

FINAL TERMS OF REFERENCE

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

FOR THE

NORTH AMERICAN OIL SANDS CORPORATION

KAI KOS DEHSEH SAGD PROJECT

Conklin, Alberta

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to identify for North American Oil Sands Corporation (North American) and the public the information required by government agencies for an Environmental Impact Assessment (EIA) report. North American will prepare and submit an EIA report that examines the environmental and socio-economic effects of the construction, operation and reclamation of its proposed Kai Kos Dehseh¹ project (the Project).

North American is an oil sands company operating in northeastern Alberta. North American is a working interest owner and operator of approximately 12 townships of oil sands leases between Lac La Biche and Fort McMurray. North American's goal is to develop the Kai Kos Dehseh Project, producing up to 35,000 cubic metres (220,000 barrels) per day of bitumen through steam assisted gravity drainage (SAGD) technology. The operating areas are within the Regional Municipalities of Wood Buffalo and Lakeland County, centred about 30 km northwest of the community of Conklin, between Highways 63 and 881.

North American has already applied and is awaiting approval for the Leismer Demonstration Project, which will produce 1,600 cubic metres (10,000 barrels) per day of bitumen. The Kai Kos Dehseh Project will include expansion of the Leismer Demonstration Project with development of the Leismer and Corner operating hubs, thereby increasing production by approximately 11,000 cubic metres (70,000 barrels) per day of bitumen. These operating hubs will include central processing facilities, SAGD wells and additional infrastructure. The Leismer hubs will be located adjacent to North American's Leismer Demonstration Project located in Section 2, Township 79, Range 10, W4M. The Corner operating hubs will be located in Section 31, Township 80, Range 8, W4M. Following these developments, North American expects to expand the Project with a series of added hubs in the Hangingstone, Corner and Thornbury areas for an additional 22,000 cubic metres (140,000 barrels) per day of bitumen.

The EIA will address the full capacity of the lease area. By addressing the full capacity of the lease in the regional EIA, North American will assess all phases of the development. This will allow the public and North American to examine the effects of the overall Kai Kos Dehseh Project.

1.2 Scope of Environmental Impact Assessment Report

North American will prepare the EIA report in accordance with these Terms of Reference and the environmental information requirements prescribed under the *Environmental Protection and Enhancement Act* (EPEA) and Regulations, the *Oil Sands Conservation Act* (OSCA) and Regulations, and any other federal legislation which may apply. The EIA report will:

- a) assist the public and government in understanding the environmental and socio-economic consequences of the Project development, operation and reclamation and will assist North American in its decision-making process;
- b) include a discussion on the possible measures, including established measures and possible improvements based on research and development, to:
 - i) prevent or mitigate impacts,
 - ii) assist in the future monitoring of environmental protection measures, and

¹ *Kai Kos Dehseh* is a Chipewyan Dene phrase which identifies the general area in which North American Oil Sands is operating. Translated it means Red Willow River which is the Chipewyan Dene name for the Christina River.

- iii) identify residual environmental impacts and their significance, including cumulative and regional development considerations;
- c) address:
 - i) project impacts,
 - ii) mitigation options, and
 - iii) residual effects relevant to the assessment of the Project including, as appropriate, those related to other industrial operations;
- d) include tables that cross-reference the report (subsections) to the EIA Terms of Reference;
- e) include a glossary of terms and list of abbreviations to assist the reader in understanding the material presented; and
- f) as appropriate for the various types of impacts, discuss impact predictions in terms of magnitude, frequency, duration, seasonal timing, reversibility, and geographic extent.

The EIA report will form part of North American's Application to the Alberta Energy and Utilities Board (EUB) and Alberta Environment (AENV) for construction and operation of the Project. A summary of the EIA report will also be included as part of the Application.

1.3 Public Consultation

The preparation of the EIA report will include a public consultation program to assist with project scoping and issue identification. The results of these consultations will be documented as part of the EIA report ([see Section 9.0](#)). To meet the public consultation requirements North American must, at a minimum, communicate with those members of the public who may be affected by the Project and to provide them with an opportunity to participate in the environmental assessment process.

1.4 Proponent's Submission

North American is responsible for the preparation of the EIA report and related applications. The submission will be based upon these Terms of Reference and issues raised during the public consultation process.

2.0 PROJECT OVERVIEW

2.1 The Proponent and Lease History

Provide:

- a) the name of the proponent;
- b) the name of the legal entity that will develop, manage and operate the Project;
- c) a corporate profile;
- d) a brief history of North American's operations including existing facilities;
- e) an overview of the previous (if applicable) and recent EIAs and the associated developments completed by North American and other lease holders in the Conklin area; and
- f) an overview of the proposed Project.

2.2 Project Area and EIA Study Area

The Project Area includes all lands subject to direct disturbance from the Project including the initial commercial phases at Leismer and Corner and the subsequent facilities at Hangingstone, Thornbury and South Leismer and associated infrastructure, including access and utility corridors. For the Project Area, provide:

- a) the legal land description;

- b) the boundaries;
- c) a map that identifies the locations of all proposed development activities; and
- d) a map and photomosaic showing the area proposed to be disturbed in relation to existing topographic features, township grids, wetlands, watercourses and waterbodies.

Study Areas for the EIA report should include the Project Area and other areas based on individual environmental components where an effect from the proposed development can reasonably be expected. Provide:

- a) the Local and Regional Study Areas chosen to assess the impacts of the Project and provide maps of appropriate scale to illustrate boundaries; and
- b) the rationale used to define Local and Regional Study Areas ([see Section 4.2](#)), considering the location and range of probable Project and cumulative effects.

2.3 Project Components and Development Schedule

Provide a development plan and description and/or figures of the Project components and activities to be approved including:

- a) activities associated with development of the area, operations, reclamation and development closure;
- b) bitumen recovery;
- c) field maintenance operations;
- d) processing/treating facilities;
- e) quantification and characterization of wastes produced;
- f) identification of waste storage sites and disposal sites;
- g) buildings;
- h) storage areas;
- i) containment structures such as berms and retention ponds;
- j) locations of borrow pits and salvaged soil stockpiles;
- k) temporary structures;
- l) infrastructure (roads, pipelines and utilities);
- m) transportation and access routes;
- n) lime sludge pond(s);
- o) water source wells and intakes;
- p) aggregate resources and road construction, identifying the material required and on-site availability; and
- q) proposed method of product transportation to market.

Provide a development schedule outlining the proposed phasing and sequencing of components, including:

- a) pre-construction;
- b) construction;
- c) operation;
- d) decommissioning;
- e) reclamation and closure;
- f) timing of key construction, operational and reclamation activities and the expected duration of each for the life of the Project;

- g) detailed schedule for any reclamation and related activities envisaged during the first decade of operations; and
- h) the key factors controlling the schedule and uncertainties.

2.4 Project Need and Alternatives

Discuss the need for the Project and the alternatives to the Project, including the alternative of not proceeding with the Project. Include the following:

- a) an analysis of the alternative means of carrying out the Project that are technically and economically feasible and indicate their potential environmental effects and impacts. Include rationale for selecting the proposed option;
- b) how a balance between environmental, resource recovery or conservation and economic goals has been achieved through planning and preliminary design, highlighting any areas where planning focused on one goal in exclusion of others;
- c) contingency plans, if selected major Project components or methods during any phase proved to be unfeasible or do not perform as expected;
- d) the environmental performance of the technology selected and a comparison to the alternative technologies considered; and
- e) the implications of a delay in proceeding with the Project, or any phase of the Project.

2.5 Regulatory Review

Provide the following:

- a) identify the environmental and other specific regulatory approvals and legislation that are applicable to the Project at the municipal, provincial and federal government levels;
- b) identify government policies, resource management, planning or study initiatives pertinent to the Project and discuss their implications;
- c) identify and delineate major components of the Project and identify those being applied for and constructed within the duration of approvals under the:
 - i) *Environmental Protection and Enhancement Act (EPEA)*,
 - ii) *Oil Sands Conservation Act*,
 - iii) *Water Act (WA)*,
 - iv) *Public Lands Act (PLA)*,
 - v) *Canada Fisheries Act*, and
 - vi) *Navigable Waters Protection Act*; and
- d) a summary of the regional, provincial or national objectives, standards or guidelines, which have been used by North American to assist in the evaluation of any predicted environmental impacts.

