

# **Government of Alberta**

## **Supplemental Guidelines for Aggregate Operations Woodlands Area – Athabasca River Valley**

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May 29, 2012

## Approval

This document will be reviewed annually and is endorsed for implementation as follows:

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Signature

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Name (printed)

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

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## Overview

This document is a region-specific supplement to the *Guidelines for Acquiring Surface Material Dispositions on Public Land* publication. The scope of this document is currently limited to aggregate operations in a section of the Athabasca River valley - within the management boundaries of Sustainable Resource Development's (SRD) Woodlands Area - that has been deemed environmentally sensitive.

This document outlines the additional requirements for Conservation and Reclamation Business Plans (CRBP) submitted on Surface Material Lease (SML) applications on public land within the designated sensitive area. This specific area of land has a legally defined geographic boundary and is mapped in Appendix 1. The environmentally sensitive area of the Athabasca River valley identified in this document has been separated into Preferred Development Areas (PDA) and Non-preferred Development Areas (NDA) with geographically-focused application criteria for aggregate development within them.

The application and approval for extraction of aggregate resources on private land within the mapped area is considered to fall outside of the scope of this document.

The information in this document is in support of the following publications:

- *Conceptual SRD Aggregate Management Strategy: Woodlands Area – Study Area 2 (Windfall)*. Green Plan Ltd., April 2008.
- *Guidelines for Acquiring Surface Material Dispositions on Public Land*, SRD 2008.
- *Best Management Practices – User Manual for Aggregate Operators on Public Land*. SRD October 2010.

## Background

The Woodlands Area represents a typical area where public land is becoming highly exposed to the aggregate industry. Over the past decade, the number and size of aggregate dispositions have increased significantly and it is expected that this trend will continue. Effective management of the aggregate resources in the Woodlands Area is a considerable challenge because of the growing conflict between aggregate development and the protection of important environmental, social and economic values.

Geographically, the area is located in a section of the Athabasca River valley which has some of the richest sand and gravel deposits in Alberta. Many of these deposits are accessible by road and rail making them attractive for development. The area also possesses critical ungulate habitat and important aquatic resources.

As a result of the high demand for aggregate resources along the Athabasca River valley corridor, a conceptual aggregate management strategy<sup>1</sup> was developed. This strategy studied a portion of the Athabasca River valley and deemed it to be environmentally sensitive<sup>2</sup> to the impact of aggregate operations. Further review determined the remainder of the river valley corridor to be environmentally sensitive as well.

The *Supplemental Guidelines for Aggregate Operations: Woodlands Area – Athabasca River Valley* document was developed based on recommendations from the conceptual aggregate management strategy to help guide future development of this resource along the Woodlands Area's section of the river valley.

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<sup>1</sup> *Conceptual SRD Aggregate Management Strategy: Woodlands Area – Study Area 2 (Windfall)*. Green Plan Ltd., April 2008.

<sup>2</sup> According Section 2.4: Conservation and Reclamation Business Plan (CRBP) of *Guidelines for Acquiring Surface Material Dispositions on Public Land*, SRD 2008.

## **Goals**

This document was built upon the following goals:

- Sustain the use of aggregate resources within the Athabasca River valley, giving consideration to other resource values, rights, tenures, development opportunities and the biological and physical limitations of the land and resources.
- Build a management framework to integrate existing and future aggregate development into the landscape.
- Implement a decision and support tool to screen aggregated applications in order to determine if development can proceed or if modifications are required to avoid adverse environmental, economic and social impacts.

## **Operating Principles**

This document was developed according to the following operating principles:

- Aggregate development will be managed within preferred areas and discouraged in other areas to conserve identified resource values.
- Aggregate development will not take place concurrently on both sides of the river in order to reduce fragmentation and help maintain habitat connectivity within the river valley at any point in time.
- Operations must ensure maximum aggregate harvest within excavation footprints to minimize the total number of hectares required to satisfy business needs.
- Aggregate operators will conduct a comprehensive inventory of the pre-disturbance landscape and ecological features to identify targets for end land use planning.
- Phased development and progressive reclamation as per *External Directive SD2010-02 – Progressive Reclamation and Interim Clean-up*.

## **Outcomes**

This document was developed in support of the following outcomes:

- Sustainable use of public land and resources.
- Low levels of land-use and resource-use conflict.
- Enhanced efficiency and effectiveness in achieving government land and resource management mandates and goals.
- Shared responsibility and embedded stewardship ethic on the part of governments and stakeholders, leading to heightened personal, group and corporate responsibility for actions, transparency of processes and objectives, and accountability for sustainability.
- Improved certainty of appropriate levels of access to public land and resources through integration and alignment of government operational plans and decision mechanisms as they pertain to land and natural resource values.
- Increased environmental quality due to improved management and impact mitigation on public land through required actions by public land users.

## **Applications With-in the Designated Area**

Applications within the lands identified in Appendix 1 are recognized as having identified prospective aggregate deposits based on information from the Alberta Geological Survey website (*Report 1995-08, February 10, 2006*) and Alberta Sustainable Resource Development (SRD).

Consequently, disposition applications affected by this document will be considered to be applied on previously identified aggregate resources and will be allocated by one of the following methods:

- Public tender<sup>3</sup>;
- Request for Proposal; or
- Any other approved means deemed necessary to ensure that the aggregate is used in an optimal manner.

If aggregate development is proposed within the lands identified as environmentally sensitive in Appendix 1, the applicant should:

- Determine if the land is designated as a Preferred Development Area (PDA) or a Non-preferred Development Area (NDA) as identified in Appendix 1.
- Determine whether aggregate development is a permitted use in that designation.
- Contact the appropriate SRD area office to discuss what additional information may be required in the Conservation and Reclamation Business Plan (CRBP), based on the specific location of the proposed aggregate operations.
- Ensure that identified CRBP requirements outlined in this document are fulfilled in addition to those set out in the *Guidelines for Acquiring Surface Material Dispositions on Public Land*.

Note: All additional information requirements must be submitted in the format specified and will be used as necessary by the Government of Alberta.

## **Land Designation and Compatible Land Uses**

The environmentally sensitive area of the Athabasca River valley identified in this document has been separated into Preferred Development Areas (PDA) and Non-preferred Development Areas (NDA) with geographically-focused application criteria for aggregate development within them. Aggregate dispositions will be directed towards PDAs and discouraged from NDAs where aggregate use is considered incompatible with other resource values in support of this document's Operating Principles and Outcomes. The PDA and NDA boundaries will continue to be refined in an ongoing manner based on the best data available.

### ***Preferred Development Areas (PDA)***

Appendix 1 identifies the locations of Preferred Development Areas (PDA) within the lands designated as environmentally sensitive along the Athabasca River valley in support of this document's Operating Principles and Outcomes. PDAs are given a high priority in aggregate and other industrial development and may be protected from incompatible development. Aggregate developments and compatible land uses within the PDAs are encouraged to share information, resources and infrastructure in an effort to minimize surface disturbances.

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<sup>3</sup> As outlined in Appendix 4A, Section 3 of the *Guidelines for Acquiring Surface Material Dispositions on Public Land*.

The PDAs have been identified based on a combination of the following attributes:

- High potential for aggregate deposits based on landforms, existing disturbances and Alberta Geological Survey data
- Near existing infrastructure including road and rail access and water crossings
- High industrial and recreational end land use values
- Developed or disturbed by industrial development
- Gravel is accessible and not sterilized by other land uses

### **Non-preferred Development Areas (NDA)**

Appendix 1 identifies the locations of Non-preferred Development Areas (NDA) within the lands designated as environmentally sensitive along the Athabasca River valley. Aggregate development is restricted within the NDAs as per this document's Operating Principles and Outcomes.

