

**TERMS OF REFERENCE  
ENVIRONMENTAL IMPACT ASSESSMENT REPORT**

**FOR SASOL CANADA HOLDINGS LIMITED  
CANADA GTL PROJECT**

**County of Strathcona, Northeast of Edmonton, Alberta**

**ISSUED BY:** Alberta Environment and Sustainable Resource Development

**DATE:** November 26, 2012

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## **PURPOSE OF THE TERMS OF REFERENCE**

The purpose of this document is to identify for Sasol Canada Holdings Limited (Sasol), 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 Canada Gas to Liquids Project (the Project).

The Project would be located in Strathcona County, within the entire Section 19, Township 55, Range 21, W4M, as well as the W ½ of Section 20, the N ½ and portions of the S ½ of Section 18, and a portion of the NW ¼ of Section 17, Township 55 Range 21, W4M. This is approximately four kilometers (km) northeast of the center of Fort Saskatchewan, Alberta and approximately 40 km northeast of the center of Edmonton, Alberta. The proposed site secured by Sasol is in an area zoned for heavy industrial development.

The Project will convert natural gas to Gas to Liquids (GTL) liquid products. The Project is proposed to have a nominal design capacity (defined as an approximation of the projected facility capacity) of 96 000 barrels per day (BPD) of Liquefied Petroleum Gas (LPG), GTL Naphtha and GTL Diesel. A phased approach will be adopted in the execution of the Project. Each of the two proposed phases will be equivalent to a nominal design capacity of 48 000 BPD. Due to local circumstances such as gas composition and local fuel specifications, it is anticipated that the nominal designed facility will be able to achieve up to an instantaneous production capacity of 103 900 barrels per stream day (BPSD), (51 950 BPSD per phase) of liquid fuels.

## **SCOPE OF THE EIA REPORT**

The Proponent 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 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 Proponent 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, including Aboriginal communities, and the actions taken to address those concerns and issues, including how input from the public and Aboriginal communities was incorporated into the Project development, mitigation, monitoring and reclamation.
- [B] Describe consultation undertaken with the public, including Aboriginal communities.

- [C] Describe plans to maintain the public and Aboriginal community engagement and consultation following completion of the EIA report to ensure that the public and Aboriginal communities will have an appropriate forum for expressing their views on the ongoing development, operation and reclamation of the Project.

## **2 PROJECT DESCRIPTION**

### **2.1 The Proponent**

- [A] Provide:
- a) a corporate profile; and
  - b) the name of the legal entity that will develop, manage and operate the Project and hold the operating approvals.
- [B] Describe the Proponent and its history in Alberta, with specific reference to existing operations, proposed operations, mineral resources, environmental studies and community involvement.
- [C] Summarize key elements of Sasol's existing or proposed environment, health and safety management system.

### **2.2 Project Development**

- [A] Provide a development plan that includes:
- a) the phases of development;
  - b) processing facilities;
  - c) steam and/or power generation facilities;
  - d) infrastructure (pipelines, access roads and power lines);
  - e) other buildings and structures;
  - f) field maintenance operations; and
  - g) activities associated with each stage of the Project.
- [B] Provide a schedule outlining the proposed phases of development and the sequence and duration of key project components, including the timing of key steps in the construction, operation, decommissioning and reclamation stages of each phase.
- [C] Discuss the key factors controlling the schedule, restrictions for conducting certain development activities, and uncertainties.

### **2.3 Evaluation of Alternatives**

#### **2.3.1 Project Alternatives**

- [A] Discuss the need for the Project including:
- a) any alternative means of carrying out the Project that are technically and economically feasible and where applicable indicate their potential environmental impacts;
  - b) a comparison of identified alternatives to the Project or components of the Project and the anticipated impacts of the alternatives. Discuss reasons for not selecting any identified alternatives;
  - c) implications resulting from a delay in proceeding with the Project, or any phase of the Project; and
  - d) potential cooperative development opportunities (e.g., shared infrastructure).

[B] Discuss the implications of not going ahead with the Project.

### **2.3.2 Process and Infrastructure Alternatives**

[A] Describe the process and criteria used to select sites for facilities and infrastructure.

[B] Discuss the options considered for supplying the thermal energy and electric power required for the Project and their environmental implications. Discuss the implications that alternate fuel sources may have on the selection of pollution abatement equipment or technologies.