2.6 EIA Summary

A summary of the results of the EIA report will be provided which includes:

- a) project components and development activities which have the potential to affect the environment;
- b) existing conditions in the Study Areas, including existing uses of lands, resources and other activities which have potential in combination with proposed development activities, to affect the environment;
- c) the anticipated environmental effects including cumulative considerations;
- d) proposed mitigation measures and appropriate monitoring plans; and

- e) any residual effects and their implications for future management of regional cumulative effects.

3.0 PROJECT DESCRIPTION

Describe the components, infrastructure and activities of the Project that are proposed for approval. The scope and detail of the Project description information shall be sufficient to allow quantitative assessment of the environmental consequences. If the scope of information varies among components or phases of the Project, North American shall provide a rationale demonstrating that the information is sufficient for EIA purposes.

Technical information required in this Section may also be required specifically for federal and provincial government approvals ([see Appendix](#)). Information required in this Section may be provided in other parts of North American's submission(s) provided that the location of the information is appropriately referenced in the EIA report. North American should ensure consistency in the information provided whenever it is discussed in more than one section of the submission.

3.1 Site Development

Describe the thermal recovery process, process facilities (including environmental abatement processes and equipment), and waste management components of the Project, and:

- a) provide a map showing the location of all existing infrastructure (e.g., roads) and the location of the proposed hubs and field facilities;
- b) show all existing leases and clearings including exploration clearings and illustrate how North American intends to use these areas for project development to minimize additional disturbances;
- c) locate the buildings, road access, pipeline routes, water source wells, water pipelines, utility corridors, lime sludge ponds, retention ponds and waste storage/disposal sites associated with the Project;
- d) describe the process and criteria used to select the sites for facilities and infrastructure for the Project including uncertainties and alternatives, if any, associated with the selection;
- e) list the facilities whose location will be determined later;
- f) describe the planned accommodation for the workforce during construction and operations;
- g) provide a description and schedule(s) of land clearing required for:
 - i) steam generation facilities,
 - ii) central processing facilities,
 - iii) well pads,
 - iv) access roads,
 - v) borrow areas,
 - vi) pipelines, and
 - vii) utilities and other site preparation activities;
- h) indicate the amount of surface disturbance from plant, field and infrastructure-related activities; discussing:
 - i) how surface disturbance (extent and duration) will be minimized,
 - ii) opportunities to undertake progressive reclamation to offset new disturbance,
 - iii) whether the timber is merchantable and if so, indicate anticipated volumes from clearing activities, and
 - iv) how visual aesthetics will be managed, where required;

- i) discuss opportunities to integrate the Project with other resource development activities (mineral and forestry); and
- j) identify any restrictions and, where appropriate, measures taken to control access to project areas while ensuring continued access to adjacent wildland areas.

3.2 Infrastructure and Transportation

Describe and locate, on maps of appropriate scales, the infrastructure and transportation (access) requirements for the Project and how they relate to local communities or activities, and:

- a) discuss the amount and source of energy required for the Project;
- b) discuss the options considered for supplying the thermal energy and electric power required for the Project and their environmental implications;
- c) describe road access to and within the Project Area and identify needs to upgrade existing roads or construct new roads;
- d) describe any crossings of, or activities that may be undertaken in, watercourses or waterbodies that will be required for the Project. Include:
 - i) appropriate maps and diagrams,
 - ii) timing,
 - iii) construction standards or methods, and
 - iv) environmental protection plans;
- e) describe existing and planned activities as they relate to boating and vessel navigational use of watercourses and waterbodies within the Local Study Area. Include implications on navigational safety and how this will be mitigated;
- f) discuss the route or site selection criteria for any linear or other infrastructure development or modification and provide the rationale for selecting the proposed alignment and design;
- g) discuss the need for access management during and after project operations;
- h) provide the results of consultation with Alberta Transportation and discussions with other industry operators;
- i) describe access corridors needed and/or planned by other resource stakeholders including Forest Management Areas or Quota holders, and those under consideration by the Regional Issues Working Group. Describe how their needs are accommodated to reduce overall environmental impact from resource development. Describe the steps taken to integrate their needs into the location and design of the access;
- j) describe the anticipated changes to traffic (e.g., type, volume) on local highways during the construction and operation of the Project. Discuss any project and cumulative effects expected on the primary and secondary highway systems and other regional roads. Consider other existing and planned operations in the region;
- k) identify the type and location of road construction and restoration materials, the volume of material needed and the availability of materials in the area. Discuss how the Project will affect aggregate reserves that may be located on North American leases and reserves in the region. Provide a plan of how these potentially-affected reserves will be salvaged and stockpiled with input provided by Alberta Transportation and Alberta Sustainable Resource Development;
- l) discuss how the Project design will minimize the amount of disturbance;
- m) outline design features to prevent spills, contingencies for spill response and environmental risks associated with spills; and

- n) discuss secondary effects that may result from linear development such as increased hunter, angler and other recreational access and facilitated predator movement.

3.3 Air Emissions Management

Develop an emissions profile (type, rate and source) for each component of the Project including point sources, fugitive emissions, construction and vehicle emissions. Consider both normal operating conditions and upset conditions. Include definitions for these conditions. Discuss the following:

- a) any National Pollutant Release Inventory (NPRI), Priority Substance List (PSL1), PSL2 and/or Accelerated Reduction/Elimination of Toxics (ARET) substances relevant to the Project;
- b) the amount and nature of any acidifying emissions, probable deposition patterns and rates to soils, vegetation and waterbodies, as well as programs North American may implement to monitor the effects of this deposition;
- c) any odorous or visual emissions from the proposed facilities;
- d) emergency flaring scenarios (e.g., frequency and duration) and proposed measures to ensure flaring events are minimized;
- e) the systems used to monitor and quantify air emissions; and
- f) the use of alternative fuels in this project, if applicable. Provide emission profiles for each fuel under consideration.

3.3.1 Emission Control Technologies

Discuss the following:

- a) the emission control technologies proposed for the Project within the following context:
 - i) minimizing air emissions such as sulphur dioxide (SO₂), hydrogen sulphide (H₂S), oxides of nitrogen (NO_x), volatile organic compounds (VOC) and particulate matter,
 - ii) use of low NO_x technology for turbines and boilers. The applicability of Canadian Council of Ministers of the Environment (CCME) *National Emissions Guidelines for Stationary Combustion Turbines* and *CCME National Emissions Guideline for Commercial/Industrial Boilers and Heaters*, and applicable provincial guidelines,
 - iii) applicability of sulphur recovery, acid gas re-injection, or other technologies to reduce sulphur emissions and applicability of EUB sulphur recovery guidelines (Interim Directive ID 2001-03),
 - iv) gas collection, conservation and applicability of technology for vapour recovery for the Project,
 - v) control technologies for minimization of venting and flaring, and
 - vi) fugitive emissions control program to detect, measure and control emissions and odours from equipment leaks and the applicability of the CCME *Code of Practice for Measurement and Control of Fugitive VOC Emissions from Equipment Leaks*, the CCME *Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Above Ground Storage Tanks*, and applicable provincial guidance documents; and
- b) monitoring programs North American will implement to assess the air quality and the effectiveness of mitigation during the Project's development and operation. Discuss how these monitoring programs are compatible with those in use by regional multi-stakeholder air initiatives.

3.3.2 Greenhouse Gas Emissions

Provide the following:

- a) expected annual and total greenhouse gas (GHG) emissions as a result of the Project;
- b) the Project's contribution to total provincial and national GHG emissions on an annual basis;
- c) the intensity of GHG emissions per unit of product produced and discuss how it compares with similar projects and technology performance;
- d) how the Project design and GHG management plans have taken into account the need for continuous improvement with respect to GHG emissions and *Albertans and Climate Change: Taking Action*; and
- e) North American's overall GHG management plans, including any plans for the use of offsets, (nationally or internationally) and the expected results of implementing the plans.

