

**TERMS OF REFERENCE
ENVIRONMENTAL IMPACT ASSESSMENT REPORT**

FOR IMPERIAL OIL RESOURCES LIMITED

FINAL

Cold Lake Midzaghe SA-SAGD PROJECT

Approximately 23 km from Cold Lake, Alberta

ISSUED BY: Alberta Energy Regulator

DATE: December 14, 2015

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PURPOSE OF THE TERMS OF REFERENCE

The purpose of this document is to identify for Imperial Oil Resources Limited (Imperial), Aboriginal communities and appropriate stakeholders the information required by government agencies for an Environmental Impact Assessment (EIA) report prepared under the *Environmental Protection and Enhancement Act* (EPEA) for the Cold Lake Midzaghe SA-SAGD Project (the Project).

Imperial is seeking approval for the proposed Project. The proposed Project is located on Crown land approximately 23 kilometres northwest of the city of Cold Lake, Alberta, in Townships 65 and 66, Ranges 2, 3 and 4, West of the Fourth Meridian on Imperial's Cold Lake oil sands lease.

The proposed Project is an in-situ oilsands project that proposes to use solvent-assisted steam-assisted gravity drainage (SA-SAGD) in order to recover bitumen from the Grand Rapids Formation. Imperial is seeking approval for an annual average production capacity of about 55,000 barrels per day (bpd) of crude bitumen, with an estimated life of over 30 years.

The proposed Project will require infrastructure including, but not limited to: a central processing facility, well pads and associated sites for water source and waste disposal, pipelines (water, fuel gas, produced oil, steam injection and diluent/condensate supply), electrical power lines and access roads. Where practical, access to the proposed Project and associated facilities will leverage existing roads and pre-disturbed areas utilized by other stakeholders and land users in the area.

SCOPE OF THE EIA REPORT

Imperial shall prepare and submit an EIA report that examines the environmental and socio-economic effects of the Project.

The EIA report shall be prepared considering all applicable provincial and federal legislation, codes of practice, guidelines, standards, policies and directives.

The EIA report shall be prepared in accordance with these Terms of Reference and the environmental information requirements prescribed under EPEA and associated regulations, and the *Canadian Environmental Assessment Act* if applicable. The EIA report will form part of Imperial's application to the Alberta Energy Regulator (AER). An EIA report summary will also be included as part of the AER Application.

Imperial shall refer to the *Guide to Preparing Environmental Impact Assessment Reports in Alberta* published by Alberta Environment and Sustainable Resource Development (the Guide) and these Terms of Reference when preparing the Environmental Impact Assessment report. In any case where there is a difference in requirements between the Guide and these Terms of Reference, the Terms of Reference shall take precedence.

CONTENT OF THE EIA REPORT

1 PUBLIC ENGAGEMENT AND ABORIGINAL CONSULTATION

- [A] Describe the concerns and issues expressed by the public and the actions taken to address those concerns and issues, including how public input was incorporated into the Project development, impact mitigation and monitoring.
- [B] Describe the concerns and issues expressed by individual Aboriginal communities and the actions taken to address those concerns and issues, including how Aboriginal community input was incorporated into the Project, EIA development, mitigation, monitoring and reclamation. Describe consultation undertaken with Aboriginal communities and groups with respect to traditional ecological knowledge and traditional use of land and water.
- [C] Describe plans to maintain the public engagement and Aboriginal consultation process following completion of the EIA report in order to facilitate in providing the public and Aboriginal peoples with an appropriate forum for expressing their views on the ongoing development, operation and reclamation of the Project.

2 PROJECT DESCRIPTION

2.1 Overview

- [A] Provide a brief project description in sufficient detail to provide context for the EIA, including:
 - a) Imperial's information;
 - b) proposed extraction and bitumen processing technology;
 - c) amount and source of energy required for the Project;
 - d) the amount and source of diluent required for extraction and transport over the life of the Project;
 - e) water supply and disposal requirements, including process water and potable water requirements;
 - f) proposed method to transport product to markets; and
 - g) development plan and schedule.
- [B] Provide maps and/or drawings of the Project components and activities including:
 - a) existing infrastructure, leases and clearings, including exploration clearings;
 - b) proposed central processing/treatment and field facilities;
 - c) other buildings and infrastructure (e.g., pipelines and utilities);
 - d) temporary structures;
 - e) transportation and access routes;
 - f) on-site hydrocarbon storage;
 - g) containment structures such as retention ponds and storage ponds (e.g., lime sludge, stormwater runoff, boiler blow-down);
 - h) water wells/intakes, pipelines, and storage structures;
 - i) sources of aggregate resources, borrow material and other construction material and locations of any stockpiles that will be developed; and
 - j) waste storage area and disposal sites.