[C] Describe the criteria and rationale for selecting the preferred water supply sources.

[D] Discuss options and technologies considered for wastewater treatment, wastewater management and wastewater disposal and reasons, including water quality and environmental considerations for selecting the preferred options in the context of best management practices and best available technologies.

[E] Discuss options and technologies considered for air emission and air quality management and the evaluation of emission minimization options, including air emission control technology considerations, for selecting the preferred options in the context of best management practices and best available technologies.

[F] Discuss the waste disposal options. Discuss the strategy for on-site waste disposal versus off-site waste disposal and identify:

- a) the location of on-site waste disposal;
- b) the availability of off-site waste disposal facilities;
- c) site suitability from a groundwater protection perspective;
- d) site suitability from a geotechnical perspective; and
- e) site suitability with regard to existing and potential human activities in the area.

### **2.4 Project Processes and Facilities**

[A] Provide maps and/or drawings of the Project components and activities including:

- a) existing infrastructure, leases and clearings;
- b) proposed processing/treatment facilities;
- c) other buildings and infrastructure (pipelines and utilities);
- d) temporary structures;
- e) transportation and access routes;
- f) on-site hydrocarbon storage;
- g) on-site sulphur storage;
- h) containment structures such as retention ponds and storage ponds (e.g., lime sludge, stormwater runoff, boiler blow-down);
- i) water wells/intakes, pipelines, and storage structures;
- j) sources of aggregate resources, borrow material and other construction material and locations of any stockpiles that will be developed; and
- k) waste storage area and disposal sites.

[B] Provide a list of facilities for which locations will be determined later.

[C] Discuss the amount and source of energy required for the Project.

[D] Describe the proposed method to transport product to markets.

- [E] Provide a list of chemical products to be manufactured, processed or otherwise used for the Project and describe, in general terms, how these products will be stored and managed. Identify products containing substances that are:
- Canadian Environmental Protection Act, 1999* toxics;
  - listed on the *National Pollutant Release Inventory*;
  - dangerous goods as defined by the federal *Transportation of Dangerous Goods Act*; and
  - on the *Domestic Substances List* and categorized as requiring further assessment under Canada's *Chemicals Management Plan*.
- [F] Describe the nature and amount of on-site hydrocarbon storage. Discuss containment and other environmental protection measures.

## **2.5 Transportation Infrastructure**

- [A] Provide a Traffic Impact Assessment (TIA) as per *Alberta Transportation's Traffic Impact Assessment Guideline* (<http://www.transportation.alberta.ca/613.htm>) to determine traffic impacts created by the Project to the provincial highway(s) and any necessary access improvements, and
- review previous TIAs that have been prepared for other existing and planned projects in the area, verify and incorporate their findings and recommendations into the TIA for the Project.
  - describe the anticipated changes to traffic (e.g., type, volume) during all stages of the Project (e.g., construction, operation, maintenance, expansion) and assess their impacts, considering the cumulative effects of other existing and planned uses of the same access(es).

## **2.6 Air Emissions Management**

- [A] 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:
- odorous or visible emissions from the proposed facilities;
  - annual and total greenhouse gas emissions for all stages of the Project;
  - the Project's contribution to total provincial and national greenhouse gas emissions on an annual basis;
  - the Proponent's overall greenhouse gas management plans;
  - the amount and nature of Criteria Air Contaminant emissions;
  - the amount and nature of acidifying emissions, probable deposition patterns and rates;
  - control technologies used to minimize air emissions;
  - emergency flaring scenarios (e.g., frequency and duration) and proposed measures to ensure flaring events are minimized;
  - upset condition scenarios (e.g., frequency and duration) and proposed measures to ensure upset conditions are minimized;
  - gas collection and conservation, and the applicability of vapour recovery technology;
  - applicability of sulphur recovery, acid gas re-injection, or flue gas desulphurization to reduce sulphur emissions; and

- l) fugitive emissions control technology to detect, measure and control emissions and odours from equipment leaks.

## **2.7 Water Management**

- [A] Discuss potential cooperation with other parties regarding water related infrastructure and management including, but not limited to, water intakes, pipelines, water storage and withdrawals, flow monitoring and reporting and ecological monitoring.