NDA lands were identified based on, but not limited to, a combination of important values, site conditions and land uses, including:

- Limited access
- Limited aggregate deposit
- Identified or potential recreation opportunities
- Provision of travel corridors and resting places for migratory species
- Identification of lands with severe development constraints such as those on steep and unstable slopes, or permanent wetlands
- Maintenance of aesthetically pleasing environments
- South facing slopes
- Confluence of tributaries with the Athabasca River
- Sources of groundwater recharge, low stream flow supplementation, flood peak reduction and headwater protection for hydrological systems
- Protection of significant geological features
- Protection of rare or endangered species
- Conservation of habitat for species that require extensive areas for breeding and habitation

## **Requirements**

Applicants must address the following requirements that are applicable to their respective Conservation and Reclamation Business Plan (CRBP). If additional clarification is required, contact your local Sustainable Resource Development (SRD) office.

### **1. Terrain, Soils and Overburden**

- The crest and toe of the slope shall be established by means of a site inspection and these lines will be plotted on proposed development plans.
- Ensure a minimum development setback of 15 metres from the crest and toe of a slope is required and no disturbance of grades or vegetation below the crest and above the toe shall occur.
- Provide detailed soil salvage and handling plans that specifically identify the dominant soil types, how they will be managed and reclaimed.

- Ensure unstable areas and riparian areas are restricted from development and are identified on the CRBP map.
- Ensure that where unstable terrain conditions are noted adjacent to the proposed excavation boundaries a geotechnical survey is required to ensure no adverse impacts due to aggregate operations are likely to occur.

## **2. Watersheds**

- Ensure a minimum setback<sup>4</sup> will be established from each side of a stream, river bed, lakeshore or wetland as outlined below:
  - 100 metres from a large permanent watercourse<sup>5</sup>
  - 45 metres from a small permanent (non-seasonal) watercourse<sup>6</sup> and immediate tributary such as stream, wetland or peatland
  - 45 metres from a ravine or seasonal watercourse
  - 100 metres from a lake
  - 45 metres from non-permanent seasonal wetlands

Note: The width of applied for buffers may be adjusted by SRD in consultation with other authorities if the proposed buffers are deemed to be inadequate.

## **3. Storm Water (Surface Water)**

- Ensure that the following sediment and erosion control practices will be carried out during development:
  - Temporary ground cover i.e. vegetation and/or mulching will be used to protect critical areas exposed during development
  - Sediment control devices will be installed and maintained to remove sediment from run-off due to changed soil surface conditions during and after construction
  - Construction in or across a watercourse or wetlands shall be conducted as per the *Environmental Code of Practice for Watercourse Crossings*
- Submit a storm water management plan which must address surface water interception and diversion, both on and off lease.
- Provide a detailed plan stating how they will mitigate the risk of any pollution of surface water resulting from their operations.

Note: Any *Water Act* approvals or licences are required by Alberta Environment prior to disturbance from aggregate operations.

## **4. Groundwater**

- Submit a hydrogeological study for applications on or adjacent to groundwater recharge areas or where extraction will take place within 1.5 metres of the water table or below the water table. Proposals remaining 1.5 metres above the water table do not require hydrogeological reports. The location of the water table is determined by the applicant and approved by SRD.
- Ensure aggregate operations do not operate on or near groundwater recharge areas and discharge areas (springs etc.).
- Provide a detailed plan stating how the company will mitigate the risk of any pollution of groundwater resulting from their operations.

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<sup>4</sup> The minimum setback will be measured from the edge of the bank to the edge of the pit excavation.

<sup>5</sup> These are streams that are generally greater than five metres in width.

<sup>6</sup> These are streams that are generally less than five metres in width.

Note: Any *Water Act* approvals or licences are required by Alberta Environment prior to disturbance from aggregate operations.

## **5. Wetlands and waterbodies<sup>7</sup>**

- Identify all wetlands or waterbody within the surface material lease boundary.
- Identify all wetland areas or waterbodies that may be adversely impacted by the proposed aggregate operations.
- Provide a mitigation and re-establishment plan that addresses the impact of proposed operations on the identified wetlands or waterbodies.

Note: Any *Water Act* approvals or licences are required by Alberta Environment prior to disturbance from aggregate operations.

## **6. Vegetation and Forest Resources**

### **6.1 Forested Land**

- Submit a detailed timber harvest and salvage plan which includes a strategy to store non-merchantable coarse woody debris on site for roll-back or interim reclamation.
- Ensure revegetation activities must be compliant with the External Directive SD 2010-02: Progressive Reclamation and Interim Clean-up and the Native Plant Revegetation Guidelines for Alberta.
- Ensure clearing of vegetation is only permitted from November 1 to February 28.

### **6.2 Non-forested Land**

- Ensure revegetation activities must be compliant with the External Directive SD 2010-02: Progressive Reclamation and Interim Clean-up and the Native Plant Revegetation Guidelines for Alberta.
- Ensure clearing of vegetation is only permitted from November 1 to February 28.

## **7. Wildlife**

- Complete the *Pre-disturbance Wildlife Assessment* requirements outlined in Appendix 2 of this document as directed by the Area Wildlife Biologist.
- Submit a detailed plan outlining mitigation activities to reduce the impacts of aggregate operations on these values.
- Cease operations immediately if additional rare habitats, species or plant communities are discovered throughout the course of operations and notify the local SRD office to discuss mitigation or CRBP amendment. In the event of snakes being identified, measures to relocate and/or create artificial snake dens may be required.
- Activities should comply with the Wildlife Land Use Guidelines.
- Ensure development is designed so as to:
  - Minimize the impacts upon wildlife habitat, in particular, rare, vulnerable, threatened plant or animal species, as identified by historical data and on-site pre-construction assessment
  - Maintain wildlife corridors and linkages with adjacent areas
  - Enhance wildlife habitat wherever possible

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<sup>7</sup> According to the definitions outlined in the Cowardin Wetland Classification System and Stewart and Kantrud Wetland Classification System.

## **8. Fish and Aquatic Resources**

- Prior to conducting any research or inventory involving fish, the operator must obtain a Fisheries Research Licence (FRL).
- Ensure that a fisheries assessment is conducted by a Qualified Aquatic Environment Specialist (QAES) so as to:
  - Determine what fish species, if any, are present in the impacted watercourse
  - Determine whether the Department of Fisheries and Oceans Canada (DFO) needs to be contacted for approval<sup>8</sup> of activities based on the potential to cause habitat alteration, damage or destruction (HADD)
  - Determine what mitigation measures the operator may be required to implement in order to offset the potential impacts to the fish or fish habitat of the watercourse
- More detailed studies with specific objectives may be required, as determined by the Area Fisheries Biologist, based on the results of the QAES assessment.
- Site development and reclamation plans will consider the restoration of historical fish habitat.

## **9. First Nations**

- First Nation's consultation must adhere to the *Alberta's First Nations Consultation Guidelines on Land Management and Resource Development* policy.

## **10. Trapping**

- Maintain traditional transport routes used by registered trapline holders to harvest fur on their traplines.
- Identify methods to allow trapping to occur in the inactive and non-operational portions of the aggregate disposition.

## **11. Forest, Energy and Other Industry**

- Identify all other industrial and commercial users that may be impacted by aggregate operations and outline mitigation strategies to work in cooperation with these users.

## **12. Recreation and Tourism**

- Identify all recreational users that may be impacted by aggregate operations and outline strategies to mitigate the impact on the identified users.
- Ensure minimum setbacks of 100 metres of a known or designated recreational area.

Note: The width of applied for buffers may be adjusted by SRD in consultation with other authorities if the proposed buffers are deemed to be inadequate.

## **13. End Land Use**

- A detailed end land use plan must be submitted addressing land use objectives and showing what the final intent for the approved site will be.
- Where the end land use is not consistent with the current reclamation criteria,<sup>9</sup> justification and supporting information must be submitted to support any variance.

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<sup>8</sup> Refer to the *Decision Framework for the Determination and Authorization of Harmful Alteration, Disruption or Destruction of Fish Habitat* document by the Department of Fisheries and Oceans Canada.