3.4 Water Supply, Water Management and Wastewater Management

3.4.1 Water Supply

Describe the water supply requirements for the Project, including, but not limited to, the following:

- a) compliance with the *Water Conservation and Allocation Guideline 2006 for Oilfield Injection*;
- b) the annual and seasonal water balance(s), if applicable, for each project phase and overall;
- c) assumptions made or methods chosen to arrive at the water balance(s), variability in the amount of water required on an annual and seasonal basis as the Project is implemented and the expected cumulative effects on water losses/gains due to the Project operations. Show the location of sources/intakes and associated infrastructure (e.g. pipelines);
- d) the process, non-saline and saline water requirements and sources for construction, startup, normal and emergency operating situations, decommissioning and reclamation;
- e) an evaluation of alternative water sources and include a description of the criteria and rationale for selecting the preferred source(s) and identify the volume of water to be withdrawn from each source while considering plans for wastewater reuse, and the locations of any water wells;
- f) contingency plans for water supply, including the potential effects of extended periods of drought on the proposed water supply; and
- g) options for using saline groundwater, including the criteria used to assess the feasibility of its use.

3.4.2 Water Management

Provide a Water Management Plan for construction, operation and reclamation phases, including, but not limited to, the following:

- a) factors considered in the design of water management systems, such as:
 - i) site drainage and anticipated annual runoff volumes,
 - ii) road and well pad run-off,
 - iii) containment,
 - iv) erosion/sediment control,
 - v) slumping areas,
 - vi) groundwater protection,
 - vii) groundwater seepage,

- viii) non-saline water
- ix) produced water, and
- x) flood protection;
- b) measures for ensuring efficient use of water including alternatives to reduce freshwater consumption such as the use of saline waters, recycle of produced water, water use minimization, conservation and synergies with other developers and/or earlier project phases;
- c) permanent or temporary alterations or realignments of watercourses, wetlands (including bogs and fens) and other waterbodies; and
- d) potential downstream impact if water is removed from local surface waterbodies.

3.4.3 Wastewater Management

Provide a Wastewater Management Plan to address site runoff, groundwater protection, deep well disposal and wastewater discharge, including, but not limited to, the following:

- a) source, quantity and composition of each wastewater stream from the existing and proposed facilities;
- b) design of facilities that will handle, treat, store and release each wastewater stream;
- c) type and quantity of chemicals used in water and wastewater treatment, including any NPRI, PSL1, PSL2, or ARET substances relevant to the Project;
- d) options considered for treatment, wastewater management strategies and reasons (including water quality and environmental considerations) for selecting the preferred options (consider Alberta Environment's *Industrial Release Limits Policy* when determining whether either technology or water quality standards will define acceptable release limits);
- e) if applicable, discuss the discharge of aqueous contaminants (quantity, quality and timing) beyond plant site boundaries and the potential environmental effects of such releases;
- f) aquifers for the disposal of wastewaters, including:
 - i) formation characterization,
 - ii) local and regional hydrodynamic flow regime,
 - iii) water quality,
 - iv) chemical compatibility,
 - v) containment potential within the disposal zones, and
 - vi) injection capacity;
- g) the chemical composition of disposal waters;
- h) wastewater disposal alternatives;
- i) current and proposed monitoring programs;
- j) non-saline water and sewage treatment systems that will be installed as components of the Project for both the construction and operation stages; and
- k) the principles that have been incorporated into the Project's design for pollution prevention, waste minimization and recycling.

3.5 Hydrocarbon, Chemical and Waste Management

3.5.1 Management of Waste Streams

Provide the following:

- a) estimate of the quantity and composition of each waste stream. Classify each waste stream according to applicable provincial regulations and guidelines. Demonstrate that plans are consistent with current industry practices;

- b) describe the composition and volume of specific waste streams generated by the Project, and identify how each stream will be managed. Demonstrate that the selected practices for the plant and field operations comply with provincial and federal regulations including EPEA's *Waste Control Regulation* and Alberta Environment's *Hazardous Waste Storage Guidelines*;
- c) describe the proposed storage and handling methods and disposal for each waste stream. Consider both central plant and field operations;
- d) identify the amount of drilling wastes produced by the Project, the options considered for disposal and the option(s) chosen;
 - i) determine the amount of surface disturbance caused by drilling waste disposal and describe any mitigative options to reduce the disturbance, and
 - ii) describe how the disposal sites and sumps will be constructed to be in compliance with the *Oil and Gas Conservation Regulation*;
- e) discuss the strategy for on-site waste disposal versus off-site waste disposal, including but not limited to the following:
 - i) the location of on-site waste disposal, including landfills, if applicable, and the general suitability of the site(s) from a groundwater protection perspective (provide geotechnical information to support siting options),
 - ii) industrial landfills,
 - iii) on- and off-site waste treatment and storage areas, and
 - iv) potential effects on the environment;
- f) describe plans for waste minimization, recycling, and management over the life of the Project; and
- g) discuss methods and technologies to reduce waste quantities and associated potential risks, to the lowest practical levels.

3.5.2 Hydrocarbons and Chemical Products

Provide the following:

- a) a listing of chemical products to be used for the Project. Identify any products that may contain substances that are:
 - i) *Canadian Environmental Protection Act (CEPA)* toxics,
 - ii) on the PSL1, PSL2,
 - iii) ARET,
 - iv) those defined as dangerous goods pursuant to the federal *Transportation of Dangerous Goods Act*,
 - v) on the NPRI list, and
 - vi) Track 1 substances targeted under Environment Canada's *Toxic Substances Management Policy* for virtual elimination from the environment;
- b) the wastes generated and characterize each stream in accordance with Alberta Environment's *User's Guide for Waste Managers*;
- c) a description, in general terms, of how these items will be stored and managed to ensure adequate protection of both the environment and employee health and safety; and
- d) the location, nature and amount of on-site hydrocarbon storage. Discuss containment and other environmental protection measures. Demonstrate how selected practices comply with the provincial and federal regulations including *EUB Guide 55 – Storage Requirements for Upstream Petroleum Industry*.

3.6 Reclamation/Closure ([See Appendix](#))

Provide a conceptual reclamation and closure plan considering the following:

- a) reclamation requirements specified by relevant regulatory organizations and stakeholder preferences;
- b) pre-development 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) Project development phasing;
- d) opportunities for integration of operations, reclamation/closure planning and reclamation activities;
- e) reclamation sequencing for each phase of development;
- f) revegetation for the disturbed terrestrial and aquatic areas, identifying the species types that will be used for seeding or planting, and the vegetation management practices. Include the rationale for selection based on the need for the development of self-sustaining biologically diverse ecosystems consistent with the appropriate natural subregion (Lower Boreal Highland Natural Subregion or the Central Mixed wood Subregion) of the Boreal Forest Natural Region with reference to the use of native vegetation species;
- g) soil and reclamation material salvage, soil storage areas and soil handling procedures, and a soil material balance;
- h) areas of soil replacement indicating depth, volume and type of reclamation material;
- i) any soil-related constraints or limitations that may affect reclamation;
- j) pre-development and final reclaimed site drainage plans;
- k) re-establishment of self-sustaining topography, drainage and surface watercourses and vegetation communities representative of the surrounding area;
- l) management of waste, wastewater, and other waters;
- m) restoration of pre-development traditional use with consideration for traditional vegetation and wildlife species in the closure landscape;
- n) post-development capability for all uses;
- o) post-development reforestation and forest productivity with information required for inclusion into the Forest Management Agreement (FMA) Detailed Forest Plan;
- p) wetlands or other alternatives to reclaim the land;
- q) reporting of reclamation progress through development of the Project, relating reclamation progress to pre-development expectations.

Discuss the conceptual closure landscape design with reference to the following:

- a) appropriate productivity equivalent to pre-development levels having regard for regulatory requirements and stakeholder end land use preferences;
- b) how North American will incorporate into the reclamation plan, the issues raised by regional environmental monitoring and management activities;
- c) promotion of biodiversity;
- d) integration and interconnectivity to the surrounding landscapes;
- e) integration of surface and near-surface drainage within the development area;
- f) resemblance to the pre-disturbed landscape. Identify the post-disturbance land capability on a map;

- g) project planning and development;
- h) anticipated timeframes for completion of reclamation phases and release of lands back to the Crown, including an outline of the key milestone dates for reclamation and a discussion of how progress will be measured in the achievement of these targets. Discuss any constraints to reclamation such as timing of activities, availability of soil materials and influence of natural processes and cycles; and
- i) development of a conceptual ecological land classification (ELC) map for the post reclamation landscape considering all potential land uses and how the landscape and soils have been designed to accommodate future land use.