### **2.7.1 Water Supply**

- [A] Describe the water supply requirements for the Project, including:
- a) the expected water balance for all stages of the Project. Discuss assumptions made or methods chosen to arrive at the water balances;
  - b) the process water, potable water, and non-potable water requirements and sources for construction, 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;
  - c) the location of sources/intakes and associated infrastructure (e.g., pipelines for water supply);
  - d) the variability in the amount of water required on an annual and seasonal basis as the Project is implemented;
  - e) the expected cumulative effects on water losses/gains resulting from the Project operations;
  - f) potable water treatment systems for all stages of the Project;
  - g) type and quantity of potable water treatment chemicals used; and
  - h) measures taken by Sasol for ensuring efficient use of water.

### **2.7.2 Surface Water**

- [A] Describe the surface water management strategy for all stages of the Project, including:
- a) design factors considered, such as:
    - i) site drainage,
    - ii) run-on management,
    - iii) road and plant run-off,
    - iv) erosion and sediment control,
    - v) groundwater and surface water protection,
    - vi) groundwater seepage,
    - vii) produced water management, and
    - viii) flood protection, and
    - ix) geotechnical stability concerns; and
  - b) permanent or temporary alterations or realignments of watercourses, wetlands and other waterbodies.
- [B] Describe navigable waterways and the results of navigability assessment(s) for waterways that may be affected by the Project.

### **2.7.3 Wastewater Management**

- [A] Describe the wastewater management strategy, including:

- a) the source, quantity and composition of each wastewater stream from each component of the proposed operation for all Project conditions, including normal, start-up, worst-case and upset conditions;
- b) the proposed disposal locations and methods for each wastewater stream;
- c) formations for the disposal of wastewaters;
- d) design of facilities that will collect, treat, store and release wastewater streams;
- e) type and quantity of chemicals used in wastewater treatment; and
- f) sewage treatment and disposal.

## **2.8 Waste Management**

- [A] Characterize and quantify the anticipated dangerous goods, and hazardous, non hazardous, and recyclable wastes generated by the Project, and:
- a) describe the composition and volume of specific waste streams and discuss how each stream will be managed;
  - b) describe how the disposal sites and sumps will be constructed; and
  - c) describe 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 considering:
- a) any existing Conservation and Reclamation Plan;
  - b) existing information with respect to land capability, vegetation, commercial forest land base by commercialism class, forest productivity, recreation, wildlife, aquatic resources, aesthetics and land use resources;
  - c) integration of operations, decommissioning, reclamation planning and reclamation activities;
  - d) anticipated timeframes for completion of reclamation stages including an outline of the key milestone dates for reclamation and how progress to achieve these targets will be measured;
  - e) constraints to reclamation such as timing of activities, availability of reclamation materials and influence of natural processes and cycles including natural disturbance regimes;
  - f) post-development land capability with respect to:
    - i) self-sustaining topography, drainage and surface watercourses representative of the surrounding area,
    - ii) wetlands,
    - iii) self-sustaining vegetation communities representative of the surrounding area, and
    - iv) reforestation and forest productivity;
  - g) a revegetation plan for the disturbed terrestrial and aquatic areas;
  - h) reclamation material salvage, storage areas and handling procedures;
  - i) reclamation material replacement indicating depth, volume and type;
  - j) existing and final reclaimed site drainage plans;
  - k) integrating surface and near-surface drainage within the Project Area; and
  - l) promotion of biodiversity.



- [B] Provide a predicted Ecological Land Classification map for the post-reclamation landscape considering potential land uses, and how the landscape and soils have been designed to accommodate future land use.
- [C] Provide a conceptual plan to monitor reclamation performance and success (including soils, vegetation, wildlife and aquatic resources).
- [D] Discuss uncertainties related to the conceptual reclamation plan.

## **2.10 Regional and Cooperative Initiatives**

- [A] Discuss the Proponent's involvement in regional and cooperative efforts to address environmental and socio-economic issues associated with regional development, including:
  - a) potential cooperative ventures that the Proponent has initiated, could initiate or could develop with other operators and other resource users;
  - b) how the Proponent will work to develop and implement such cooperative opportunities;
  - c) the Proponent's participation in any regional forums; and
  - d) how regional environmental management initiatives will be incorporated into the Proponent's management practices.