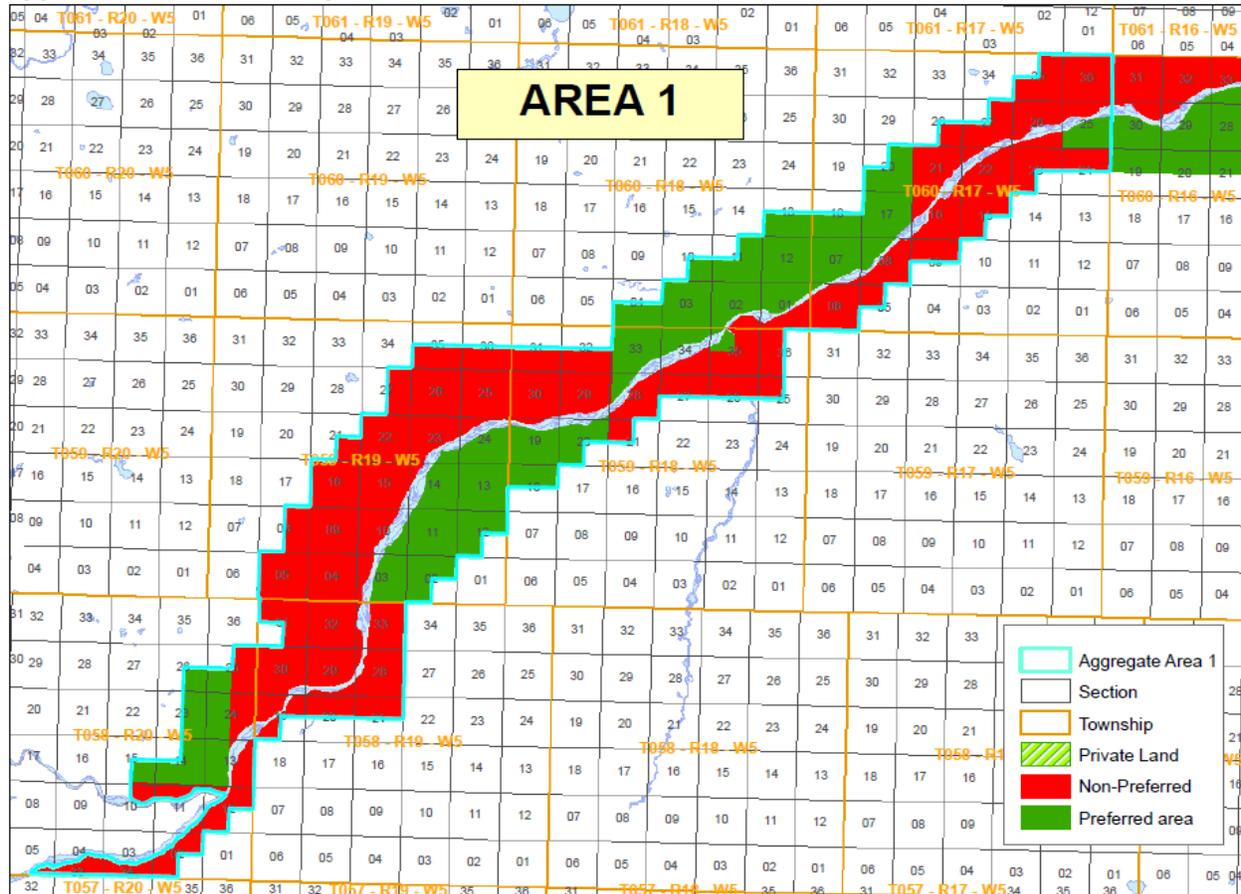
<sup>9</sup> Refer to Part 6 – Conservation and Reclamation of the *Environmental Protection and Enhancement Act*.

## Appendices

### Appendix 1 – Lands Designated as Environmentally Sensitive

For the purpose of this document, the area of the Athabasca River valley deemed environmentally sensitive has been subdivided into four separate areas. Each area of land has a legally defined geographic boundary and has been mapped in Appendices 1.1 – 1.4 according to the four subsections.

#### Appendix 1.1 – Area 1 Map



#### Area 1 Legal Description

The legal descriptions below denote the properties that are considered to be part of the *Supplemental Guidelines for Aggregate Operations: Woodlands Area – Athabasca River Valley*. Any proposed aggregate operations falling within these legal descriptions are required to follow this aggregate strategy.

#### Township 58, range 19, west of the 5<sup>th</sup> meridian

Southwest, northwest and northeast quarters of section 19, township 58, range, 19 west of the 5<sup>th</sup> meridian, north half of section 20, township 58, range 19 west of the 5<sup>th</sup> meridian, north half of section 21, township 58, range 19, west of the 5<sup>th</sup> meridian, section 28, 29, 30, township 58, range, 19 west of the 5<sup>th</sup> meridian, southeast, northeast and northwest quarters of section 31, township 58, range 19, west of the 5<sup>th</sup> meridian, section 32 and 33, township 58, range 19, west of the 5<sup>th</sup> meridian.

#### Township 58, range 20, west of the 5<sup>th</sup> meridian

Southwest, northwest and northeast quarter of section 2, township 58, range 20 west of the 5<sup>th</sup> meridian, south of the Athabasca River, south half of section 3, 4, township 58, range 20 west of the 5<sup>th</sup> meridian, southeast quarter of section 5, township 58, range 20 west of the 5<sup>th</sup> meridian, south of the Athabasca

River, northwest quarter of section 10, township 58, range 20, west of the 5<sup>th</sup> meridian, north of the Berland River, north half of section 11, township 58 range 20 west of the 5<sup>th</sup> meridian, north of the Berland River, southwest, northwest and northeast quarter of section 12, township 58 range 20 west of the 5<sup>th</sup> meridian, section 13 of township 58, range 20 west of the 5<sup>th</sup> meridian, southeast, southwest, and northeast quarter of section 58, range 20 west of the 5<sup>th</sup> meridian, southwest quarter of section 15, township, 58 range, 20 west of the 5<sup>th</sup> meridian, east half of section 23, township 58, range 20, west of the 5<sup>th</sup> meridian, section 24 of township 58, range 20, west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarter of section 25, township 58, range 20, west of the 5<sup>th</sup> meridian, southwest quarter of section 26, township 58, range , 20, west of the 5<sup>th</sup> meridian.

**Township 59, range 18, west of the 5<sup>th</sup> meridian**

North half of section 18, township 59, range 18, west of the 5<sup>th</sup> meridian, section 19 of township 59, 18, west of the 5<sup>th</sup> meridian, section 19, township 59, range 18, west of the 5<sup>th</sup> meridian, southwest, northwest and northeast quarters of section 20, township 59, range 18, west of the 5<sup>th</sup> meridian, northwest quarter of section 21, township 59, range, 18 west of the 5<sup>th</sup> meridian, northwest quarter of section 25, township 59, range 18, west of the 5<sup>th</sup> meridian, north half of sections 26 and 27, township 59 range 18, west of the 5<sup>th</sup> meridian, sections 28, 29 and 30 of township 59, range 18 west of the 5<sup>th</sup> meridian, south half of sections 31 and 32, township 59, range 18, west of the 5<sup>th</sup> meridian, sections 33, 34, and 35, township 59, range 18, west of the 5<sup>th</sup> meridian, west half of section 36, township 59, range 19 west of the 5<sup>th</sup> meridian.

**Township 59, range 19, west of the 5<sup>th</sup> meridian**

Southwest, northwest and northeast quarters of section 2, township 59, range 19, west of the 5<sup>th</sup> meridian, sections 3, 4 and 5, township 59, range 19, west of the 5<sup>th</sup> meridian, east half of section 8, township 59, range 19, west of the 5<sup>th</sup> meridian, sections 9, 10, 11 of township 59, range 19, west of the 5<sup>th</sup> meridian, southwest, northwest and northeast quarters of section 12, township 59, range 19, west of the 5<sup>th</sup> meridian, section 13, 14, 15 and 16, township 59, range 19, west of the 5<sup>th</sup> meridian, southeast quarter of section 21, township 59, range 19, west of the 5<sup>th</sup> meridian, sections 22, 23, 24, 25 and 26, township 59, range 19, west of the 5<sup>th</sup> meridian, east half of section 27, township 59, range 19, west of the 5<sup>th</sup> meridian, south half of section 35, 36, township 59, range 19, west of the 5<sup>th</sup> meridian.