3.7 Environmental Management Systems and Contingency Plans

Summarize key elements of North American's existing or proposed environment, health and safety management system and discuss how it will be integrated into the Project, addressing the following:

- a) plans for monitoring air emissions, wastewater releases waste tracking, process inputs and outputs. Present conceptual contingency plans that consider the environmental effects of serious malfunctions or accidents; the key elements of the operating plans and performance standards to be developed prior to the commissioning of the Project, such as:
 - i) policies and corporate procedures,
 - ii) operator training,
 - iii) emergency reporting procedures for spill and air emission reporting, response and monitoring procedures, and
 - iv) emergency response, public notification protocol and safety procedures;
- b) plans to minimize the production or release into the environment of substances that may have an adverse effect, including:
 - i) modifying existing plans, or
 - ii) developing new conceptual contingency plans that consider environmental effects associated with operational upset conditions such as serious malfunctions or accidents that represent deviations from normal operating performance;
- c) proposed monitoring, including:
 - i) monitoring done independently by North American,
 - ii) monitoring performed in conjunction with other stakeholders,
 - iii) publicly-available monitoring information, and
 - iv) new monitoring initiatives that may be required as a result of the Project;
- d) an emergency response system to deal with emergency situations and minimizing adverse environmental effects, while protecting the safety of personnel. Comment on contingency plans that have been or will be developed to respond to operational upsets or unpredicted environmental impacts that are realized during and after project development;
- e) a fire control plan:
 - i) highlighting measures taken to ensure continued access for fire fighters to adjacent wildland areas,
 - ii) highlighting forest fire prevention measures, and
 - iii) using the "FireSmart" Wildfire Assessment System to assess areas adjacent to proposed facilities and identify mitigative measures;
- f) how regional environmental management initiatives will be incorporated into the management practices; and
- g) a weed management plan including provisions such as those outlined in the *Guidelines for Weed Management in Forestry Operations* (Forest Management Division Directive -

2001-06). This will detail how North American will prevent the establishment and control the spread of restricted and noxious weeds (as listed in the *Alberta Weed Control Act*) within the Project Area.

3.8 Adaptive Planning

Describe adaptive management plans that will reduce the impact of the Project at the design stage. Describe how the adaptive management plans will be used throughout the life of the Project to site facilities and infrastructure associated with future phases of the Project.

3.9 Participation in Cooperative Efforts

Demonstrate and document North American's current and planned involvement in regional cooperative efforts to address environmental and socio-economic issues associated with oil and gas development during the life of the Project. Include on-going initiatives and any potential cooperative ventures that North American is participating in with oil and gas and resource users (e.g., minerals and forestry). Include:

- a) regional air monitoring networks and studies, health studies, biomonitoring and research, aquatics monitoring, wetlands management, end land use planning and socio-economic studies;
- b) potential cooperative ventures that North American has initiated, could initiate or could develop with other oil sands operators and other resource users (minerals and forestry) to minimize the environmental impact of the Project or the environmental impact of regional oil sands development;
- c) a description of how North American will rely upon regional cooperative efforts to design and implement mitigation measures (to mitigate project specific effects and cumulative effects), monitoring programs (project specific monitoring and regional mentoring), and research programs;
- d) a description of how North American will design and implement mitigation measures (to mitigate project specific effects and cumulative effects), monitoring programs (project specific monitoring and regional monitoring), and research programs outside of these initiatives where necessary; and
- e) the improvements in environmental performance achieved as a result of such ventures.

4.0 ENVIRONMENTAL ASSESSMENT

4.1 Scenarios

Define assessment scenarios including:

- a) a Baseline Case, which includes existing environmental conditions, and existing and approved projects or activities;
- b) an Application Case, which includes the Baseline Case plus the Project; and
- c) a Cumulative Effects Assessment (CEA) Case or Planned Development Case, which includes , existing, planned and approved projects or activities, and the Application case.

Note: For the purposes of defining assessment scenarios, "approved" means approved by the applicable federal, provincial or municipal regulatory authority. "Planned" is considered any project or activity that has been publicly disclosed during the time period ending six months prior to the submission of the Project's Application and EIA report.

4.2 Study Areas

The EIA Study Area shall include the Project Area and associated infrastructure, as well as, the spatial and temporal areas of individual environmental components outside the boundaries where

an effect can be reasonably expected. The EIA Study Area includes both Regional and Local Study Areas.

Illustrate boundaries and identify the Local and Regional Study Areas chosen to assess impacts. Define temporal and spatial boundaries for the Study Areas. Maps of these areas shall include township and range lines for easy identification and comparisons with other information within the EIA report. Describe the rationale and assumptions used in establishing the Study Area boundaries, including those related to cumulative effects.

4.3 Information Requirements for the Environmental Assessment

Discuss the methods, criteria and assumptions used in North American's Environmental Assessment process, and:

- a) provide information on the environmental resources and resource uses that could be affected by the construction, operation and reclamation of the Project;
- b) provide a sufficient base for the prediction of positive and negative impacts and the extent to which negative impacts may be mitigated by planning, project design, construction techniques, operational practices and reclamation techniques;
- c) discuss how the EIA report ensures that the same level of information is provided for all phases of the Project;
- d) quantify and assess impact significance where possible, taking into consideration spatial, temporal and cumulative aspects;
- e) discuss the sources of information used in the assessment including a summary of previously conducted environmental baseline work related to North American's operations. Information sources will include literature and previous baseline reports and environmental studies, operating experience from current oil sands operations, industry study groups, traditional knowledge and government sources;
- f) identify any limitations or deficiencies that the information may place on the analysis or conclusions in the EIA report. Discuss how these limitations or deficiencies will be addressed within the current EIA report;
- g) describe the stakeholder consultation process (including, but not limited to, the public, Aboriginal people, industry and regulatory representatives) used to select and rationalize the Key Indicator Resources (KIRs). Where required, undertake studies and investigations to obtain additional information for establishing a sound baseline in the Study Area(s). From a broad-based examination of all ecosystem components including previous environmental baseline work, describe and rationalize the selection of key components and indicators examined; and
- h) for each environmental parameter:
 - i) describe baseline conditions (includes existing and approved facilities and activities). Comment on whether the available data are sufficient to assess impacts and mitigation measures. Identify environmental disturbance from previous activities that have become part of the baseline conditions,
 - ii) describe the nature and significance of the environmental effects and impacts associated with the development activities. Discuss the impacts of both the baseline case, as well as the application case,
 - iii) present plans to minimize, mitigate, or eliminate negative effects and impacts. Discuss the key elements of such plans,
 - iv) identify residual impacts and comment on their significance, and
 - v) present a plan to identify possible effects and impacts, monitor environmental impacts and manage environmental changes to demonstrate the Project is

operating in an environmentally sound manner. Identify any follow-up programs necessary to verify the accuracy of the environmental assessment and to determine the effectiveness of any measures taken to mitigate any adverse environmental effects.

4.4 Modelling

Document any assumptions, used in the EIA report, to obtain modelling predictions. Clearly identify the limitations of the model(s) and data used in modelling, including sources of error and relative accuracy. Discuss the applicability and reasons for using a particular model.

4.5 Cumulative Environmental Effects Assessment

Assessment of cumulative effects will be an integral component of the EIA report. North American will conduct a cumulative environmental effects assessment of the Project based on the EUB/AENV/NRCB Information Letter *Cumulative Effects Assessment in Environmental Impact Assessment Reports under the Alberta Environmental Protection and Enhancement Act* (June 2000). This will include a summary of all proposed monitoring, research and other strategies or plans to minimize, mitigate and manage potential adverse effects.

The identification and assessment of the likely cumulative environmental effects of the Project will:

- a) define the spatial and temporal Study Area boundaries with due consideration for regional environmental monitoring and management activities and provide the rationale for assumptions used to define those boundaries for each environmental component examined;
- b) describe the baseline state of the environment in the Regional Study Area (used for the cumulative effects assessment);
- c) provide a discussion of historic developments and activities that have created the current conditions, clearly describing the state of the environment that will be affected by the proposed development, the potential interactions of stresses created by the Project and other stresses and, if possible, predict the cumulative consequences of these combined effects;
- d) assess the incremental consequences that are likely to result from the Project in combination with other existing, approved and planned projects in the region;
- e) demonstrate that relevant information or data used from previous oil sands and other development projects is appropriate for use in this EIA report;
- f) consider and describe deficiencies or limitations in the existing database for relevant components of the environment;
- g) explain the approach and methods used to identify and assess cumulative impacts, including cooperative opportunities and initiatives undertaken to further the collective understanding of cumulative impacts, and provide a record of relevant assumptions, confidence in data and analysis to support conclusions; and
- h) discuss any deviations from the EUB/AENV/NRCB Information Letter *Cumulative Effects Assessment in Environmental Impact Assessment Reports under the Alberta Environmental Protection and Enhancement Act* (June 2000).