## **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; and
  - b) information from regional ambient air quality monitoring programs.
- [B] Provide representative baseline noise levels at receptor locations.

#### **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) estimate ground-level concentrations of appropriate air quality parameters;
  - c) discuss any expected changes to particulate deposition, nitrogen deposition or acidic deposition patterns;
  - d) identify areas that are predicted to exceed Potential Acid Input (PAI) critical loading criteria;
  - e) discuss interactive effects that may occur resulting from co-exposure of a receptor to all emissions; and
  - f) describe air quality impacts resulting from the Project, and their implications for other environmental resources, including habitat diversity and quantity, soil resources, vegetation resources, and water quality.

- [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. Discuss what impacts the change to climate parameters may have on elements of the Project that are sensitive to climate parameters.
- [C] Identify components of the Project that have the potential to increase noise levels and discuss the implications. Present the results of a noise assessment. Include:
  - a) potentially-affected people and wildlife;
  - b) an estimate of the potential for increased noise resulting from the development; and
  - c) the implications of any increased noise levels.
- [D] Describe how air quality and noise impacts resulting from the Project will be mitigated.
- [E] Describe the residual air quality and noise effects of the Project and the Proponent's plans to manage those effects.

## **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 disposal zones. Document any new hydrogeological investigations, including methodology and results, undertaken as part of the EIA, and:
  - a) present regional and Project Area geology to illustrate depth, thickness and spatial extent of lithology, stratigraphic units and structural features;
  - 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 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 surface water quantity and quality;
  - b) implications for terrestrial or riparian vegetation, wildlife and aquatic resources including wetlands;
  - c) changes in groundwater quality and quantity;
  - 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 construction and operations.
- [C] Describe programs to manage and protect groundwater resources including:
  - a) the early detection of potential contamination; and
  - b) groundwater remediation options in the event that adverse effects are detected.

## **3.3 Hydrology**

### **3.3.1 Baseline Information**

- [A] Describe and map the surface hydrology. Include flow regimes of streams in the Project Area.
- [B] Provide surface flow baseline data, including:
  - a) seasonal variation, low, average and peak flows for watercourses; and
  - b) low, average and peak levels for waterbodies.
- [C] Identify any surface water users who have existing approvals, permits or licenses.

### **3.3.2 Impact Assessment**

- [A] Discuss changes to watersheds, including surface and near-surface drainage conditions, potential flow impediment, and potential changes in open-water surface areas caused by the Project.
- [B] Describe the extent of hydrological changes that will result from disturbances to groundwater and surface water movement:
  - a) 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;
  - b) 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;
  - c) discuss both the Project and cumulative 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

- d) identify any potential erosion problems in watercourses resulting from the Project.
- [C] Discuss changes in sedimentation patterns in receiving waters resulting from the Project.
- [D] Describe impacts on other surface water users resulting from the Project. Identify any potential water use conflicts.
- [E] Describe potential downstream impact if surface water is removed.
- [F] Discuss the impact of low flow conditions and in-stream flow needs on water supply and water and wastewater management strategies.
- [G] Discuss how potential impacts of temporary and permanent roads on wetland hydrology will be minimized and mitigated.
- [H] Describe mitigation measures to address impacts during all stages of the Project including:
  - a) alteration in flow regimes;
  - b) potential water use conflicts; and
  - c) increased sediment loadings.

### **3.4 Surface Water Quality**

#### **3.4.1 Baseline Information**

- [A] Describe the baseline water quality of watercourses and waterbodies. Discuss the effects of seasonal variations, flow and other factors on water quality.

#### **3.4.2 Impact Assessment**

- [A] Identify Project components that may influence or impact surface water quality.
- [B] Describe the potential impacts of the Project on surface water quality:
  - a) discuss any changes in water quality resulting from the Project that may exceed the *Surface Water Quality Guidelines for Use in Alberta* or the *Canadian Water Quality Guidelines*;
  - b) discuss the significance of any effects on water quality and implications to aquatic resources (e.g., biota, biodiversity and habitat);
  - c) discuss seasonal variation and potential effects on surface water quality;
  - d) assess the potential Project related and cumulative effects of acidifying and other air emissions on surface water quality; and
  - e) discuss the effect of changes in surface runoff or groundwater discharge on water quality in surface waterbodies.
- [C] Describe proposed mitigation measures to maintain acceptable surface water quality at all stages of the Project.