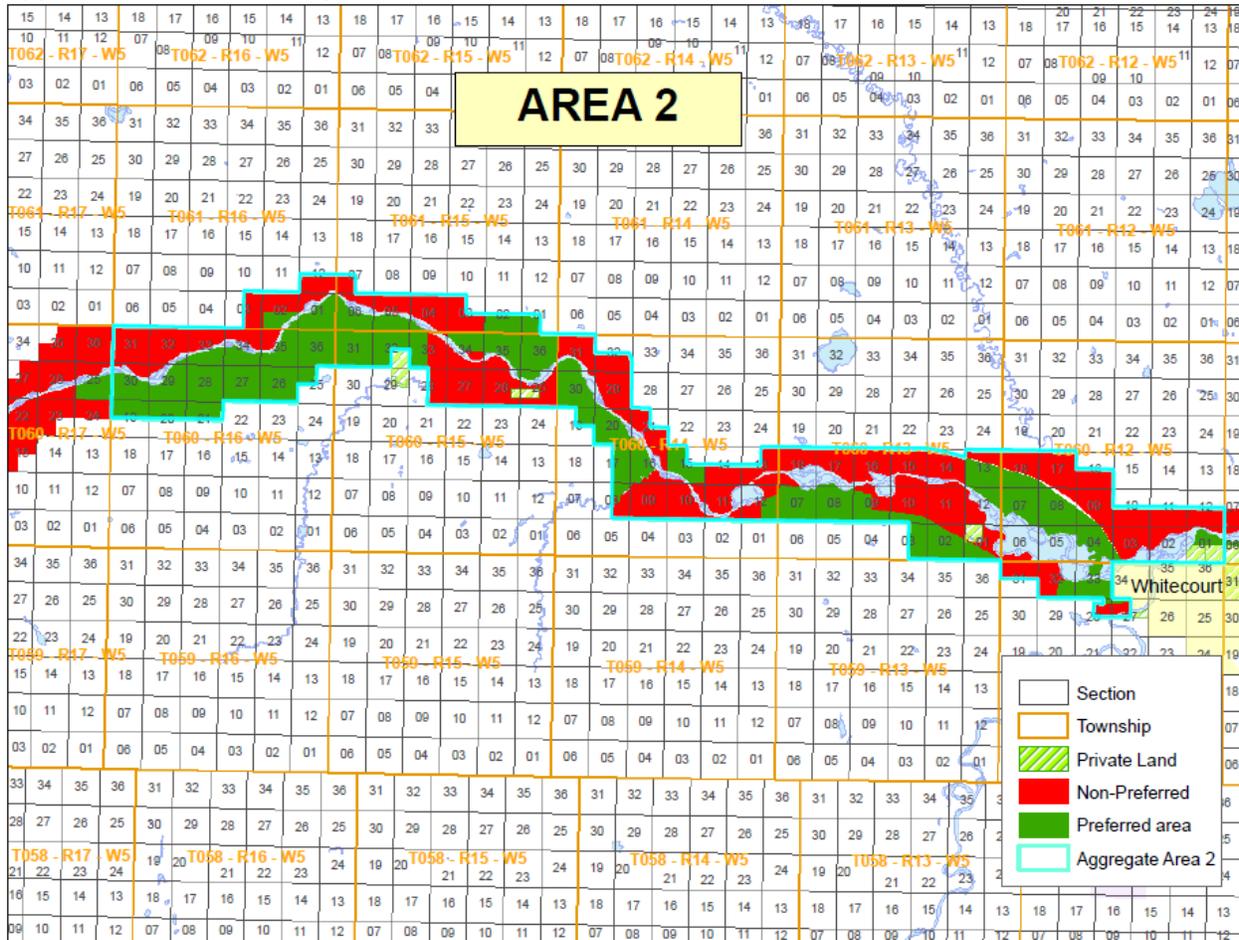
**Township 60, range 17, west of the 5<sup>th</sup> meridian**

Northwest quarter of section 5, township 60, range 17, west of the 5<sup>th</sup> meridian, section 6, 7 and 8, township 60, range 17, west of the 5<sup>th</sup> meridian, north half of section 9, township 60, range 17, west of the 5<sup>th</sup> meridian, southwest, northwest and northeast quarters of section 15, township 60, range 17, west of the 5<sup>th</sup> meridian, section 16 and 17, township 60, range 17, west of the 5<sup>th</sup> meridian, south half of section 18, township 60, range 17, west of the 5<sup>th</sup> meridian, southwest, southeast and northeast quarters of section 20, township 60, range 17, west of the 5<sup>th</sup> meridian, sections 21 and 22, township 60, range 17, west of the 5<sup>th</sup> meridian, southwest, northwest and northeast quarters of section 23, township 60, range 17, west of the 5<sup>th</sup> meridian, north half of section 24, township 60, range 17, west of the 5<sup>th</sup> meridian, section 25 and 26, township 60, range 17, west of the 5<sup>th</sup> meridian, northeast, southeast, and southwest quarters of section 27, township 60, range 17, west of the 5<sup>th</sup> meridian, southeast quarter of section 28, township 60, range 17, west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 35, township 60, range 17, west of the 5<sup>th</sup> meridian, section 36, township 60, range 17, west of the 5<sup>th</sup> meridian.

**Township 60, range 18, west of the 5<sup>th</sup> meridian**

Section 1, 2, and 3, township 60, range 18, west of the 5<sup>th</sup> meridian, south half of section 4, township 60, range 18 west of the 5<sup>th</sup> meridian, southeast quarter of section 10, township 60, range 18, west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 11, township 60, range 18, west of the 5<sup>th</sup> meridian, section 12, township 60, range 18, west of the 5<sup>th</sup> meridian, south half of section 13, township 60, range 18, west of the 5<sup>th</sup> meridian.

Appendix 1.2 – Area 2 Map



**Area 2 Legal Description**

The legal descriptions below denote the properties that are considered to be part of the *Supplemental Guidelines for Aggregate Operations: Woodlands Area – Athabasca River Valley*. Any proposed aggregate operations falling within these legal descriptions are required to follow this aggregate strategy.

**Township 60, Range 12 west of the 5th meridian**

Sections 1, 2, 3, 4, 5, 6, 7, 8 and 9, township 60, range 12 west of the 5th meridian, s ½ of sections 10, 11 and 12, township 60 range 12 west of the 5th meridian, s ½ of section 16, township 60, range 12 west of the 5th meridian, section 17 and 18 township 60 range 12 west of the 5th meridian

**Township 60, Range 13 west of the 5th meridian**

Sections 1 and 2, township 60, range 13 west of the 5th meridian, east ½ of section 3, township 60, range 13 west of the 5th meridian, sections 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 and 18, township 60, range 14 west of the 5th meridian

**Township 60, Range 14 west of the 5th meridian**

East ½ of section 8, township 60, range 14 west of the 5th meridian, sections 9, 10, 11, 12 of township 60, range 14 west of the 5th meridian, southeast, southwest and northeast quarters of section 13, township 60, range 14 west of the 5th meridian, s ½ of section 14, township 60, range 14 west of the 5th meridian, southeast, southwest and northwest quarter of section 15, township 60, range 14 west of the 5th meridian, section 16, township 60, range 14 west of the 5th meridian, east ½ of section 17, township 60, range 14

west of the 5<sup>th</sup> meridian, northeast quarter of section 19, township 60 range 14 west of the 5<sup>th</sup> meridian, section 20, township 60, range 14 west of the 5<sup>th</sup> meridian, southeast, southwest and northwest quarters of section 21, township 60, range 14 west of the 5<sup>th</sup> meridian, sections 29, 30 and 31, township 60, range 14 west of the 5<sup>th</sup> meridian, s ½ of section 32, township 60 range 14 west of the 5<sup>th</sup> meridian