4.6 Climate, Air Quality and Noise

4.6.1 Baseline Information

Provide the following:

- a) baseline climatic conditions, including the type and frequency of meteorological conditions, that may impact ambient air quality; and
- b) identify any regional air monitoring underway in the area and North American's participation in any regional air monitoring forums.

4.6.2 Methodology

Provide the following:

- a) describe air quality in the Study Areas and any anticipated environmental changes for air quality. Review emission sources identified in Section 3.3 and model normal and upset conditions;
- b) describe the selection criteria used to determine the Study Areas, including information sources and assessment methods;
- c) provide justification of models used, model assumptions, and any model shortcomings or constraints on findings;
- d) discuss the meteorological data model input set used to run the model and provide a rationale for the choice of data set;
- e) provide the air dispersion modelling completed in accordance with Alberta Environment's *Air Quality Model Guideline*;
- f) for acid deposition modelling, provide deposition data from maximum levels to areas with 0.17 keq H⁺/ha/yr Potential Acid Input (PAI). Justify the selection of the models used and identify any model shortcomings or constraints of findings; include analysis of PAI deposition levels consistent with the most recent acid deposition management framework for the Study Areas;
- g) identify the regional, provincial and national objectives for air quality that were used to evaluate the significance of emission levels and ground-level concentrations, including the Canada Wide Standard for particulate matter and ozone, and the CEMA *Particulate Matter and Ozone Management Framework*; and
- h) compare predicted air quality concentrations with the appropriate air quality guidelines available.

4.6.3 Impact Assessment

Discuss current and approved emission sources and changes as a result of anticipated future development scenarios within the EIA Study Area(s) (CEA case). Consider emission point sources as well as fugitive emissions. Identify components of the Project that will affect air quality from local and regional perspectives. Identify, describe and discuss the following:

- a) the appropriate air quality parameters such as: sulphur dioxide (SO₂), hydrogen sulphide (H₂S), total hydrocarbons (THC), oxides of nitrogen (NO_x), volatile organic compounds (VOC), individual hydrocarbons of concern in the THC and VOC mixtures, particulates (road dust, PM₁₀ and PM_{2.5}), ozone (O₃), trace metals (including arsenic) and visibility;
- b) estimates of ground-level concentrations of the appropriate air quality parameters; include frequency distributions for air quality predictions in communities and sensitive receptors; maximums for all predictions, 99.9th percentile for hourly predictions and 98th percentile for 24-hour PM_{2.5} predictions;

- c) the formation of secondary pollutants such as ground-level ozone (O₃), secondary particulate matter, and acid deposition;
- d) any expected changes to particulate deposition or acidic deposition patterns;
- e) the potential for reduced air quality (including odours) resulting from the Project and discuss any implications of the expected air quality for environmental protection and public health;
- f) interactive effects that may occur as a result of co-exposure of a receptor to the emissions and discuss limitations in the present understanding of this subject;
- g) project-related and cumulative air quality impacts, and their implications for other environmental resources, including habitat diversity and quantity, vegetation resources, water quality and soil conservation;
- h) the effect of the use of alternative fuels on the air quality in the Study Areas, if applicable;
- i) how air quality impacts resulting from the Project will be mitigated;
- j) ambient air quality monitoring that will be conducted during construction and operation of the Project;
- k) components of the Project that have the potential to affect noise levels and discuss the implications and measures to mitigate; and
- l) the results of a noise assessment based on operations, as specified by *EUB ID 99-08*, and *EUB Guide 38*, include the following:
 - i) potentially-affected people and wildlife,
 - ii) characterization of noise sources, and noise resulting from the development,
 - iii) the implications of any increased noise levels, and
 - iv) proposed mitigation measures; and
- m) regional air monitoring underway in the area and describe North American's participation in regional forums.

4.6.4 Climate Change

Provide the following:

- a) in accordance with the guideline document *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*, review and discuss climate change and the local and/or regional, inter-provincial/territorial changes to environmental conditions resulting from climate conditions, including trends and projections where available;
- b) identify stages or elements of the Project that are sensitive to changes or variability in climate parameters. Discuss what impacts the change to climate parameters may have on elements of the Project that are sensitive to climate parameters; and
- c) comment on the adaptability of the Project in the event the region's climate changes. Discuss any follow-up programs and adaptive management considerations.

4.7 Aquatic Resources

4.7.1 Hydrogeology

4.7.1.1. Baseline Information

Provide the following:

- a) an overview of the existing geologic and hydrogeologic setting in the Study Areas from the ground surface down to and including the bitumen producing zones and disposal zones;

- b) presentation of the geologic setting should describe depth, thickness and spatial extent of lithology, stratigraphic units and structural features including water table and potentiometric surfaces; and
- c) presentation of the hydrogeologic setting including:
 - i) the spatial distribution of aquifers and aquitards, their properties and the hydraulic connections between hydrostratigraphic units (include hydrostratigraphic cross sections),
 - ii) the hydraulic head, hydraulic gradients and groundwater flow directions and velocities,
 - iii) the chemistry of groundwater including background concentrations of major ions, metals and hydrocarbon indicators,
 - iv) the potential discharge zones, potential recharge zones and sources, areas of groundwater-surface water interaction and areas of Quaternary aquifer-bedrock aquifer interaction,
 - v) all water well development and groundwater use, including an inventory of all groundwater users (where applicable, field verification surveys will be completed),
 - vi) the recharge potential for Quaternary aquifers,
 - vii) the potential hydraulic connection between bitumen production zones, disposal formations and other aquifers,
 - viii) confirmation that the disposal zones currently used for deep disposal of wastes and wastewater will be sufficient for the life of the Project. Provide descriptions of wastewater disposal formations including containment, water quality, and the chemical compatibility with the wastewater, and
 - ix) the locations of major facilities associated with the Project including facilities for waste storage, treatment and disposal (e.g., deep well disposal), and the site-specific aquifer and shallow groundwater beneath these proposed facilities.

4.7.1.2. Methodology

Provide the following:

- a) the selection criteria used to determine the Study Areas, including information sources and assessment methods;
- b) structure contour maps, geologic cross-sections and isopach maps to describe specific geology in the Local and Regional Study Areas;
- c) justification of hydrogeological models used for the impact assessment and the cumulative effects assessment, including the results of the sensitivity analysis and discussions of model/modelling assumptions, constraints on the results and how limitations were addressed;
- d) details on the observation well network used to calibrate hydrogeological modelling efforts used in this assessment; and
- e) demonstration of how, or if, figures, maps, diagrams, interpretations and concepts developed from previous work and submitted in the EIA report have been modified by the incorporation of any subsequent new data.

4.7.1.3. Impact Assessment

Discuss the following:

- a) the components and activities of the Project which have the potential to affect groundwater resource quantity and quality within the Study Areas during project development, operation and reclamation; and

- b) the nature and significance of the potential project effects on groundwater with respect to:
 - i) inter-relationship between groundwater and surface water in terms of surface water quantity and quality,
 - ii) potential conflicts with other groundwater users and proposed resolutions to these conflicts,
 - iii) changes in groundwater quality,
 - iv) potential implications of seasonal variations,
 - v) the suitability of on-site waste disposal and supporting geotechnical information, and
 - vi) groundwater withdrawal for project operations.

4.7.1.4. Mitigation

Discuss conceptual plans and implementation program to manage and protect groundwater resources including, but not limited to:

- a) monitoring programs for groundwater quality and quantity;
- b) response/mitigation plans that may be considered in the event that adverse effects on non-saline groundwater, other groundwater users and/or surface effects related to groundwater pumping or steam/waste injection are detected; and
- c) North American's involvement in regional groundwater initiatives in the in-situ oil sands.

4.7.2 Hydrology

4.7.2.1. Baseline Information

- a) Describe baseline hydrological conditions in the Study Areas;
- b) Provide local and regional surface flow baseline data, including low, average and peak flows and seasonal variations for key watercourses, and low, average and peak levels and seasonal variations for key waterbodies; and
- c) Describe and map drainage patterns in the Study Areas.