### **3.5 Aquatic Ecology**

#### **3.5.1 Baseline Information**

- [A] Describe the existing fish and other aquatic resources (e.g., benthic invertebrates). Identify species composition, distribution, relative abundance, movements and general life history parameters.

- [B] Describe and map, as appropriate, the fish habitat and aquatic resources of the lakes, rivers, ephemeral water bodies and other waters and identify:
- a) key indicator species and provide the rationale and selection criteria used;
  - b) critical or sensitive areas such as spawning, rearing, and over-wintering habitats. Discuss seasonal habitat use including migration and spawning routes; and
  - c) current and potential use of the fish resources by Aboriginal, sport or commercial fisheries.

### **3.5.2 Impact Assessment**

- [A] Describe the potential impacts to fish, fish habitat, and other aquatic resources (e.g., stream alterations and changes to substrate conditions, water quality and quantity) considering:
- a) fish tainting, survival of eggs and fry, chronic or acute health effects, and increased stress on fish populations from release of contaminants, sedimentation, flow alterations, temperature and habitat changes;
  - b) potential impacts on riparian areas that could affect aquatic biological resources and productivity;
  - c) the potential for increased fishing pressures in the region that could arise from the increased workforce and improved access resulting from the Project. Identify the implications on the fish resource and describe any mitigation strategies that might be planned to minimize these impacts, including any plans to restrict employee and visitor access; and
  - d) changes to benthic invertebrate communities that may affect food quality and availability for fish.
- [B] Discuss the design, construction and operational factors to be incorporated into the Project to minimize effects to fish and fish habitat and protect aquatic resources. Describe how any water intakes have been designed to avoid entrapment and entrainment of fish and provide information on the species of fish considered.
- [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 including the development of a “No Net Loss” fish habitat objective.
- [D] Describe the effects of any surface water withdrawals considered including cumulative effects on fish, fish habitat and other aquatic resources.

## **3.6 Vegetation**

### **3.6.1 Baseline Information**

- [A] Describe and map vegetation communities.
- [B] Describe and map wetlands and discuss their distribution and relative abundance.
- [C] Identify, verify and map the relative abundance of species of rare plants and the vegetation communities where they are found.
- [D] Quantitatively describe the current extent of habitat fragmentation.
- [E] Identify key indicators and discuss the rationale for their selection. Identify composition, distribution, relative abundance, and habitat requirements. Address those species listed

as “at Risk, May be at Risk and Sensitive” in the *General Status of Alberta Wild Species* (Alberta Environment and Sustainable Resource Development) and all species listed in Schedule 1 of the federal *Species at Risk Act*.

[F] Discuss the potential of each vegetation community to support rare plant species, old growth forests and communities of limited distribution. Consider their importance for local and regional habitat, sustained forest growth, rare plant habitat and the hydrologic regime.

[G] Describe the regional relevance of landscape units that are identified as rare.

### **3.6.2 Impact Assessment**

[A] Identify the amount of vegetation and wetlands to be disturbed for all stages of the Project.

[B] Discuss any potential impacts the Project may have on rare plants or endangered species.

[C] Discuss temporary (include timeframe) and permanent changes to vegetation and wetland communities and comment on:

- a) the impacts and their implications for other environmental resources (e.g., habitat diversity and quantity, water quality and quantity, erosion potential);
- b) the impacts and their implications to recreation and other uses; and
- c) the sensitivity to disturbance (including acid deposition), as well as the techniques used to estimate sensitivity to disturbance and reclamation, of each vegetation community.

[D] Describe the regional impact of any vegetation communities to be removed.

[E] Discuss from an ecological perspective, the expected timelines for establishment and recovery of vegetative communities and the expected differences in the resulting vegetative community structures.

[F] Provide a predicted Ecological Land Classification map that shows the reclaimed vegetation. Comment on the importance of the size, distribution and variety of the reclaimed landscape units from both a local and regional perspective.

[G] Discuss the impact of any loss of wetlands, including how the loss will affect land use.