[C] Discuss the implications, of a delay in proceeding with the Project, or any phase of the Project, or not going ahead with the Project.

[D] Describe the benefits of the Project, including jobs created, local training, employment and business opportunities, and royalties and taxes generated that accrue to:

- a) Imperial;
- b) local and regional communities, including Aboriginal communities;
- c) the local authority;
- d) Alberta; and
- e) Canada.

For the estimation of royalties and taxes generated, identify the calculations and assumptions used.

[E] Provide the adaptive management approach that will be implemented throughout the life of the Project. Include how monitoring, mitigation and evaluation were incorporated.

2.2 Relationship of the Midzaghe Expansion to the existing/approved Cold Lake Operations

[A] Describe the history of the existing Cold Lake Operations.

[B] Provide maps showing the EIA study areas for the existing Cold Lake Operations and the proposed Project Area for the Midzaghe expansion. Discuss the implications of any overlaps in the mapped areas, including the confidence Imperial has in the data and assessments from the previous Cold Lake developments as they apply to the Midzaghe expansion and the need for additional field studies to fill any gaps.

[C] Describe for each EIA discipline, the lessons learned from the planning, design, construction, operation, reclamation, mitigation and monitoring of the existing Cold Lake Operations. Include examples where possible.

[D] Describe for each EIA discipline the lessons learned from the public engagement and aboriginal consultation process for the existing Cold Lake Operations. Include examples where possible.

[E] Describe using examples how the lessons learned have been incorporated into the design of the Midzaghe Project. Use examples where possible.

2.3 Constraints

[A] Discuss the process and criteria used to identify constraints to development, and how the Project has been designed to accommodate those constraints. Include the following:

- a) any applicable *Alberta Land Stewardship Act* Regional Plan;
- b) how this Project aligns with the *Comprehensive Regional Infrastructure Sustainability Plan for the Cold Lake Oil Sands Area*;
- c) land use policies and resource management initiatives that pertain to the Project;
- d) Aboriginal traditional land and water use;
- e) Campgrounds and recreational sites;
- f) historic resource sites;
- g) all known traplines;
- h) the environmental setting;
- i) cumulative environmental impacts in the region;

- j) cumulative social impacts in the region;
 - k) results of project-specific and regional monitoring;
 - l) potential for new or additional technology to increase resource recovery at later times; and
 - m) potential for changes in the regulatory regime.
- [B] Discuss the selection criteria used, options considered, and rationale for selecting:
- a) location of facilities and infrastructure (including linear infrastructure); and
 - b) thermal energy and electric power required for the Project.
- [C] Provide a list of facilities for which locations will be determined later. Discuss the selection criteria that will be used to determine the specific location of these facilities.

2.4 Regional and Cooperative Efforts

- [A] Discuss Imperial's involvement in regional and cooperative efforts to address environmental and socio-economic issues associated with regional development.
- [B] Describe opportunities for sharing infrastructure (e.g., access roads, utility corridors, water infrastructure) with other resource development stakeholders. Provide rationale where these opportunities will not be implemented.

2.5 Transportation Infrastructure

- [A] Prepare a Traffic Impact Assessment as per Alberta Transportation's Traffic Impact Assessment Guideline (<http://www.transportation.alberta.ca/613.htm>).
- [B] Describe background traffic and consider the cumulative effects of traffic impacts due to other existing and planned developments using the same highways and accesses.
- [C] Discuss anticipated changes to highway traffic (e.g., type, volume) due to the Project.
- [D] Assess potential traffic impacts for all stages of the Project (e.g., construction, operation, maintenance, expansion, shutdown).
- [E] Determine any necessary improvements and methods to mitigate traffic impacts.
- [F] Describe and map the locations of any new road or intersection construction, or any improvements to existing roads or intersections, related to the development of the Project, from the boundary of the Project Area up to and including the highway access points, and
- a) discuss the alternatives and the rationale for selection for the preferred alternative;
 - b) discuss compatibility of the preferred alternative to Alberta Transportation's immediate and future plans;
 - c) describe the impacts to local communities of the changes in transportation and infrastructure; and
 - d) provide a proposed schedule for the work.
- [G] Describe any infrastructure or activity that could have a potential impact on existing roads (e.g., pipelines or utilities crossing provincial highways, any facilities in close proximity of the highways, any smoke, dust, noise, light or precipitation generated by the Project that could impact the highway and road users).
- [H] Provide a summary of any discussions with Alberta Transportation in regards to the Project and its traffic impacts.

- [I] Indicate where Crown land dispositions may be needed for roads or infrastructure required for the Project.