**Township 60, Range 15 west of the 5th meridian**

Section 25, 26 and 27 of township 60, range 15 west of the 5th meridian, east ½ of section 28, township 60, range 15 west of the 5<sup>th</sup> meridian, section 31 of township 60, range 15 west of the 5<sup>th</sup> meridian, southwest, northwest and northeast quarters of section 32, township 60, range 15 west of the 5<sup>th</sup> meridian, sections 34, 35, 36 of township 60, range 15 west of the 5<sup>th</sup> meridian

**Township 60, Range 16 west of the 5th meridian**

North ½ of sections 19, 20 and 21, township 60, range 16 west of the 5th meridian, northwest quarter of section 25 of township 60, range 16 west of the 5<sup>th</sup> meridian, sections 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 and 36 of township 60 range 16 west of the 5<sup>th</sup> meridian

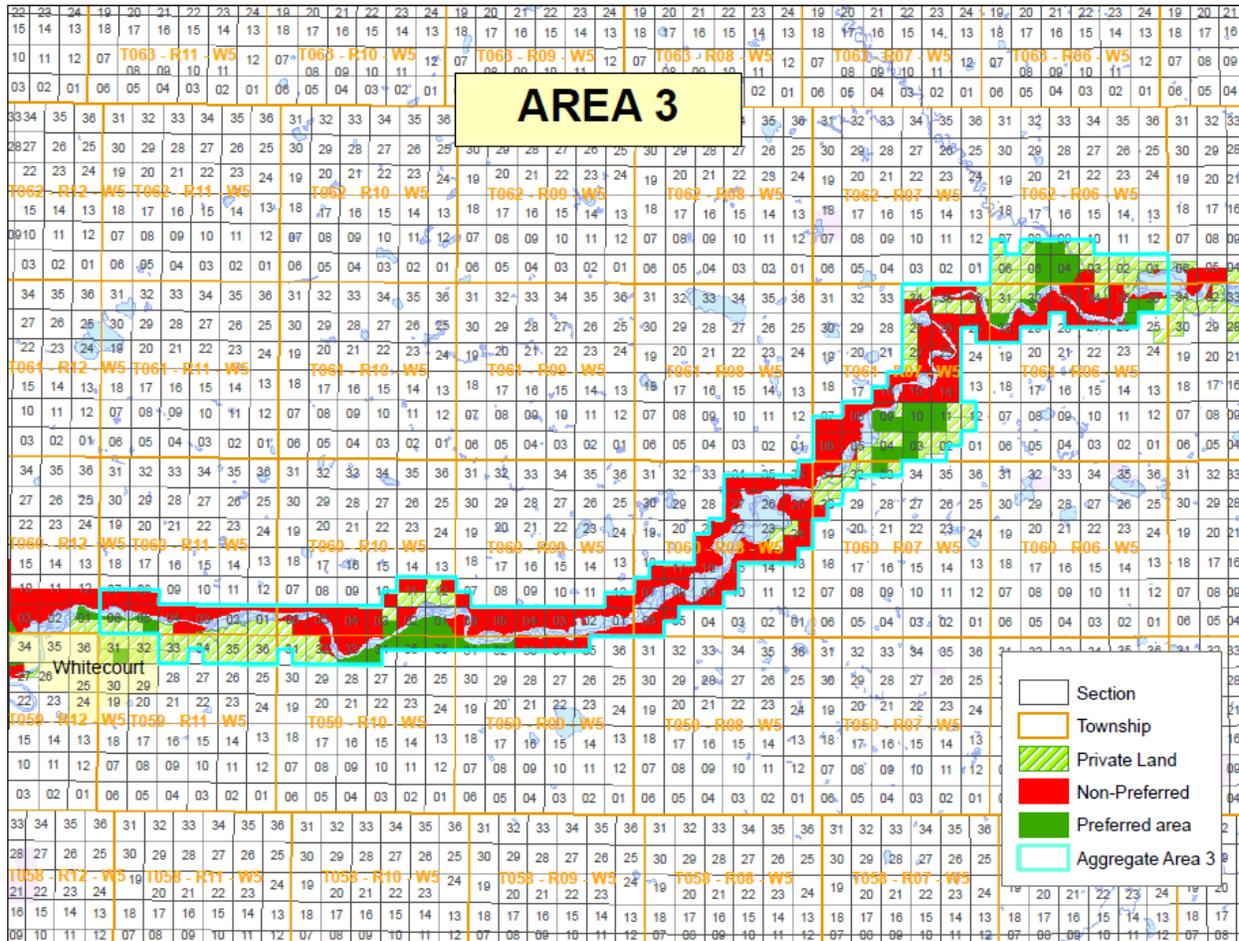
**Township 61, Range 15 west of the 5th meridian**

Southwest quarter of section 1, township 61, range 15 west of the 5<sup>th</sup> meridian, s ½ of section 2, township 61, range 15 west of the 5<sup>th</sup> meridian, southeast, southwest and northwest quarters of section 3, township 61, range 15 west of the 5<sup>th</sup> meridian, sections 4, 5 and 6, township 61, range 15 west of the 5<sup>th</sup> meridian, southwest quarter of section 7, township 61 range 15 west of the 5<sup>th</sup> meridian

**Township 61, Range 16 west of the 5th meridian**

Sections 1 and 2, township 61, range 16 west of the 5th meridian, east ½ of section 3, township 61, range 16 west of the 5th meridian, south ½ of section 12, township 61 and township 16 west of the 5<sup>th</sup> meridian

Appendix 1.3 – Area 3 Map



**Area 3 Legal Description**

The legal descriptions below denote the properties that are considered to be part of the *Supplemental Guidelines for Aggregate Operations: Woodlands Area – Athabasca River Valley*. Any proposed aggregate operations falling within these legal descriptions are required to follow this aggregate strategy.

**Township 59, range 9 west of the 5<sup>th</sup> meridian**

North ½ of sections 31, 32, 33 and 34, township 59, range 9 west of the 5<sup>th</sup> meridian, northwest quarter of section 35, township 59, range 9 west of the 5<sup>th</sup> meridian.

**Township 59, range 10 west of the 5<sup>th</sup> meridian**

Northwest, northeast and southeast quarters of section 31, township 59 range 10 west of the 5<sup>th</sup> meridian, sections 32 and 33 of township 59 range 10 west of the 5<sup>th</sup> meridian, southwest, northwest and northeast quarters of section 34, township 59, range 10 west of the 5<sup>th</sup> meridian, north ½ of sections 35 and 36, township 59, range 10 west of the 5<sup>th</sup> meridian.

**Township 59, Range 11 West of the 5<sup>th</sup> Meridian**

Section 33 of township 59, range 11 west of the 5<sup>th</sup> meridian, northwest, northeast and southeast quarters of section 34, township 59, range 11 west of the 5<sup>th</sup> meridian, section 35 and 36, township 59, range 11 west of the 5<sup>th</sup> meridian.

**Township 60, range 7 west of the 5<sup>th</sup> meridian**

Southwest, northwest and northeast quarters of section 30, township 60, range 7 west of the 5<sup>th</sup> meridian, section 31, township 60, range 7 west of the 5<sup>th</sup> meridian, southwest, northwest and northeast quarters of section 32, township 60, range 7 west of the 5<sup>th</sup> meridian, north ½ of section 33, township 60, range 7 west of the 5<sup>th</sup> meridian.

**Township 60, range 8 west of the 5<sup>th</sup> meridian**

Northwest quarter of section 5, township 60, range 8 west of the 5<sup>th</sup> meridian, sections 6,7,8 and 9 of township 60, range 8 west of the 5<sup>th</sup> meridian, northwest quarter of section 10, township 60, range 8 west of the 5<sup>th</sup> meridian, northwest quarter of section 13, township 60, range 8 west of the 5<sup>th</sup> meridian, south ½ of section 14, township 60, range 8 west of the 5<sup>th</sup> meridian, southwest, northwest and northeast quarters of section 15, township 60, range 8 west of the 5<sup>th</sup> meridian, section 16, township 60, range 8 west of the 5<sup>th</sup> meridian, south ½ of section 17, township 60, range 8 west of the 5<sup>th</sup> meridian, southeast quarter of section 18, township 60, range 8 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 21, township 60, range 8 west of the 5<sup>th</sup> meridian, sections 22, 23, 24, 25 26 and 27, township 60, range 8 west of the 5<sup>th</sup> meridian, south ½ of sections 34 and 35, township 60, range 8 west of the 5<sup>th</sup> meridian, southwest, southeast and northeast quarters of section 36, township 60, range 8 west of the 5<sup>th</sup> meridian.