[H] Provide a mitigation strategy that will minimize Project impacts addressing:

- a) mitigation of the adverse effects of site clearing on rare plants and plant communities. Identify any setbacks proposed around environmentally-sensitive areas such as surface waterbodies, riparian areas and wetlands; and
- b) measures and techniques that will be used to minimize the loss of wetlands on land use.

[I] Discuss weeds and non-native invasive species and describe how these species will be assessed and controlled prior to and during operation and reclamation.

[J] Discuss at multiple spatial scales, the predicted changes to upland, riparian and wetland habitats resulting from increased fragmentation.

## **3.7 Wildlife**

### **3.7.1 Baseline Information**

- [A] Describe and map existing wildlife resources (amphibians, reptiles, birds and terrestrial and aquatic mammals) and their use and potential use of habitats.
- [B] Identify key indicator species and discuss the rationale for their selection. Identify composition, distribution, relative abundance, seasonal movements, movement corridors, habitat requirements, key habitat areas, and general life history. Address those species:
  - 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*; and
  - c) listed as “at risk” by COSEWIC.
- [C] Describe, quantify and map all existing habitat disturbance and identify those habitat disturbances that are related to existing and approved Project operations.

### **3.7.2 Impact Assessment**

- [A] Describe Project components and activities that may affect wildlife and wildlife habitat.
- [B] Describe and assess the potential impacts of the Project on key indicator species and related those impacts to wildlife populations and wildlife habitats, addressing:
  - a) how the Project will affect wildlife relative abundance, movement patterns, distribution and recruitment into regional populations for all stages of the Project;
  - b) how improved or altered access may affect wildlife including potential obstruction of daily and seasonal movements, increased vehicle-wildlife collisions, and increased hunting pressures;
  - c) how increased habitat fragmentation may affect wildlife considering edge effects, the availability of core habitat, and the influence of linear features and infrastructure on wildlife movements and other population parameters;
  - d) the spatial and temporal changes to habitat availability and habitat effectiveness (types, quality, quantity, diversity and distribution);
  - e) potential impacts on wildlife resulting from changes to air and water quality, including both acute and chronic effects to animal health;
  - f) the resilience and recovery capabilities of wildlife populations and habitats to disturbance; and
  - g) the potential for the Project Area to be returned to its existing state with respect to wildlife populations and their habitats.
- [C] Provide a strategy and mitigation plan to minimize impacts on wildlife and wildlife habitat for all stages of the Project and to return productive wildlife habitat to the area, considering:
  - a) consistency of the plan with applicable regional, provincial and federal wildlife habitat objectives and policies;
  - b) a schedule for the return of habitat capability to areas impacted by the Project;
  - c) anticipated access controls or other management strategies to protect wildlife during and after Project operations;
  - d) measures to prevent habituation of wildlife to minimize the potential for human-wildlife encounters and consequent destruction of wildlife, including any staff

training program, fencing camps, garbage containment measures or regular follow-up;

- e) measures to mitigate habitat fragmentation considering impacts to habitat connectivity and wildlife movements resulting from linear features (e.g., above ground pipelines, roads etc.) and other Project infrastructure and activities; and
- f) measures to minimize the impacts of light on wildlife.

### **3.8 Biodiversity**

#### **3.8.1 Baseline Information**

- [A] Describe the terrestrial and aquatic biodiversity metrics that will be used to characterize the existing ecosystems and probable effects of the Project, and:
  - a) describe the process and rationale used to select biotic and abiotic indicators for biodiversity within selected taxonomic groups;
  - b) determine the relative abundance of species in each vegetation community;
  - c) provide species locations, lists and summaries of observed and estimated species richness and evenness for each vegetation community;
  - d) provide a measure of biodiversity on baseline sites that are representative of the proposed reclamation vegetation community; and
  - e) rank each ecological unit for biodiversity potential. Describe the techniques used in the ranking process.

#### **3.8.2 Impact Assessment**

- [A] Describe the metrics used to assess the probable effects of the Project. Discuss the contribution of the Project to any anticipated changes in regional biodiversity and the potential impact to local and regional ecosystems.
- [B] Identify and evaluate the extent of potential effects of fragmentation on biodiversity that may result from the Project. Discuss these effects at all relevant scales (from site specific to landscape level).
- [C] Discuss the mitigation measures proposed to minimize any anticipated changes in regional biodiversity.