2.6 Air Emissions Management

- [A] Discuss the selection criteria used, options considered, and rationale for selecting control technologies to minimize air emission and ensure air quality management.
- [B] Provide emission profiles (type, rate and source) for the Project's operating and construction emissions including point and non-point sources and fugitive emissions. Consider both normal and upset conditions. Discuss:
- a) odorous and visible emissions from the proposed facilities;
 - b) annual and total greenhouse gas emissions during all stages of the Project. Identify the primary sources and provide detailed calculations;
 - c) the intensity of greenhouse gas emissions per unit of bitumen produced;
 - d) the Project's contribution to total provincial and national greenhouse gas emissions on an annual basis;
 - e) Imperial's overall greenhouse gas management plans;
 - f) amount and nature of Criteria Air Contaminants emissions;
 - g) the amount and nature of acidifying emissions, probable deposition patterns and rates;
 - h) control technologies used to reduce emissions;
 - i) emergency flaring scenarios (e.g., frequency and duration) and proposed measures to ensure flaring events are minimized;
 - j) upset condition scenarios (e.g., frequency and duration) and proposed measures to ensure upset conditions are minimized;
 - k) gas collection and conservation, and the applicability of vapour recovery technology;
 - l) applicability of sulphur recovery, acid gas re-injection or flue gas desulphurization to reduce sulphur emissions; and
 - m) fugitive emissions control technology to detect, measure and control emissions and odours from equipment leaks.

2.7 Water Management

2.7.1 Water Supply

- [A] Describe the water supply requirements for the full Cold Lake Operations, and for the Midzaghe Project specifically, outline :
- a) the criteria used, options considered and rationale for selection of water supply sources(s);
 - b) the expected water balance during all stages of the Project. Discuss assumptions made or methods chosen to arrive at the water balances;
 - c) the process water, potable water, and non-potable water requirements and sources for construction (including, but not limited to, road construction, winter road construction, lease construction, production well drilling and dust suppression), camp(s) and plant site, start-up, normal and emergency operating situations, decommissioning and reclamation. Identify the volume of water to be withdrawn from each source, considering plans for wastewater reuse;
 - d) the location of sources/intakes and associated infrastructure (e.g., pipelines for water supply);

- e) the variability in the amount of water required on an annual and seasonal basis as the Project is implemented;
- f) the expected cumulative effects on water losses/gains resulting from the Project operations;
- g) annual and total freshwater use, both for the Midzaghe Project and for the Cold Lake Operations as a whole;
- h) contingency plans in the event of restrictions on the Project's water supply source (e.g., due to license conditions, source volume limitations, climate change or cumulative impact water deficits);
- i) potable water treatment systems for all stages of the Project;
- j) type and quantity of potable water treatment chemicals used; and
- k) measures for ensuring efficient use of water including alternatives to reduce the consumption of non-saline water such as water use minimization, recycling, conservation, and technological improvements.

2.7.2 Surface Water

- [A] Describe the surface water management strategy for all stages of the Project, including:
 - a) design factors considered; and
 - b) permanent or temporary alterations or realignments of watercourses, wetlands and other waterbodies.
- [B] Describe and map all roadway, pipeline, powerline and any other utility crossings of watercourses or waterbodies.
- [C] Describe the placement of infrastructure (including processing facilities, well pads, roads and borrow pits) in relation to water bodies and watercourses.

2.7.3 Wastewater Management

- [A] Describe the wastewater management strategy, including:
 - a) the criteria used, options considered and rationale for the selection of wastewater treatment and wastewater disposal;
 - b) the source, quantity and composition of each wastewater stream from each component of the proposed operation (e.g., bitumen extraction and associated facilities) for all project conditions, including normal, start-up, worst-case and upset conditions;
 - c) the proposed disposal locations and methods for each wastewater stream;
 - d) geologic formations for the disposal of wastewaters;
 - e) the options for the disposal of wastewater in the context of best management practices and best available technologies, including the rationale for choosing the preferred option and the measures taken to prevent impacts on potable groundwater, aquatic ecosystems and vegetation;
 - f) design of facilities that will collect, treat, store and release wastewater streams;
 - g) type and quantity of chemicals used in wastewater treatment; and
 - h) sewage treatment and disposal.

2.8 Waste Management

- [A] Discuss the selection criteria used, options considered, and rationale for waste disposal.

- [B] Characterize and quantify the anticipated dangerous goods, and hazardous, non-hazardous, and recyclable wastes generated by the Project, and describe:
- a) the composition and volume of specific waste streams and discuss how each stream will be managed;
 - b) how the disposal sites and sumps will be constructed; and
 - c) plans for pollution prevention, waste minimization, recycling, and management to reduce waste quantities for all stages of the Project.