**Township 60, range 9 west of the 5<sup>th</sup> meridian**

Sections 1, 2, 3, 4, 5 and 6, township 60, range 9 west of the 5<sup>th</sup> meridian, southwest quarter of section 7, township 60, range 9 west of the 5<sup>th</sup> meridian, south ½ of section 12, township 60, range 9 west of the 5<sup>th</sup> meridian.

**Township 60, range 10 west of the 5<sup>th</sup> meridian**

Sections 1, 2, 3, 4, 5 and 6, township 60, range 10 west of the 5<sup>th</sup> meridian, southeast quarter of section 10, township 60, range 10 west of the 5<sup>th</sup> meridian, sections 11 and 12, township 60, range 10 west of the 5<sup>th</sup> meridian.

**Township 60, range 11 west of the 5<sup>th</sup> meridian**

Sections 1, 2, 3, 4, 5 and 6, township 60, range 11 west of the 5<sup>th</sup> meridian, south ½ of sections 7 and 8, township 60, range 11 west of the 5<sup>th</sup> meridian.

**Township 61, range 6 west of the 5<sup>th</sup> meridian**

North ½ of sections 26 and 27, township 61, range 6 west of the 5<sup>th</sup> meridian, northeast quarter of section 28, township 61, range 6 west of the 5<sup>th</sup> meridian, north ½ section 29, township 61, range 6 west of the 5<sup>th</sup> meridian, sections 30, 31, 32, 33, 34, 35 and 36, township 61, range 6 west of the 5<sup>th</sup> meridian.

**Township 61, range 7 west of the 5<sup>th</sup> meridian**

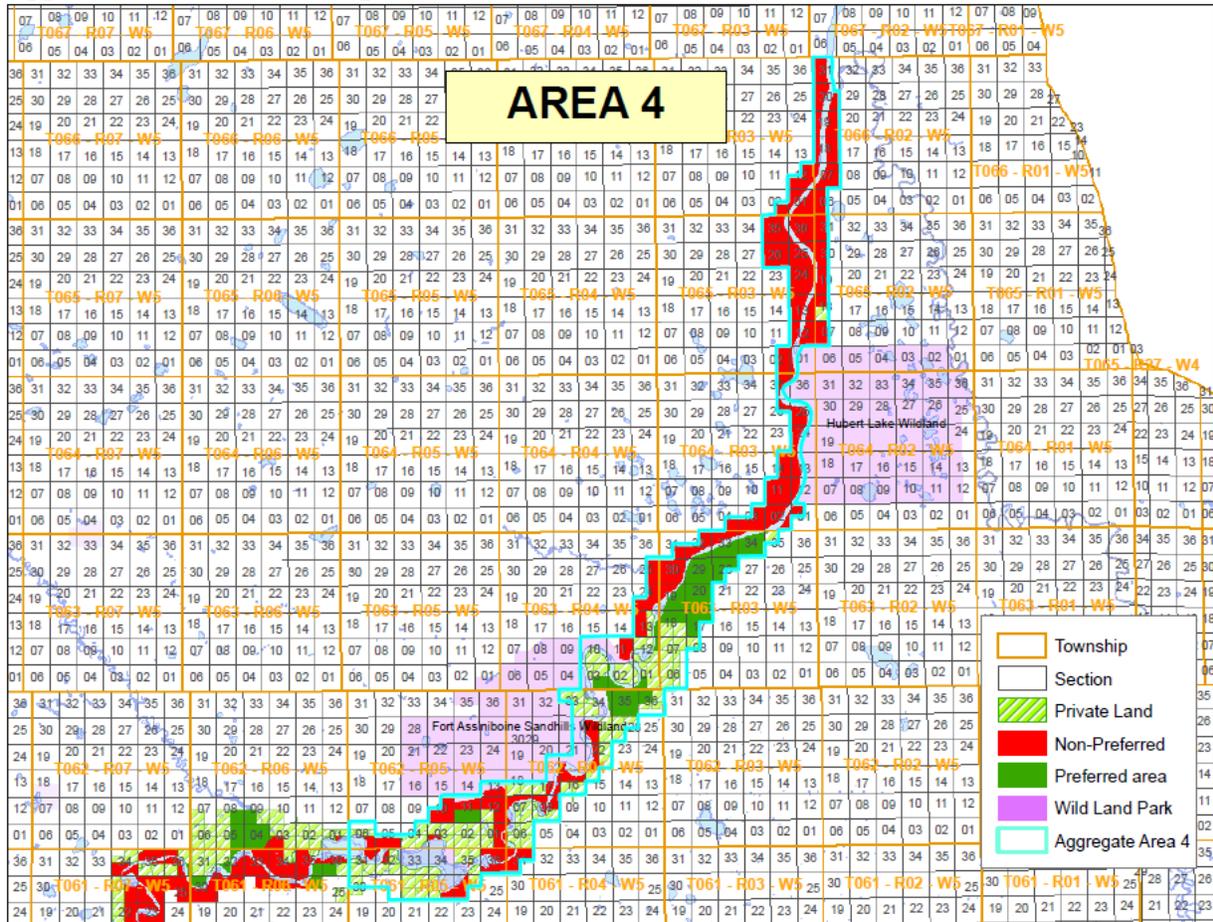
Southwest, northwest and southeast quarters of section 2, township 61, range 10 west of the 5<sup>th</sup> meridian, sections 3, 4, 5, and 6, township 61, range 7 west of the 5<sup>th</sup> meridian, south ½ section 7, township 61, range 7 west of the 5<sup>th</sup> meridian, sections 8, 9, 10 and 11, township 61, range 7 west of the 5<sup>th</sup> meridian, ½ of section 12, township 61, range 7 west of the 5<sup>th</sup> meridian, sections 14 and 15 township 61, range 7 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 16, township 61, range 7 west of the 5<sup>th</sup> meridian, sections 22 and 23, township 61, range 7 west of the 5<sup>th</sup> meridian, southeast

northeast and northwest quarters of section 25, township 61, range 7 west of the 5<sup>th</sup> meridian, sections 26, 27, 34, 35 and 36, township 61, range 7 west of the 5<sup>th</sup> meridian.

**Township 62, range 6 west of the 5th meridian**

Sections 1, 2, 3, 4, 5 and 6, township 62, range 6 west of the 5<sup>th</sup> meridian, southwest quarter of section 7, township 62, range 6 west of the 5<sup>th</sup> meridian, south ½ of sections 8 and 9, township 62, range 6 west of the 5<sup>th</sup> meridian, southwest quarter of section 10, township 62, range 6 west of the 5<sup>th</sup> meridian.

**Appendix 1.4 – Area 4 Map**



**Area 4 Legal Description**

The legal descriptions below denote the properties that are considered to be part of the *Supplemental Guidelines for Aggregate Operations: Woodlands Area – Athabasca River Valley*. Any proposed aggregate operations falling within these legal descriptions are required to follow this aggregate strategy.

**Township 62, range 4 west of the 5th meridian**

Sections 6, 7 and 8, township 62, range 4 west of the 5<sup>th</sup> meridian, northwest quarter of section 15, township 62, range 4 west of the 5<sup>th</sup> meridian, section 16, township 62, range 4 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 17, township 62, range 4 west of the 5<sup>th</sup> meridian, south ½ of 18, township 62 range 4 west of the 5<sup>th</sup> meridian, southeast quarter of section 20, township 62, range 4 west of the 5<sup>th</sup> meridian, southeast, southwest, and northeast quarters of section 21, township 62, range 4 west of the 5<sup>th</sup> meridian, section 22, township 62, range 4 west of the 5<sup>th</sup> meridian, southwest,

northwest and northeast quarters of section 26, township 62, range 4 west of the 5<sup>th</sup> meridian, section 27, township 62, range 4 west of the 5<sup>th</sup> meridian, east ½ of section 28, township 62, range 4 west of the 5<sup>th</sup> meridian, southeast, northeast and northwest quarters of section 33, township 62, range 4 west of the 5<sup>th</sup> meridian, sections 34,35 and 36, township 62, range 4 west of the 5<sup>th</sup> meridian.