### **3.9 Terrain and Soils**

#### **3.9.1 Baseline Information**

- [A] Provide descriptions and maps of the terrain and soils conditions, including:
  - a) surficial geology and topography;
  - b) soil types and their distribution. Provide an ecological context to the soil resource by supplying a soil survey report and maps to Survey Intensity Level 2 for the Project Area;
  - c) suitability and availability of soils within the Project Area for reclamation;
  - d) soils that could be affected by the Project with emphasis on potential acidification (by soil type); and
  - e) descriptions and locations of erosion sensitive soils.



### **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, infrastructure (pipelines, access roads), aggregate and borrow sites, construction camps, and other infrastructure-related construction activities;
  - b) provide an inventory of the pre- and post-disturbance land capability classes for soils in both the Project Area and the Local Study Area and describe the impacts to land capability resulting from the Project. Indicate the size and location of soil types and land capability classes that will be disturbed;
  - c) discuss the relevance of any changes for the local and regional landscapes, biodiversity, productivity, ecological integrity, aesthetics and future use resulting from disturbance for all stages of the Project;
  - d) identify the potential acidification impact on soils and discuss the significance of predicted impacts by acidifying emissions resulting from the Project;
  - e) describe the impact of the Project on soil types and reclamation suitability and the approximate volume of soil materials for reclamation. Discuss any constraints or limitations to achieving vegetation/habitat reclamation based on anticipated soil conditions (e.g., compaction, contaminants, soil moisture, nutrient depletion, erosion, etc.); and
  - f) discuss the potential for soil erosion during the life of the Project.
- [B] Provide a mitigation plan to address:
- a) possible measures to minimize surface disturbance including the use of existing clearings for the Project;
  - b) possible actions to address potential impacts of acid deposition;
  - c) actions to mitigate impacts of any constraint or limitation to habitat reclamation such as compaction, contaminants, soil moisture, erosion, nutrient regime, etc.;
  - d) possible actions to address impacts to land capability; and
  - e) any other measures to reduce or eliminate the potential impacts that the Project may have on soil capability and/or quality.

### **3.10 Land Use**

#### **3.10.1 Baseline Information**

- [A] Identify the current land uses, including oil and gas development, agriculture, forestry, tourism, Aboriginal uses and outdoor recreational activities.
- [B] Identify and map all Crown land and Crown Reservations (Holding Reservation, Protective Notation, Consultative Notation).
- [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 (World Heritage Sites, Ramsar Sites, Internationally Important Bird Areas, etc.).
- [D] Identify any land use policies and resource management initiatives that pertain to the Project, and discuss how the Project will be consistent with the intent of these initiatives.

### **3.10.2 Impact Assessment**

- [A] Identify the potential impact of the Project on land uses, including:
  - a) impacts to unique sites or special features;
  - b) the implications of relevant land use policies and resource management initiatives for the Project, including any constraints to development;
  - c) potential impacts to aggregate reserves that may be located on land under the Proponent's control and reserves in the region;
  - d) the potential impact on existing land uses of anticipated changes (type and extent) to the pre-disturbance topography, elevation and drainage pattern within the Project Area; and
  - e) impacts of the Project on public access, regional recreational activities, Aboriginal land use and other land uses during and after development activities.
- [B] Discuss possible mitigation strategies to address:
  - a) the need for, and plans to address, access management during and after Project operations;
  - b) the process for addressing the needs of other land users in both the Project Area and the Local Study Area;
  - c) measures to mitigate Project impacts on land use; and
  - d) how potentially-affected aggregate reserves will be salvaged and stockpiled with input provided by Alberta Transportation and Alberta Environment and Sustainable Resource Development.

## **4 HISTORIC RESOURCES**

- [A] Describe the Historic Resource Impact Assessment (HRIA) work done to date for the Project, and provide a schedule for any future work.
- [B] Describe the implications of the findings of the HRIA work on Project design and scheduling.
- [C] Describe any Project uncertainties arising from the need for future HRIA work.