2.9 Conservation and Reclamation

- [A] Provide a conceptual conservation and reclamation plan for the Project. Describe and map as applicable:
- a) current land use and proposed post-development land use and capability;
 - b) anticipated timeframes for completion of reclamation stages and release of lands back to the Crown including an outline of the key milestone dates for reclamation and how progress to achieve these targets will be measured;
 - c) constraints to reclamation such as timing of activities, availability of reclamation materials and influence of natural processes and cycles including natural disturbance regimes;
 - d) a revegetation plan consistent with CEMA's *Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region*;
 - e) reclamation material salvage, storage areas and handling procedures; and
 - f) existing and final reclaimed site drainage plans.
- [B] Discuss, from an ecological perspective, the expected timelines for establishment and recovery of vegetative communities and wildlife habitat, the expected success of establishment and recovery, and how success will be determined and measured, as well as the expected differences in the resulting communities.
- [C] Describe how Imperial considered the use of progressive reclamation in project design and reclamation planning.
- [D] Discuss uncertainties related to the conceptual reclamation plan.

3 ENVIRONMENTAL ASSESSMENT

3.1 Air Quality, Climate and Noise

3.1.1 Baseline Information

- [A] Discuss the baseline climatic and air quality conditions including:
- a) the type and frequency of meteorological conditions that may result in poor air quality;
 - b) potential receptors, current regional air quality issues and trends (e.g. odours, exceedances of Ambient Air Quality Objectives (AAQO)); and
 - c) appropriate ambient air quality parameters.

3.1.2 Impact Assessment

- [A] Identify components of the Project that will affect air quality, and:

- a) describe the potential for reduced air quality (including odours and visibility) resulting from the Project and discuss any implications of the expected air quality for environmental protection and public health;
 - b) discuss the design, construction and operational factors to be incorporated into the Project to comply with the AER's Directive 60 *Odour Management Protocol*;
 - c) estimate ground-level concentrations of appropriate air quality parameters;
 - d) discuss any expected changes to particulate deposition, nitrogen deposition or acidic deposition patterns;
 - e) provide the expected gas-to-oil (GOR) ratio, the expected concentration of sulphur in the produced gas and the requested sulphur dioxide emission limit. Show calculations for the sulphur dioxide limit including the basis for the expected parameters, factors and assumptions used;
 - f) identify areas that are predicted to exceed Potential Acid Input critical loading criteria;
 - g) discuss interactive effects that may occur resulting from co-exposure of a receptor to all emissions; and
 - h) describe air quality impacts resulting from the Project, and their implications for other environmental resources.
- [B] Identify stages or elements of the Project that are sensitive to changes or variability in climate parameters, including frequency and severity of extreme weather events and discuss the potential impacts over the life of the Project.
- [C] Summarize the results of the noise assessment conducted for the AER, and:
- a) identify the nearest receptor used in the assessment;
 - b) discuss the effects of construction and operational noise on potential receptors including but not limited to:
 - i. wildlife;
 - ii. recreational activities; and
 - iii. traditional land use
 - c) discuss the design, construction and operational factors to be incorporated into the Project to comply with the AER's *Directive 38: Noise Control*.

3.2 Hydrogeology

3.2.1 Baseline Information

- [A] Provide an overview of the existing geologic and hydrogeologic setting from the ground surface down to, and including, the oil producing zones and disposal zones, and:
- a) present regional and Project Area geology to illustrate depth, thickness and spatial extent of lithology, stratigraphic units and structural features; and
 - b) present regional and Project Area hydrogeology describing:
 - i) the major aquifers, aquitards and aquicludes (Quaternary and bedrock), their spatial distribution, properties, hydraulic connections between aquifers, hydraulic heads, gradients, groundwater flow directions and velocities. Include maps and cross sections,
 - ii) the chemistry of groundwater aquifers including baseline concentrations of major ions, metals and hydrocarbon indicators,

- iii) the potential discharge zones, potential recharge zones and sources, areas of groundwater-surface water interaction and areas of Quaternary aquifer-bedrock groundwater interaction,
- iv) water well development and groundwater use, including an inventory of groundwater users,
- v) the recharge potential for Quaternary aquifers,
- vi) potential hydraulic connection between bitumen production zones, deep disposal formations and other aquifers resulting from project operations,
- vii) the characterization of formations chosen for deep well disposal, including chemical compatibility and containment potential, injection capacity, hydrodynamic flow regime, and water quality assessments, and
- viii) the locations of major facilities associated with the Project including facilities for waste storage, treatment and disposal (e.g., deep well disposal) and describe site-specific aquifer and shallow groundwater conditions beneath these proposed facilities. Provide supporting geological information.

