will be monitored during the primary surface water quality monitoring program;

b) surface water quality samples will be collected three times a year, including (at minimum) during the spring freshet, mid-summer (i.e., when most chemical parameters are at their seasonal peak), and autumn (i.e., during seasonal low flow conditions). Mid-summer sampling should not occur during or directly after a storm event;

c) Surface water quality sampling locations will be specific to each site and will depend on local hydrology, drainage network, and receiving waters. Sampling locations at a minimum will include:
   • one upstream location (i.e. reference locations that are not impacted by operations) for each receiving waterbody;
   • one downstream location for each receiving water body;
   • one sampling location for each potential release waters location; and
   • any water body within or adjacent to the peat operation area that is not protected by at least a 50 m buffer.

Proponents will submit a water quality monitoring proposal, including overall monitoring design and a map identifying all sampling locations.


<table>
<thead>
<tr>
<th>Parameter</th>
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<tr>
<td><strong>Flow rate/water level</strong></td>
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<td>Sulphate (mg/L)</td>
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<td>Magnesium (mg/L)</td>
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<td>Potassium (mg/L)</td>
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<td>Chloride (mg/L)</td>
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<td><strong>Cations &amp; Anions</strong></td>
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<td>Nitrate-N (mg/L)</td>
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<td>Ammonia (mg/L)</td>
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<td>NO2 &amp; NO3-N (mg/L)</td>
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<td>Total Phosphorus (mg/L)</td>
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<td>Specific Conductivity (µS/cm)</td>
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<td>(low level detections)</td>
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<td>Total Molybdenum (µg/L)</td>
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<td>Total Vanadium (µg/L)</td>
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### 2.3. Construction Surface Water Quality Monitoring Requirements

Initial construction stages (sedimentation pond construction, perimeter ditching, production field ditching, etc.) may require a Construction Monitoring Program as these activities may result in additional turbidity downstream. Potential adverse impacts to the aquatic environment during construction are subject to the Water Act approval conditions. Construction Monitoring includes high frequency *in situ* turbidity and pH monitoring of the upstream and downstream receiving environment to ensure that water quality guidelines for turbidity and pH are being met downstream.

### 2.4. Surface Water Quality Monitoring Requirements

Surface water quality monitoring is required over the life of the peat operations. The Primary Monitoring Program can become a Core Monitoring (Level 1) or Enhanced Monitoring (Level 2) program once sufficient data has been collected. This data determines if there has been an impact to surface water quality and the significance and extent of any impact in the receiving environment as a result of peat operations. The onus is on the proponent to provide the relevant information and a proposal for a Level 1 or 2 monitoring program. Instances that could trigger the need for Level 2 monitoring program include exceedances of surface water quality guidelines downstream as a result of peat operations, or a statistically significant difference between upstream and downstream locations caused by peat operations that would be of concern to the aquatic ecosystem.
Core Monitoring (Level 1)

If data from the Primary Monitoring Program suggest that there is minimal impact on water quality from peat operations, the approval holder may submit a Core Monitoring proposal to the Department. The Core Monitoring Program proposal will use data and information collected during the Baseline and Primary Monitoring Programs to identify an appropriate list of water quality indicators, sampling frequency, sampling locations and reporting schedule.

Enhanced Monitoring (Level 2)

If data from the Primary Monitoring Program suggest that there is the potential for adverse effects to the aquatic environment as a result of peat operations, the approval holder will submit an Enhanced Monitoring Program proposal to the Department. The intent of an Enhanced Monitoring Program is to detect and measure changes in the aquatic ecosystem and assess the magnitude, extent and duration of potential effects of activities on the ecological integrity of the aquatic environment. Enhanced Monitoring may include water quality and sediment quality monitoring, and biological studies that may involve epilithic algae, macrophytes, benthic invertebrates or fish communities.

Information collected during the Baseline and Primary Monitoring Programs can be used to ensure the timing of the Enhanced Monitoring Program occurs during the time of year when peat operations and receiving water body conditions are such that the effects are most likely to be measurable. Once effects are understood, the Director, by amending approval conditions, may require the approval holder to submit a Remedial Action Plan for approval by the director if certain triggers or limits are exceeded.

3. Surface Water Quality Monitoring Reporting Requirements

Submission of surface water quality monitoring reports will be a condition of the Water Act approval. These requirements may vary depending on the peat operation and the significance of the potential impacts to the environment.

Peat operators will be required to submit monitoring reports, as set by the Department. The Primary Water Monitoring Report must, at a minimum, include:

- a summary and map location of sampling locations;
- evaluation of all the data that has been collected and their comparison to Environmental Quality Guidelines for Alberta Surface Waters as applicable;
- identification of any changes in water quality through time;
- comparison of water quality data collected from upstream and downstream locations and determinations of whether there have been any changes in water quality in the receiving environment as a result of peat operations; and
- a summary of all exceedances of surface water quality guidelines downstream as a result of peat operations or statistically significant differences between upstream and downstream locations caused by peat operations that would be of concern to the aquatic ecosystem and the mitigation measures implemented to address those exceedances and differences.

The ongoing surface water quality monitoring program and conditions within the Water Act Approval will identify the surface water quality reporting requirements over the life of the operation.
4. Conservation and Reclamation Plans

Peat operations are deemed as “Specified Land” in the Environmental Protection and Enhancement Act (EPEA); Conservation and Reclamation Regulation. As per EPEA Section 137 (1), Duty to Reclaim, and the Conservation and Reclamation Regulation Section 3 Standards, Criteria and Guidelines, peat operations are required to be reclaimed in accordance with Requirements for Conservation and Reclamation Plans for Peat Operations in Alberta. On private lands, the Water Act application is required to include reclamation plans according to the Requirements for Conservation and Reclamation Plans for Peat Operations in Alberta and be included in the conditions of the Water Act approval. On Public Lands, reclamation plans and conditions will be covered in the Public Lands Approval.

5. Works Cited


This document may be cited as:


All comments, questions or suggestions regarding this document may be directed to:

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