**Township 62, range 5 west of the 5th meridian**

Sections 1, 2 and 3, township 62, range 5 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 4, township 62, range 5 west of the 5<sup>th</sup> meridian, south ½ of section 5, township 62, range 5 west of the 5<sup>th</sup>, section 6, township 62, range 5 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 10, township 62, range 5 west of the 5<sup>th</sup> meridian, sections 11 and 12, township 62, range 5 west of the 5<sup>th</sup> meridian, south ½ section 13, township 62, range 5 west of the 5<sup>th</sup> meridian.

**Township 63, range 3 west of the 5th meridian**

Sections 6 and 7, Township 63, range 3 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 17, Township 63, range 3 west of the 5<sup>th</sup> meridian, sections 18, 19 and 20, Township 63, range 3 west of the 5<sup>th</sup> meridian, southwest, northwest and northeast quarters of section 28, Township 63, range 3 west of the 5<sup>th</sup> meridian, sections 29 and 30, Township 63, range 3 west of the 5<sup>th</sup> meridian, southeast quarter of section 31, Township 63, range 3 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 32, Township 63, range 3 west of the 5<sup>th</sup> meridian, sections 33 and 34, Township 63, range 3 west of the 5<sup>th</sup> meridian, northwest quarter of section 35, Township 63, range 3 west of the 5<sup>th</sup> meridian.

**Township 63, range 4 west of the 5th meridian**

Sections 1, 2, 3, 10, 11, 12, 13, township 63, range 4 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 24, township 63, range 4 west of the 5<sup>th</sup> meridian, west ½ of section 25, township 63, range 4 west of the 5<sup>th</sup> meridian.

**Township 64, range 3 west of the 5th meridian**

Northwest quarter of section 1, township 64, range 3 west of the 5<sup>th</sup> meridian, section 2, township 64, range 3 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 3, township 64, range 3 west of the 5<sup>th</sup> meridian, southwest quarter of section 4, township 64, range 3 west of the 5<sup>th</sup> meridian, w ½ of section 12, township 64, range 3 west of the 5<sup>th</sup> meridian, section 11, township 64, range 3 west of the 5<sup>th</sup> meridian, east ½ of section 14, township 64, range 3 west of the 5<sup>th</sup> meridian, west ½ of section 24, township 64, range 3 west of the 5<sup>th</sup> meridian, northwest quarter of section 25, township 64, range 3 west of the 5<sup>th</sup> meridian, northeast quarter of section 26, township 64, range 3 west of the 5<sup>th</sup> meridian, east ½ of section 35, township 64, range 3 west of the 5<sup>th</sup> meridian.

**Township 65, range 2 west of the 5th meridian**

West ½ of sections 7, 18, 19, 30 and 31, town ship 65, range 2 west of the 5<sup>th</sup> meridian.

**Township 65, range 3 west of the 5th meridian**

West ½ of section 1, township 65, range 3 west of the 5<sup>th</sup> meridian, east ½ of section 2, township 65, range 3 west of the 5<sup>th</sup> meridian, sections 12, 13,24, 25, 26, 35 and 36 township 65, range 3 west of the 5<sup>th</sup> meridian.

**Township 66, range 2 west of the 5th meridian**

West ½ of section 6, township 66, range 2 west of the 5<sup>th</sup> meridian, sections 7, 18, 19 and 30, township 66, range 2 west of the 5<sup>th</sup> meridian, west ½ of section 31, township 66, range 2 west of the 5<sup>th</sup> meridian.

**Township 66, range 3 west of the 5<sup>th</sup> meridian**

Section 1, township 66, range 3 west of the 5<sup>th</sup> meridian, southeast quarter of section 2, township 66, range 3 west of the 5<sup>th</sup> meridian, southeast, southwest and northeast quarters of section 12, township 66, range 3 west of the 5<sup>th</sup> meridian.

## Appendix 2 – Pre-disturbance Wildlife Assessment Guidelines

The Athabasca River is considered a Canadian Heritage River System and a highly valued part of Alberta's natural resources. Ecologically, the aquatic and terrestrial biotic communities which make up the watershed account for a significant portion of Alberta's fish and wildlife resources. As a result, Alberta Sustainable Resource Development (SRD) deems the Athabasca River valley to be an area sensitive that is sensitive to industrial development. Due to the large spatial extent of the watershed and complexity of the habitat arrangements within the river valley, a complete understanding of the wildlife resources and significant special features is lacking within this region.

In order to make fully informed approval decisions, SRD is requiring all aggregate extraction applications within the scope of this document to conduct a *Pre-disturbance Wildlife Assessment* of the lands being proposed for development. This assessment should be considered to have three procedural steps:

### 1. Historical Data Evaluation

Historical data (where it exists) should be obtained and evaluated, to better inform the site assessment survey, by requesting a Fisheries and Wildlife Management Information System (FWMIS) query and by having an initial consultation with the Area Wildlife Biologist. Information on conducting FWMIS searches, data sharing agreements, and wildlife contacts can be found on the ESRD website.

Information can also be viewed spatially using the Internal Mapping Framework site on the same webpage.

Information on known rare plants and/or rare community types should also be identified and can be requested from the Alberta Conservation Information Management System (formerly ANHIC).

### 2. Site Assessment and Wildlife Survey

Depending on the scope and scale of the development, addressing the requirements of the site assessment should be done in consultation with the Area Wildlife Biologist as not all survey elements may be required. If the proposed development is  $\geq 32$  hectares, the following elements should be addressed:

- a. **Breeding Birds** – of particular concern are species which are listed as *At Risk*, *May be at Risk*, *Sensitive*, or *Data Deficient* in Alberta and which are known to, or could occur, within the Athabasca River watershed.
- b. **Amphibians** - of particular concern are species which are listed as *At Risk*, *May be at Risk*, *Sensitive*, or *Data Deficient* in Alberta and which are known to, or could occur, within the Athabasca River watershed.
- c. **Bats** - of particular concern are species which are listed as *At Risk*, *May be at Risk*, *Sensitive*, or *Data Deficient* in Alberta and which are known to, or could occur, within the Athabasca River watershed.
- d. **Significant Wildlife Features** – there are many important elements of necessity for sustaining the life functions of species. Critical to the survival of certain species are nests, dens, and hibernacula as well important foraging areas, mineral sites, escape cover and travel corridors. In many cases, locations of many of these features are not precisely known until it is too late for mitigation to minimize the developmental effects. Identifying any locations of the following should be an aspect of the Site Assessment:
  - i. Raptor and other birds of prey nests – including cavity nesting species
  - ii. Den sites – Grizzly and black bears, wolves, coyotes, foxes, etc.
  - iii. Mineral Licks
  - iv. Hibernacula – Red-sided Garter snakes are known to occupy the Athabasca River valley with a number of known hibernacula identified. Certain species of bats will

form communal roosts throughout the summer and hibernate in large hibernacula during the winter.

- v. **Travel Corridors** – Significant trails or features which facilitate the use of large mammals.
- e. **Rare Plants** – Survey guidelines can be found at Alberta Tourism, Parks, and Recreation website.

The appropriate methodologies, survey techniques, and timing of surveys for all listed species and features should follow the standards established in the *Sensitive Species Inventory Guidelines* and *Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta* downloadable from the SRD website.

Note: Some of the surveys being proposed will require the application of a Research Permit and/or Collection Licence (Free of Charge) from the Fish and Wildlife Division, Wildlife Management Branch.