3.2.2 Impact Assessment

- [A] Describe project components and activities that have the potential to affect groundwater resource quantity and quality at all stages of the Project.
- [B] Describe the nature and significance of the potential project impacts on groundwater with respect to:
 - a) inter-relationship between groundwater and surface water in terms of both groundwater and surface water quantity and quality;
 - b) implications for terrestrial or riparian vegetation, wildlife and aquatic resources including wetlands;
 - c) changes in groundwater quality, quantity and flow;
 - d) conflicts with other groundwater users, and proposed resolutions to these conflicts;
 - e) potential implications of seasonal variations; and
 - f) groundwater withdrawal for project operations, including any expected alterations in the groundwater flow regime during and following project operations.

3.3 Hydrology

3.3.1 Baseline Information

- [A] Describe and map the surface hydrology in the Project Area.
- [B] Identify any surface water users who have existing approvals, permits or licenses.

3.3.2 Impact Assessment

- [A] Describe the extent of hydrological changes that will result from disturbances to groundwater and surface water movement, and:
 - a) Include an assessment of potential ground heave/subsidence and the potential impact on surface water flows;
 - b) include changes to the quantity of surface flow, water levels and channel regime in watercourses (during minimum, average and peak flows) and water levels in waterbodies;

- c) assess the potential impact of any alterations in flow on the hydrology and identify all temporary and permanent alterations, channel realignments, disturbances or surface water withdrawals;
 - d) discuss the effect of these changes on hydrology (e.g., timing, volume, peak and minimum flow rates, river regime and lake levels), including the significance of effects for downstream watercourses; and
 - e) identify any potential erosion problems in watercourses resulting from the Project.
- [B] Describe impacts on other surface water users resulting from the Project. Identify any potential water use conflicts.
- [C] Discuss the impact of low flow conditions and in-stream flow needs on water supply and water and wastewater management strategies.

3.4 Surface Water Quality

3.4.1 Baseline Information

- [A] Describe the baseline water quality of watercourses and waterbodies and their seasonal variations. Consider appropriate water quality parameters.

3.4.2 Impact Assessment

- [A] Describe the potential impacts of the Project on surface water quality. Include consideration for thermal plumes and changes in arsenic concentrations.

3.5 Aquatic Ecology

3.5.1 Baseline Information

- [A] Describe and map the fish, fish habitat and aquatic resources (e.g., aquatic and benthic invertebrates) of the lentic and lotic ecosystems, including intermittent and ephemeral water bodies. Describe the species composition, distribution, relative abundance, movements and general life history parameters of fish resources. Also identify any species that are:
- a) listed as “at Risk, May be at Risk and Sensitive” in the *General Status of Alberta Wild Species* (Alberta Environment and Sustainable Resource Development);
 - b) listed in Schedule 1 of the federal *Species at Risk Act*;
 - c) listed as “at risk” by COSEWIC; and
 - d) traditionally used species.
- [B] Describe and map existing critical or sensitive areas such as spawning, rearing, and overwintering habitats, seasonal habitat use including migration and spawning routes. Include a map illustrating proposed drill paths overlain on surface hydrology.
- [C] Describe the current and potential use of the fish resources by Aboriginal, sport or commercial fisheries.

3.5.2 Impact Assessment

- [A] Describe and assess the potential impacts of the Project to fish, fish habitat, and other aquatic resources, considering:
- a) habitat loss and alteration;
 - b) potential water quality and quantity changes;

- c) potential impacts on riparian areas that could affect aquatic resources and productivity;
 - d) changes to benthic invertebrate communities;
 - e) increased fishing pressures in the region that could arise from the increased human activity and improved access from the Project. Characterize the current use of local and regional fisheries resources to support the assessment of potential changes in angling pressure;
 - f) increased habitat fragmentation;
 - g) acidification;
 - h) groundwater-surface water interactions;
 - i) potential for thermal plumes to affect aquatic habitat;
 - j) potential for ground heave/subsidence and impacts to aquatic habitat; and
 - k) entrapment and entrainment of fish at water intakes.
- [B] Identify the key aquatic indicators that Imperial used to assess project impacts. Discuss the rationale for their selection.
- [C] Identify plans proposed to offset any loss in the productivity of fish habitat. Indicate how environmental protection plans address applicable provincial and federal policies on fish habitat.

3.6 Vegetation

3.6.1 Baseline Information

- [A] Describe and map the vegetation communities, wetlands, rare plants, old growth forests, and communities of limited distribution. Identify the occurrence, relative abundance and distribution and identify any species that are:
- a) listed as “at Risk, May be at Risk and Sensitive” in the *General Status of Alberta Wild Species* (Alberta Environment and Sustainable Resource Development);
 - b) listed in Schedule 1 of the federal *Species at Risk Act*;
 - c) listed as “at risk” by COSEWIC; and
 - d) traditionally used species.
- [B] Describe and quantify the current extent of habitat fragmentation.