4.7.2.2. Methodology

Provide:

- a) the selection criteria used to determine the Study Areas, including information sources and assessment methods;
- b) the criteria used to identify key creeks, lakes and waterbodies to be monitored;
- c) maps of the drainage patterns in the Study Areas; and
- d) a topographic map of the Local Study Area with an appropriate contour interval.

4.7.2.3. Impact Assessment

- a) Describe the changes to groundwater and surface water movement as a result of the Project:
 - i) include changes to the quantity of surface flow, water levels and channel regime in local watercourses (during minimum, average and peak flows) and water levels in local waterbodies,
 - ii) assess the potential impact of any alterations in flow on the local and regional hydrology and identify all temporary and permanent alterations, channel realignments, disturbances and surface water withdrawals, their magnitude, duration, frequency, and proposed mitigation measures,
 - iii) discuss both project and cumulative effects 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

- iv) discuss the potential for short and long term changes in the connection between surface water, groundwater, production zones and disposal zones;
- b) discuss changes to watershed(s), including surface and near-surface drainage conditions, potential flow changes, and potential changes in open-water surface areas caused by construction of access roads, drilling and well pads, and other facilities;
- c) if any surface water withdrawals are considered, assess the potential impact of withdrawals including cumulative effects with respect to their magnitude, duration and frequency;
- d) identify any potential erosion problems in local creek channels due to existing or proposed project activities;
- e) discuss changes in sediment concentrations in receiving waters caused by construction, operation, and reclamation phases of the Project; and
- f) discuss any surface water users who have existing approvals, permits or licenses including the impact on these users due to the Project. Identify any potential water use conflicts and potential solutions.

4.7.2.4. Mitigation

- a) Describe surface water management plans, mitigation measures and monitoring programs, including participation in regional initiatives, for the start-up, operations, and reclamation phases;
- b) discuss how potential impacts of temporary and permanent roads and well pads on open-water hydrology (including peatland/wetland types) will be minimized, mitigated and monitored;
- c) discuss plans to return disturbed areas to a self-sustaining habitat, if applicable;
- d) discuss remedial measures to alleviate any anticipated erosion;
- e) describe mitigation measures to reduce sediment loadings; and
- f) describe any monitoring programs that may be considered to assess the impacts of potential changes to surface water on aquatic resources, wildlife and vegetation.

4.7.3 Surface Water Quality

4.7.3.1. Baseline Information

Provide:

- a) a summary of the baseline water quality of watercourses and waterbodies in the Study Areas, including consideration of all appropriate water quality parameters, their seasonal variations and relationships to flow and other controlling factors;
- b) the identity of waterbodies that are sensitive to acid deposition; and
- c) an inventory of surface water users in the area.

4.7.3.2. Methodology

Provide:

- a) the selection criteria used to determine the Study Areas, including information sources and assessment methods, considering the current framework for the management of acid deposition; and
- b) a comparison of existing and predicted water quality, using as appropriate, the *Surface Water Quality Guidelines for Use in Alberta* (November 1999) or the *Canadian Water Quality Guidelines*.

4.7.3.3. Impact Assessment

- a) Identify project components that may affect surface water quality during all stages of the Project; and
- b) describe the potential impacts of the Project on surface water quality within the Study Areas:
 - i) discuss any changes in water quality resulting from the Project and identify any parameters that are inconsistent with the *Surface Water Quality Guidelines for Use in Alberta (November 1999)* or the *Canadian Water Quality Guidelines*,
 - ii) discuss the significance of any impacts on water quality and implications to aquatic resources (e.g., biota, biodiversity and habitat),
 - iii) assess the potential project-related and cumulative impacts of acidifying and other air emissions on surface water quality,
 - iv) distinguish between natural variability and project-related impacts to water quality including the potential effects of seasonal variations and weather extremes on surface water quality,
 - v) discuss seasonal variation and potential effects on surface water quality. Describe the cumulative effects of regional activities on surface water quality in the Study Areas;
- c) discuss the residual effects for each stage of the Project, including post-reclamation. Predict and describe water conditions and suitability for aquatic biota in constructed waterbodies; and
- d) discuss the effect of water quality in surface waterbodies due to the change in surface runoff or groundwater discharge.

4.7.3.4. Mitigation

- a) Discuss the proposed mitigation measures to be considered, during construction, operation and reclamation phases of the Project, to maintain surface water quality;
- b) for any monitoring implemented for the Project, justify the selection of monitoring locations, and the integration of these sites into an overall aquatic assessment and monitoring program. Describe how the methods are in accordance to Alberta Environment standards for surface water quality monitoring; and
- c) identify any cooperative monitoring and assessment initiative(s) such as with regional stakeholders that North American may consider joining.

4.7.4 Aquatic Biological Resources

4.7.4.1. Baseline Information

- a) Describe the existing fish and other aquatic resources (e.g., benthic invertebrate and aquatic vegetation) in the waters found in the Local and Regional Study Areas and in other fish-bearing waters likely to be impacted by the Project:
 - i) identify species composition, distribution, relative abundance, movements and general life history parameters,
 - ii) identify critical or sensitive areas such as spawning, rearing, and over-wintering habitats. Discuss seasonal habitat use including migration and spawning routes,
 - iii) identify key indicator species and provide the rationale and selection criteria used,
 - iv) describe and map, as appropriate, the fish habitat and aquatic resources of the lakes, rivers and other waters within the Local Study Area, and
 - v) describe the existing baseline information, any deficiencies in information, how these deficiencies will be addressed and, as applicable, any studies proposed to evaluate the status of the fish and aquatic resources in the Local Study Area;

- b) for water course crossings, describe the fish species present and life stages of concern; and
- c) discuss the use of the fish resources as existing or potential Aboriginal, sport or commercial fisheries.

4.7.4.2. Methodology

Provide:

- a) the selection criteria used to determine the Study Areas, including information sources and assessment methods;
- b) the criteria and selection process for key indicator species; and
- c) a description of the timing, techniques, and the design of the inventory sampling used to determine the abundance, distribution and habitat use of aquatic biological resources.

4.7.4.3. Impact Assessment

Discuss:

- a) the potential for adverse impacts on the lakes and streams in the area (e.g., stream alterations and changes to substrate conditions, water quality and quantity affecting fish, fish habitat, and other aquatic resources in the Study Areas). Consider 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 impact aquatic biological resources and productivity;
- c) how potential changes to groundwater and surface water may affect fisheries and aquatic resources, under normal and drought conditions;
- d) the potential effects of watercourse crossings on fish, fish habitat, and aquatic communities including habitat losses, and their potential for habitat fragmentation;
- e) the significance of residual environmental effects in the context of local and regional fisheries; and
- f) the potential for increased fishing pressures in the region that could arise from the increased workforce and improved access as a result of the Project. Identify the implications for the fish resource.

4.7.4.4. Mitigation

- a) Discuss, as applicable, the design, construction and operational factors to be incorporated into the Project for the protection of fish resources;
- b) 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;
- c) for potential watercourse crossings, discuss the short and long term monitoring of fish, fish habitat and habitat fragmentation, including mitigation measures incorporated in the design of proposed watercourse crossings;
- d) describe any mitigation strategies that might be planned to minimize the effects of improved access, increased workforce and increased fishing pressure on the fish resource;
- e) as appropriate, discuss any cooperative mitigation strategies that might be planned or continued with other oil sands and industrial operators; and
- f) as applicable, discuss any monitoring programs that have been initiated by North American or conducted in cooperation with stakeholders to assess fisheries impacts from the Project. Provide details of any programs and discuss how they would contribute to an overall understanding of Project impacts on fish resources.

4.8 Terrestrial Resources

4.8.1 Geology, Soils, Terrain

4.8.1.1. Baseline Information

Describe the Local Study Area and Regional Study Area geological, terrain and soil conditions, including:

- a) a general description of the surficial geology, including surface topography and bedrock;
- b) a detailed description of regional soils;
- c) a detailed description of the soil types and their distribution in the Project Area and Local Study Area;
- d) the sensitivity of the local and regional soil types to potential acid deposition;
- e) the pre- and post-disturbance land capability classes for soils in the Local Study Area;
- f) the availability and suitability of soils within the Project Area for reclamation;
- g) a reclamation balance for topsoils and subsoils in all phases of the Project; and
- h) identification and location of erosion sensitive soils.