## **5 PUBLIC HEALTH AND SAFETY ASSESSMENT**

- [A] Describe those aspects of the Project that may have implications for public health or the delivery of regional health services. Determine whether there may be implications for public health arising from the Project. Specifically:
  - a) assess the potential health implications of the compounds that will be released to the environment from the Project in relation to exposure limits established to prevent acute and chronic adverse effects on human health;
  - b) provide the data, exposure modeling calculations, and describe the methods the Proponent used to assess impacts of the Project on human health and safety;
  - c) provide information, including chemical analyses and modeling results, on samples of selected environmental media (e.g., soil, water, air, vegetation, wild game, etc.) used in the assessment;
  - d) discuss the potential for changes to water quality, air quality and soil quality to increase human exposure to contaminants taking into consideration all Project activities;

- e) identify the human health impact of the potential contamination of country foods and natural food sources taking into consideration all Project activities;
- f) document any health concerns raised by stakeholders during consultation on the Project;
- g) 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 and include an Aboriginal receptor type in the assessment;
- h) assess the cumulative human health impacts to receptors, including First Nations and Métis receptors;
- i) as appropriate, describe anticipated follow-up work, including regional cooperative studies. Discuss how such work will be implemented and coordinated with ongoing air, soil and water quality initiatives;
- j) describe the potential health impacts resulting from higher regional traffic volumes and the increased risk of accidental leaks and spills; and
- k) discuss mitigation strategies to minimize the potential effect of the Project on human health.

[B] Describe those aspects of the Project that may have implications for public safety. Determine whether there may be implications for public safety arising from the Project. Specifically:

- a) describe the Proponent's 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) document any safety concerns raised by stakeholders during consultation on the Project;
- c) describe how local residents will be contacted during an emergency and the type of information that will be communicated to them;
- d) 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;
- e) describe the potential safety impacts resulting from higher regional traffic volumes; and
- f) discuss mitigation plans to ensure workforce and public safety for all stages of the Project. Include prevention and safety measures for wildfire occurrences, water saturated plume from cooling towers, icy roads in the winter months, accidental release or spill of chemicals to the environment and failures of structures retaining water or fluid wastes.

## **6 SOCIO-ECONOMIC ASSESSMENT**

### **6.1 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) the Proponent's policies and programs regarding the use of regional and Alberta goods and services;

- c) a project schedule and a general description of the overall engineering and contracting plan for the Project;
- d) workforce requirements for the Project, including a description of when peak activity periods will occur; and
- e) planned accommodations for the workforce for all stages of the Project.

## **6.2 Impact Assessment**

[A] Describe the socio-economic impacts of construction and operation of the Project, including:

- a) impacts related to:
  - i) local training, employment and business opportunities,
  - ii) regional and provincial economic benefits,
  - iii) housing, and
  - iv) recreational activities;
- b) estimated total Project cost, including a breakdown for engineering and project management, equipment and materials, 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;
- c) impacts of the Project on the availability of affordable housing and the quality of health care services. Provide a summary of any discussions that have taken place with the local municipalities and the local environmental public health office of Alberta Health Services concerning housing availability and health care services respectively;
- d) discuss any impacts expected on primary and secondary highway systems and other regional roads caused by anticipated traffic changes; and
- e) the impact on local and regional infrastructure and community services, including consideration of municipal “hard services”, education/training services, social services, urban and regional recreation services, law enforcement and emergency services.

[B] Discuss options for mitigating impacts including:

- a) the Proponent's policies and programs regarding the use of regional and Alberta goods and services;
- b) plans to work with local residents and businesses regarding employment, training needs, and other economic development opportunities arising from the Project;
- c) steps that have been undertaken by industry, the municipality, provincial government or through regional and cooperative initiatives to address socio-economic concerns and impacts to local and regional transportation infrastructure;
- d) the potential to avoid overlap with other projects that are reasonably anticipated during all stages of the Project;
- e) mitigation plans that will be undertaken to address issues related to the availability of affordable housing and the quality of health care services; and
- f) strategies to mitigate socio-economic concerns raised by the local municipality and other stakeholders in the region.

## **7 RESIDUAL IMPACTS**

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

## **8 MONITORING**

- [A] Describe the Proponent's current and proposed monitoring programs, including:
- a) how the monitoring programs will assess any project impacts and measure the effectiveness of mitigation plans. Discuss how the Proponent will address any Project impacts identified through the monitoring program;
  - b) how the Proponent 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 the Proponent's environmental management system.