3.6.2 Impact Assessment

- [A] Describe and assess the potential impacts of the Project on vegetation communities, considering:
- a) both temporary (include timeframe) and permanent impacts;
 - b) the potential for introduction and colonization of weeds and non-native invasive species;
 - c) potential increased fragmentation and loss of upland, riparian and wetland habitats; and
 - d) implications of vegetation changes for other environmental resources (e.g., terrestrial and aquatic habitat diversity and quantity, water quality and quantity, erosion potential).
- [B] Identify key vegetation indicators used to assess the Project impacts. Discuss the rationale for the indicator’s selection.

3.7 Wildlife

3.7.1 Baseline Information

- [A] Describe and map the wildlife resources (amphibians, reptiles, birds, and terrestrial and aquatic mammals). Describe and quantify species relative abundance, distribution and their use and potential use of habitats. Also identify any species that are:
- listed as “at Risk, May be at Risk and Sensitive” in the *General Status of Alberta Wild Species* (Alberta Environment and Sustainable Resource Development);
 - listed in Schedule 1 of the federal *Species at Risk Act*;
 - listed as “at risk” by COSEWIC;
 - “species at risk” identified by the *Alberta Wildlife Act* as ‘Endangered’, ‘Threatened’, or ‘Species of Special Concern’; and
 - traditionally used species.
- [B] Describe and map existing wildlife habitat and habitat disturbance including exploration activities. Identify habitat disturbances that are related to existing and approved projects.
- [C] Identify and provide rationale for the baseline data collection methods used to determine the wildlife resources, species relative abundance, distribution, and their potential use of habitats.

3.7.2 Impact Assessment

- [A] Describe and assess the potential impacts of the Project to wildlife and wildlife habitats, considering:
- how the Project will affect wildlife relative abundance, , mortality, movement patterns, and distribution for all stages of the Project;
 - measure and quantify the potential impacts of the Project on identified indicator species.
 - how improved or altered access may affect wildlife, including potential obstruction of daily and seasonal movements, increased human-wildlife incidents and increased hunting pressures;
 - how increased habitat fragmentation may affect wildlife. Consider edge effects, the availability of core habitat and the influence of linear features and infrastructure on wildlife movements and predator-prey relationships;
 - potential effects on wildlife resulting from changes to air and water quality, including both acute and chronic effects to animal health;
 - the spatial and temporal changes to habitat availability and function;
 - potential effects on wildlife from Imperial’s proposed and planned exploration, seismic and core hole activities, including monitoring/4D seismic; and
 - potential effects of the proposed Project on the Cold Lake caribou herd due to proximity of the designated caribou range.
- [B] Identify the key wildlife and habitat indicators used to assess project impacts. Discuss the rationale for their selection.

3.8 Biodiversity

3.8.1 Baseline Information

- [A] Describe and map the existing biodiversity.

- [B] Identify the biodiversity metrics, biotic and abiotic indicators that are used to characterize the baseline biodiversity. Discuss the rationale for their selection.

3.8.2 Impact Assessment

- [A] Describe and assess the potential impacts of the Project to biodiversity considering:
- a) the biodiversity metrics, biotic and abiotic indicators selected;
 - b) the effects of fragmentation on biodiversity potential;
 - c) the contribution of the Project to any anticipated changes in regional biodiversity and the potential impact to local and regional ecosystems; and
 - d) effects during construction, operations and post-reclamation and the significance of these changes in a local and regional context.

3.9 Terrain and Soils

3.9.1 Baseline Information

- [A] Describe and map the terrain and soils conditions in the Project Area.
- [B] Describe and map soil types in the areas that are predicted to exceed Potential Acid Input critical loading criteria.

3.9.2 Impact Assessment

- [A] Describe project activities and other related issues that could affect soil quality (e.g., compaction, contaminants) and:
- a) indicate the amount (ha) of surface disturbance from plant, field (e.g., pads, pipelines, access roads), aggregate and borrow sites, camps, , drilling waste disposal and other infrastructure-related construction and operational activities;
 - b) discuss the relevance of any changes for the local and regional landscapes, biodiversity, productivity, ecological integrity, aesthetics and future use;
 - c) identify the potential acidification impact on soils and discuss the significance of predicted impacts by acidifying emissions; and
 - d) describe potential sources of soil contamination.
- [B] Discuss:
- a) the environmental effects of proposed drilling methods on the landscape and surficial and bedrock geology;
 - b) the potential for changes in the ground surface during steaming and recovery operations (e.g., ground heave and/or subsidence) and their environmental implications; and
 - c) the potential impacts caused by the mulching and storage of woody debris considering, but not limited to, vulnerability to fire, degradation of soil quality, increased footprint.