4.8.1.2. Methodology

Provide the following:

- a) the rationale used to determine the Study Areas, including information sources and assessment methods;
- b) the sensitivity and buffering capacity of the Local and Regional soil types to potential acid deposition from the proposed development using accepted soil sensitivity analyses and modelled predictions of acid deposition patterns;
- c) the distribution of soil types in the Local and Regional Study Areas using appropriate soil survey intensity and classification procedures as outlined in the *Soil Survey Handbook, Vol. 1* (Agriculture Canada, 1987) and *The Canadian System of Soil Classification* (Agriculture and Agri-Food Canada, 1999);
- d) a description of the suitability and availability of soils within the Project for reclamation using *Soil Quality Criteria Relative to Disturbance and Reclamation* (Alberta Agriculture, 1987);
- e) an inventory of the pre- and post-disturbance land capability classes for soils in the Local Study Area by using the *Land Capability Classification System for Forest Ecosystems in the Oil Sands, Third Edition* (Leskiw, 2006); and
- f) an ecological context of the soil resources by supplying a soil survey report and maps following *Soil Survey Handbook, Vol. 1* (Agriculture Canada, 1987) at an appropriate level of detail to determine the effect of the Project on soil types and quality on the Regional Study Area.

4.8.1.3. Impact Assessment

Discuss the following:

- a) the significance of any changes for the Local and Regional landscapes, biodiversity, productivity, ecological integrity, aesthetics and future use resulting from disturbance during construction, operation and reclamation;
- b) the significance of predicted impacts by acidifying emissions on Local and Regional soils resulting from the Project, with reference to local studies, current guidelines and management objectives for acidifying emissions consistent with the latest acid deposition management framework;

- c) any constraints or limitations to achieving vegetation/habitat restoration based on anticipated soil conditions (e.g. compaction, contaminants, soil moisture, nutrient depletion, erosion, etc.);
- d) the impact of the Project development on soil types and reclamation suitability and the approximate volume of soil materials for reclamation;
- e) the potential for soil erosion from the disturbance, construction, operation and reclamation of the Project;
- f) the anticipated changes (type and extent) to the pre-disturbance topography, elevations and drainage patterns within the Project Area resulting from disturbance during construction, operation and reclamation;
- g) the potential for changes in the ground surface during operations (e.g., temperature, ground heave and ground subsidence). Summarize applicable experience with temperature changes, surface heaving and subsidence and the factors involved in their occurrence. Describe the environmental implications of any terrain changes during the steaming and recovery operations;
- h) the impacts to land capability in the Local Study Area due to the Project; and
- i) any other issues that will affect soil capability and quality of the Study Areas and the reclaimed landscape.

4.8.1.4. Mitigation

Provide the following:

- a) possible mitigative measures to minimize surficial disturbance;
- b) possible mitigative actions to address potential effects of acid deposition;
- c) actions to mitigate effects of any constraint or limitation to habitat restoration such as compaction, contaminants, soil moisture, erosion, nutrient regime, etc.;
- d) possible measures to mitigate changes to ground surface (temperature, heave and subsidence) during operations;
- e) possible mitigative actions to address impacts to land capability; and
- f) any other measures to reduce or eliminate the potential impacts that the Project may have on soil capability and/or quality.

4.8.2 Terrestrial Vegetation, Wetlands and Forest Resources

4.8.2.1. Baseline Information

- a) Describe vegetation communities in the Study Areas, using, as appropriate, the *Alberta Vegetation Inventory* (AVI) Standard AVI 2.1 and *The Field Guide to Ecosites of Northern Alberta* (Beckingham and Archibald 1996);
- b) describe peatlands and wetlands in the Study Areas according to the *Alberta Wetland Inventory Standards Manual* (AWI) Version 1.0;
- c) identify and discuss the rare or endangered species, as listed by the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC) and the *Alberta Natural Heritage Information Centre* (ANHIC), for each landscape unit;
- d) identify and discuss the ecosites considering their potential to support rare plant species, plants for traditional or medicinal purposes, old growth forests or other communities of limited distribution. Consider their importance for local and regional habitat, sustained forest growth, rare plant habitat and hydrologic regime;
- e) identify and verify the presence of species of rare plants and the ecosite phases where they are found, using reliable survey methods;

- f) where landscape units are identified as rare, or where a significant percentage of landscape units within the LSA may be removed by the Project, describe their regional significance; and
- g) discuss the rarity or abundance of wetlands in the Local Study Area.

4.8.2.2. Methodology

Provide:

- a) a map of vegetation-related information, including vegetation communities, peatlands and wetlands in the Study Areas. Map the Project development footprint at an appropriate scale. Discuss any shortfalls in using AVI and AWI for mapping the Local Study Area;
- b) a discussion of the adequacy of the Study Areas, information sources and assessment methods for a cumulative effects assessment, including how baseline information was collected to enable a detailed ELC of the Local Study Area to be completed; and
- c) the selection criteria used to determine the Study Areas, including information sources and assessment methods.

4.8.2.3. Impact Assessment

- a) Identify the amount of vegetation and wetlands to be disturbed during each stage of the Project;
- b) discuss any potential effects the Project may have on rare plants and areas with high rare plant potential habitat;
- c) produce an ELC map that shows pre-disturbance and reclaimed land surfaces. Comment on the importance of size, distribution and variety of these landscape units for timber harvesting and other land uses;
- d) discuss temporary (including the timeframe) and permanent changes to vegetation and wetland communities:
 - i) comment on the significance of the effects and their implications for other environmental resources (habitat diversity and quantity, water quality, erosion potential, soil conservation, recreation and other uses),
 - ii) comment on the sensitivity to disturbance (including acid deposition), as well as the techniques used to estimate sensitivity to disturbance and reclamation, of each vegetation community and discuss permanent and temporary changes,
 - iii) predict the anticipated effect of the Project on wetlands, and
 - iv) discuss the impact of any loss of peatlands or surface wetlands, as well as how this will affect land use, fragmentation and biodiversity;
- e) identify and evaluate the extent of potential effects of the Project, such as ecosystem fragmentation and introduction of non-native plant species on native species composition and changes to plant communities;
- f) determine the amount of commercial and non-commercial forest land base that will be disturbed by the Project. Compare the pre-disturbance and reclaimed percentages and distribution of all forested communities in the Local Study Area. Provide Timber Productivity Ratings for the Local Study Area lands, including identification of productive forested, non-productive forested and non-forested lands;
- g) determine how the project disturbance impacts Annual Allowable Cuts and quotas within the Forest Management Agreement. Discuss opportunities to integrate this project with other resource development activities such as logging; and
- h) comment on the significance of the residual effects on vegetation resources, peatlands and wetlands, and their implications for other environmental resources.

4.8.2.4. Mitigation

Provide:

- a) a detailed mitigation strategy that will minimize Project impacts in the Study Areas;
- b) a plan to mitigate the adverse effects of site clearing on rare plants, and existing cutblocks. Identify any setbacks proposed around environmentally sensitive areas such as surface waterbodies, riparian areas and peatlands/wetlands;
- c) a discussion of measures and techniques that will be used to minimize the impact of peatland and wetland loss;
- d) plans to return disturbed areas to a self-sustaining habitat equivalent to pre-disturbance conditions, considering factors such as biological capability and diversity, and end land use objectives; and
- e) in addition to equivalent land capability principle, 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.

4.8.3 Wildlife

4.8.3.1. Baseline Information

Identify and describe:

- a) existing wildlife resources (amphibians, reptiles, birds and terrestrial and aquatic mammals), their use and potential use of habitats in the Study Areas;
- b) wildlife species composition, distribution, relative abundance, seasonal movements, movement corridors, habitat requirements, key habitat areas, and general life history in the Study Areas; and
- c) include current field data for all key indicator species and species of concern, including those listed by Alberta (at risk, may be at risk, and sensitive list species in the *General Status of Alberta Wild Species 2005*, or update) and COSEWIC (endangered, threatened, and special concern species in the *Canadian Species at Risk Act (SARA)*).

4.8.3.2. Methodology

Provide:

- a) the selection criteria used to determine the Study Areas, including information sources and assessment methods;
- b) key indicator species including rationale and selection criteria;
- c) current field data to establish baseline conditions, using recognized sampling protocols; and
- d) if habitat models are used to evaluate impacts, models will be modified, calibrated and validated by comparing model predictions with wildlife data from the Study Area(s). Describe data and data sources that were used to evaluate wildlife models.