### **3. Consultants Report and Data Submission**

A written report outlining the survey findings should be prepared and submitted to the applicant and appended to the Conservation and Reclamation Business Plan (CRBP) as part of the disposition approval process. Results from the surveys should be taken into consideration when developing the CRBP which may include mitigation and/or setbacks during operations and specific reclamation considerations for end land use planning.

All wildlife data acquired from the physical site surveys, as a requirement of this document as well as any Research Permit or Collection Licence, shall be submitted to FWMIS according to the standards outlined by Alberta Sustainable Resource Development.

**ESRD/Supplemental Guidelines for Aggregate Operations**

**Table 1:** Summary of Alberta wildlife that have been given the status of *At Risk*, *May be at Risk*, or *Sensitive* and based on known occurrences, current range/distribution, or seasonal/migratory patterns may be encountered within the Athabasca River watershed.

Group ID	Scientific Name	Common Name	2005 Status
Mammals	<i>Rangifer tarandus caribou</i>	Woodland Caribou	At Risk
Mammals	<i>Myotis septentrionalis</i>	Northern Long-eared Bat	May Be at Risk
Mammals	<i>Ursus arctos</i>	Grizzly Bear	May Be at Risk
Mammals	<i>Mustela frenata</i>	Long-tailed Weasel	May Be at Risk
Mammals	<i>Gulo gulo</i>	Wolverine	May Be at Risk
Mammals	<i>Lasionycteris noctivagans</i>	Silver-haired Bat	Sensitive
Mammals	<i>Lasiurus cinereus</i>	Hoary Bat	Sensitive
Mammals	<i>Martes pennanti</i>	Fisher	Sensitive
Mammals	<i>Lynx canadensis</i>	Canada Lynx	Sensitive
Birds	<i>Cygnus buccinator</i>	Trumpeter Swan	At Risk
Birds	<i>Falco peregrinus</i>	Peregrine Falcon	At Risk
Birds	<i>Podilymbus podiceps</i>	Pied-billed Grebe	Sensitive
Birds	<i>Podiceps auritus</i>	Horned Grebe	Sensitive
Birds	<i>Aechmophorus occidentalis</i>	Western Grebe	Sensitive
Birds	<i>Progne subis</i>	Purple Martin	Sensitive
Birds	<i>Hirundo rustica</i>	Barn Swallow	Sensitive
Birds	<i>Certhia americana</i>	Brown Creeper	Sensitive
Birds	<i>Cistothorus platensis</i>	Sedge Wren	Sensitive
Birds	<i>Pelecanus erythrorhynchos</i>	American White Pelican	Sensitive
Birds	<i>Botaurus lentiginosus</i>	American Bittern	Sensitive
Birds	<i>Ardea herodias</i>	Great Blue Heron	Sensitive
Birds	<i>Anas crecca</i>	American Green-winged Teal	Sensitive
Birds	<i>Anas acuta</i>	Northern Pintail	Sensitive
Birds	<i>Aythya affinis</i>	Lesser Scaup	Sensitive
Birds	<i>Melanitta fusca</i>	White-winged Scoter	Sensitive
Birds	<i>Cathartes aura</i>	Turkey Vulture	Sensitive
Birds	<i>Pandion haliaetus</i>	Osprey	Sensitive
Birds	<i>Haliaeetus leucocephalus</i>	Bald Eagle	Sensitive
Birds	<i>Circus cyaneus</i>	Northern Harrier	Sensitive
Birds	<i>Accipiter gentilis</i>	Northern Goshawk	Sensitive
Birds	<i>Buteo platypterus</i>	Broad-winged Hawk	Sensitive
Birds	<i>Buteo swainsoni</i>	Swainson's Hawk	Sensitive
Birds	<i>Aquila chrysaetos</i>	Golden Eagle	Sensitive
Birds	<i>Tympanuchus phasianellus</i>	Sharp-tailed Grouse	Sensitive
Birds	<i>Porzana carolina</i>	Sora	Sensitive
Birds	<i>Grus canadensis</i>	Sandhill Crane	Sensitive
Birds	<i>Bartramia longicauda</i>	Upland Sandpiper	Sensitive

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Birds	<i>Sterna forsteri</i>	Forster's Tern	Sensitive
Birds	<i>Chlidonias niger</i>	Black Tern	Sensitive
Birds	<i>Surnia ulula</i>	Northern Hawk Owl	Sensitive
Birds	<i>Glaucidium gnoma</i>	Northern Pygmy-owl	Sensitive
Birds	<i>Strix varia</i>	Barred Owl	Sensitive
Birds	<i>Strix nebulosa</i>	Great Gray Owl	Sensitive
Birds	<i>Chordeiles minor</i>	Common Nighthawk	Sensitive
Birds	<i>Picoides arcticus</i>	Black-backed Woodpecker	Sensitive
Birds	<i>Dryocopus pileatus</i>	Pileated Woodpecker	Sensitive
Birds	<i>Empidonax minimus</i>	Least Flycatcher	Sensitive
Birds	<i>Sayornis phoebe</i>	Eastern Phoebe	Sensitive
Birds	<i>Myiarchus crinitus</i>	Great-crested Flycatcher	Sensitive
Birds	<i>Dendroica tigrina</i>	Cape May Warbler	Sensitive
Birds	<i>Dendroica virens</i>	Black-throated Green Warbler	Sensitive
Birds	<i>Dendroica castanea</i>	Bay-breasted Warbler	Sensitive
Birds	<i>Geothlypis trichas</i>	Common Yellowthroat	Sensitive
Birds	<i>Wilsonia canadensis</i>	Canada Warbler	Sensitive
Birds	<i>Piranga ludoviciana</i>	Western Tanager	Sensitive
Birds	<i>Euphagus carolinus</i>	Rusty Blackbird	Sensitive
Birds	<i>Icterus galbula</i>	Baltimore Oriole	Sensitive
Reptiles	<i>Thamnophis sirtalis</i>	Red-sided Garter Snake	Sensitive

### **Appendix 3 – Resources**

To access the related documents referenced in this manual, search one of the following document titles at [srd.alberta.ca](http://srd.alberta.ca).

- Guidelines for Acquiring Surface Material Dispositions on Public Land
- Best Management Practices – User Manual for Aggregate Operators on Public Land

The following information is a collection of resources to provide information to aggregate operators wishing to fulfill the requirements of their Conservation and Reclamation Business Plan (CRBP): [srd.alberta.ca](http://srd.alberta.ca).

- Guidelines for Acquiring Surface Material Dispositions on Public Land
- Best Management Practices – User Manual for Aggregate Operators on Public Land
- External Directive SD 2010-02: Progressive Reclamation and Interim Clean-up
- Native Plant Revegetation Guidelines for Alberta
- Wildlife Land Use Guidelines
- Fisheries Research Licence Application Form (FRL).
- Fisheries and Wildlife Management Information System (FWMIS)
- How to Access FWMIS Fisheries and Wildlife Data
- Sensitive Species Inventory Guidelines
- Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta
- Research Permits & Collection Licences

[environment.alberta.ca](http://environment.alberta.ca)

- Environmental Code of Practice for Watercourse Crossings
- Provincial Wetland Restoration/Compensation Guide
- Provincial Wetland Restoration/Compensation Fact Sheet

[www.dfo-mpo.gc.ca/](http://www.dfo-mpo.gc.ca/)

- Decision Framework for the Determination and Authorization of Harmful Alteration, Disruption or Destruction of Fish habitat

[qp.alberta.ca](http://qp.alberta.ca)

- Environmental Code of Practice for Watercourse Crossings
- *Environmental Protection and Enhancement Act*

[aboriginal.alberta.ca](http://aboriginal.alberta.ca)

- Alberta's First Nations Guidelines on Land Management and Resource Development

[tpr.alberta.ca](http://tpr.alberta.ca)

- Alberta Conservation Information Management System (formerly ANHIC)
- Draft Ecological Community Sampling Guidelines
- Alberta Conservation Information Management System (ACIMS)
- Draft Ecological Community Sampling Guidelines

[wetlandpolicy.ca](http://wetlandpolicy.ca)

- Cowardin Wetland Classification System
- Stewart and Kantrud Wetland Classification System