3.10 Land Use and Management

3.10.1 Baseline Information

- [A] Describe and map the current land uses in the Project Area, including all Crown land dispositions and Crown Reservations (Holding Reservation, Protective Notation, Consultative Notation), traplines and Registered Fur Management Areas.

- [B] Indicate where Crown land dispositions may be needed for roads or other infrastructure for the Project.
- [C] Identify and map unique sites or special features such as Parks and Protected Areas, Heritage Rivers, Historic Sites, Environmentally Significant Areas, culturally significant sites and other designations (e.g., World Heritage Sites, Ramsar Sites, Internationally Important Bird Areas).
- [D] Describe and map land clearing activities, showing the timing of the activities.
- [E] Describe the status of timber harvesting arrangements, including species and timing.
- [F] Describe existing access control measures.

3.10.2 Impact Assessment

- [A] Identify the potential impacts of the Project on land uses, including:
 - a) unique sites or special features;
 - b) traplines and Registered Fur Management Areas;
 - c) changes in public access arising from linear development, including secondary effects related to increased hunter, angler and other recreational access and facilitated predator movement;
 - d) aggregate reserves that may be located on land under the Imperial's control and reserves in the region;
 - e) development and reclamation on commercial forest harvesting and fire management in the Project Area;
 - f) the amount of commercial and non-commercial forest land base that will be disturbed by the Project, including the Timber Productivity Ratings for the Project Area. Compare the baseline and reclaimed percentages and distribution of all forested communities in the Project Area;
 - g) how the Project impacts Annual Allowable Cuts and quotas within the Forest Management Agreement area;
 - h) the operations of any agricultural crown leases and provincial grazing reserves;
 - i) anticipated changes (type and extent) to the topography, elevation and drainage patterns within the Project Area; and
 - j) access control for public, regional recreational activities, Aboriginal land use and other land uses during and after development activities.
- [B] Describe how Integrated Land Management has been used (e.g., sharing of infrastructure, access requirements).
- [C] Provide a fire control plan highlighting:
 - a) measures taken to ensure continued access for firefighters to adjacent wildland areas;
 - b) forest fire prevention, detection, reporting, and suppression measures, including proposed fire equipment;
 - c) measures for determining the clearing width of power line rights-of-way; and
 - d) required mitigative measures for areas adjacent to the Project Area based on the *FireSmart Field Guide for the Upstream Oil and Gas Industry*.

4 HISTORIC RESOURCES

4.1 Baseline Information

- [A] Provide a brief overview of the regional historical resources setting including a discussion of the relevant archaeological, historic and palaeontological records.
- [B] Describe and map known historic resources sites in the Project Area, considering:
 - a) site type and assigned Historic Resources Values; and
 - b) existing site specific *Historical Resources Act* requirements.
- [C] Provide an overview of previous Historical Resources Impact Assessments that have been conducted within the Project Area, including:
 - a) a description of the spatial extent of previous assessment relative to the Project Area, noting any assessment gap areas; and
 - b) a summary of *Historical Resources Act* requirements and/or clearances that have been issued for the Project to date.
- [D] Identify locations within the Project Area that are likely to contain previously unrecorded historic resources. Describe the methods used to identify these areas.

4.2 Impact Assessment

- [A] Describe project components and activities that have the potential to affect historic resources at all stages of the Project.
- [B] Describe the nature and magnitude of the potential project impacts on historical resources, considering:
 - a) effects on historic resources site integrity; and
 - b) implications for the interpretation of the archaeological, historic and palaeontological records.

5 TRADITIONAL ECOLOGICAL KNOWLEDGE AND LAND USE

- [A] Provide:
 - a) a map and description of traditional land use areas including fishing, hunting, trapping and nutritional, medicinal or cultural plant harvesting by affected Aboriginal peoples (if the Aboriginal community or group is willing to have these locations disclosed);
 - b) a map of cabin sites, spiritual sites, cultural sites, graves and other traditional use sites considered historic resources under the *Historical Resources Act* (if the Aboriginal community or group is willing to have these locations disclosed), as well as traditional trails and resource activity patterns; and
 - c) a discussion of:
 - i) the availability of vegetation, fish and wildlife species for food, traditional, medicinal and cultural purposes in the identified traditional land use areas considering all project related impacts,
 - ii) the availability of access to traditional lands in the Project Area during all stages of the Project, and
 - iii) Aboriginal views on land reclamation.

- [B] Describe how Traditional Ecological Knowledge and Traditional Land Use information was incorporated into the Project, EIA development, environmental and socio-economic baseline and impact assessments, the conservation and reclamation plan, monitoring and mitigation.
- [C] Determine the impacts of the Project on Aboriginal activities for traditional, medicinal and cultural purposes and identify possible mitigation strategies.

6 PUBLIC HEALTH AND SAFETY

6.1 Public Health

- [A] Describe aspects of the Project that may have implications for public health or the delivery of regional health services. Determine quantitatively whether there may be implications for public health arising from the Project.
- [B] Document any health concerns raised by stakeholders during consultation on the Project.
- [C] Document any health concerns identified by Aboriginal communities or groups resulting from impacts of existing development and of the Project, specifically on their traditional lifestyle. Include an Aboriginal receptor type in the assessment.
- [D] Describe the potential health impacts resulting from higher regional traffic volumes and the increased risk of accidental leaks and spills.

6.2 Public Safety

- [A] Describe aspects of the Project that may have implications for public safety. Specifically:
 - a) describe the emergency response plan including public notification protocol and safety procedures to minimize adverse environmental effects, including emergency reporting procedures for spill containment and management;
 - b) describe the spill response plans and assessment approach that would address spills, including pipeline spills, flow-to-surface events, and well head blow outs, including the potential associated residual effects;
 - c) document any safety concerns raised by stakeholders during consultation on the Project;
 - d) describe how local residents will be contacted during an emergency and the type of information that will be communicated to them;
 - e) describe the existing agreements with area municipalities or industry groups such as safety cooperatives, emergency response associations, regional mutual aid programs and municipal emergency response agencies; and
 - f) describe the potential safety impacts resulting from higher regional traffic volumes.

7 SOCIO-ECONOMIC ASSESSMENT

7.1 Baseline Information

- [A] Describe the existing socio-economic conditions in the region and in the communities in the region.
- [B] Describe factors that may affect existing socio-economic conditions including:
 - a) population changes;

- b) workforce requirements for all stages of the Project, including a description of when peak activity periods will occur;
- c) planned accommodations, including alternative accommodation options and trade-offs considered, for the workforce for all stages of the Project. Discuss the rationale for their selection;
- d) Imperial's policies and programs regarding the use of local, regional and Alberta goods and services;
- e) the project schedule; and
- f) the overall engineering and contracting plan for the Project.

7.2 Impact Assessment

- [A] Describe the effects of construction and operation of the Project on:
 - a) housing;
 - b) availability and quality of health care services;
 - c) local and regional infrastructure and community services;
 - d) recreational activities;
 - e) hunting, fishing, trapping and gathering; and
 - f) First Nations and Métis (e.g., traditional land use and social and cultural implications).
- [B] Describe the socio-economic effects of any new or existing camp(s) required for the Project and identify:
 - a) its location;
 - b) the number of workers it is intended to house;
 - c) whether the camp will service the Project only or other clients;
 - d) the length of time the camp will be in service;
 - e) describe the services that will be provided in the camp (e.g., security, recreation and leisure, medical services), including a description of the impacts on Municipal or other external services; and
 - f) outline the emergency services and evacuation plan that will be in place.
- [C] Discuss opportunities to work with First Nation and Métis communities and groups, other local residents and businesses regarding employment, training needs and other economic development opportunities arising from the Project.
- [D] Provide the estimated total project cost, including a breakdown for engineering and project management, equipment and materials including diluent, and labour for both construction and operation stages. Indicate the percentage of expenditures expected to occur in the region, Alberta, Canada outside of Alberta, and outside of Canada.

8 MITIGATION MEASURES

- [A] Discuss mitigation measures planned to avoid, minimize or eliminate the potential environmental and socioeconomic impacts for all stages of the Project.
- [B] Identify the mitigation objectives for each associated impact and describe those mitigation measures that will be implemented. Provide rationale for their selection, including a discussion on the effectiveness of the proposed mitigation.

9 RESIDUAL IMPACTS

[A] Describe the residual impacts of the Project following implementation of Imperial's mitigation measures and Imperial's plans to manage those residual impacts.

10 MONITORING

[A] Describe Imperial's current and proposed environmental and socioeconomic monitoring programs, including:

- a) how the monitoring programs will assess any project impacts and measure the effectiveness of mitigation plans. Discuss how Imperial will address any project impacts identified through the monitoring program;
- b) how Imperial will contribute to current and proposed regional monitoring programs;
- c) monitoring performed in conjunction with other stakeholders, including Aboriginal communities and groups;
- d) new monitoring initiatives that may be required as a result of the Project;
- e) regional monitoring that will be undertaken to assist in managing environmental effects and improve environmental protection strategies;
- f) how monitoring data will be disseminated to the public, Aboriginal communities or other interested parties; and
- g) how the results of monitoring programs and publicly available monitoring information will be integrated with Imperial's environmental management system.