4.8.3.3. Impact Assessment

Discuss:

- a) the anticipated changes to wildlife in the Study Areas;
- b) the potential adverse impacts on wildlife populations (including indicator species and sensitive species), habitat use, habitat availability/quality and food supply during all phases of the Project. Consider habitat loss, abandonment, reduced effectiveness, fragmentation or alteration as it relates to reproductive potential and recruitment for regional wildlife populations over the life of the Project;

- c) the spatial and temporal changes to habitat (type, quality, quantity, diversity and distribution) and to wildlife distribution, relative abundance, movements, habitat availability including:
 - i) anticipated effects on wildlife as a result of changes to air, water, including both acute and chronic effects on animal health, and
 - ii) anticipated effects on wildlife due to improved or altered access into the area, (e.g., vehicle collisions with wildlife, obstructions to daily or seasonal movements, noise effects and hunting pressure) during operations and after Project closure;
- d) the mapped changes in habitat distribution and fragmentation anticipated from the project and other planned activities, and their implications; and
- e) residual impacts to wildlife and wildlife habitat and discuss their significance in the context of local and regional wildlife populations.

4.8.3.4. Mitigation

Discuss:

- a) a strategy and mitigation plan to minimize impacts on wildlife habitat and populations through the life of the Project and to return productive wildlife habitat to the area, considering:
 - i) habitat enhancement measures and a schedule for the return of habitat capability to areas impacted by the Project,
 - ii) consistency of the plan with applicable regional, provincial and federal wildlife habitat objectives and policies,
 - iii) the need for access controls or other management strategies to protect wildlife during and after project operations, and
 - iv) monitoring programs to assess predicted wildlife impacts from the Project and the effectiveness of mitigation strategies and habitat enhancement measures, giving special attention to sensitive species in the Local Study Area;
- b) the potential to return the Project Area to pre-disturbance wildlife habitat/population conditions;
- c) the use setbacks to provide for the protection of riparian habitats, interconnectivity of such habitat and the unimpeded movement by wildlife species using the habitat; and
- d) measures that will be taken to prevent habituation of wildlife, the potential for human-wildlife encounters and consequent destruction of wildlife (e.g., black bears), including any staff training programs, garbage containment or regular follow-up.

4.9 Biodiversity and Fragmentation

4.9.1 Baseline Information

Provide the following:

- a) within selected taxonomic groups, discuss the presence and abundance of species in each ecosite phase or ecological type;
- b) species lists and summaries of observed and estimated species richness and evenness for each ecosite phase or ecological type;
- c) a ranking of each ecological unit for biodiversity potential;
- d) a measure of biodiversity on baseline sites that are representative of the proposed reclamation ecosites;

- e) the variety, distribution and abundance of non-biotic systems including , but not limited to, landforms and waterbodies, at the local, regional and landscape levels of biodiversity analysis; and
- f) the current level of habitat fragmentation in the Study Areas.

4.9.2 Methodology

Provide and discuss the following:

- a) using the definition for biodiversity provided in the *Canadian Biodiversity Strategy* (1995), the determination of the suite of target elements that will be used to assess biodiversity in terrestrial and aquatic ecosystems in order to characterize the existing ecosystems and that will be used to represent broad taxonomic assemblages;
- b) the process and rationale used to select biotic target elements for biodiversity;
- c) the collection of baseline information in each terrestrial and aquatic community using a suitable proportional sampling method to provide sufficient plots in each ecosite phase and statistically sound data;
- d) the combination of measures of species richness, overlap in species lists, significance of individual species or associations, uniqueness and other appropriate measures to rank ecological units for biodiversity potential. Provide the rationale and techniques for the chosen ranking system;
- e) North American's participation in regional programs that will allow for the collection and submission of baseline information in a timely manner; and
- f) the techniques used in the fragmentation analysis.

4.9.3 Impact Assessment

Discuss:

- a) the contribution of the Project to any anticipated changes in regional biodiversity;
- b) how changes in biodiversity could potentially impact local and regional ecosystems; and
- c) the anticipated level of habitat fragmentation in the Study Areas as a result of the Project, the principle factors contributing to fragmentation and the extent of potential effects from fragmentation (e.g., potential introduction of non-native plant species on native species composition and any changes to plant communities).

4.9.4 Mitigation

Discuss:

- a) measures to minimize changes in regional biodiversity resulting from the Project; and
- b) biodiversity monitoring programs and management thresholds that North American will implement either individually or in cooperation with other operators or regional initiatives.

4.10 Land And Resource Use

4.10.1 Baseline Information

Describe the following:

- a) the existing recreational, commercial, residential, institutional, industrial, tourism, cultural/historical, trapping, hunting, traditional land uses and other outdoor recreational activities in the Study Areas;
- b) unique sites or special features in the Study Areas, such as Natural Areas, Environmentally Significant Areas archaeological sites or Heritage Rivers. Indicate the location and significance of other protected areas, if present; and

- c) the quantity and quality of aggregate resources in the Study Areas.

4.10.2 Methodology

- a) Identify any land use policies and resource management initiatives that pertain to the Study Areas;
- b) discuss how the proposed development will be consistent with the intent of the guidelines and objectives of these initiatives;
- c) outline the process for addressing the needs of other users in the Study Areas; and
- d) discuss the implications of those land and resource use policies for the Project, including any constraints to development.

4.10.3 Impact Assessment

Discuss the following:

- a) the potential impact of the Project on the identified land uses and public access during and after development activities;
- b) the aesthetic characteristics of the facilities with respect to the existing landscape;
- c) any impacts of the Project on special features in the Study Area;
- d) the impact of development and reclamation on commercial forest harvesting in the Project Area; and
- e) the impact of the development on aggregate resources in the Study Areas.

4.10.4 Mitigation

- a) Identify measures to mitigate the potential land use impacts resulting from the Project;
- b) discuss how regional environmental management initiatives will be incorporated into North American's land use plan;
- c) discuss how reclamation will restore existing land use potentials considering any recommendations of the *Oil Sands Mining End Land Use Committee* and the Cumulative Environmental Management Association, Reclamation Working Group that are applicable to in-situ oil sands operations;
- d) discuss opportunities for timber salvage, revegetation, reforestation and harvest for the reduction of fire hazard; and
- e) discuss mitigative measures to conserve aggregate resources.

5.0 PUBLIC HEALTH AND SAFETY

Describe those aspects of the Project that may have implications for public health or the delivery of regional healthcare services. Determine whether there may be implications for public health arising from the Project, specifically:

- a) identify and discuss the data and methods North American used to assess impacts of the Project on human health and safety;
- b) assess the potential health implications of the compounds that will be released to the environment from the proposed operation in relation to exposure limits established to prevent acute and chronic adverse effects on human health;
- c) identify the human health impact of the potential contamination of country foods and natural food sources taking into consideration all project activities;
- d) provide the information on compounds released from the project found in samples of selected species of vegetation;

- e) provide results of modelling of compounds released from the Project and found in wildlife known to be consumed by humans based on chemical data from soil, vegetation, water and other available samples;
- f) discuss the potential to increase human exposure to contaminants from changes to water quality, air quality and soil quality taking into consideration all project activities;
- g) during consultation on the project, document any health concerns identified by Aboriginal stakeholders due to the impacts of existing industrial development and of the Project specifically on their traditional lifestyle. Determine the impact of the Project on the health of Aboriginal stakeholders and identify possible mitigation strategies;
- h) assess cumulative health effects to receptors, including First Nations and Aboriginal receptors, that are likely to result from the Project in combination with other existing, approved, and planned projects;
- i) identify, as appropriate, the anticipated follow-up work, including regional cooperative studies. Identify how such work will be implemented and coordinated with ongoing air, soil and water quality initiatives;
- j) identify and discuss potential health and safety impacts due to higher regional traffic volumes and the increased risk of accidental leaks and spills;
- k) document health and safety concerns raised by stakeholders during consultation on the Project;
- l) provide a summary of North American's emergency response plan and discuss mitigation plans to ensure workforce and public safety during pre-construction, construction, operation and reclamation of the Project. Include prevention and safety measures for wildfire occurrences, accidental release or spill of chemicals to the environment and failures of structures retaining water or fluid wastes;
- m) describe how local residents will be contacted during an emergency and the type of information that will be communicated to them;
- n) describe the existing agreements with area municipalities or industry groups such as safety cooperatives, emergency response associations and municipal emergency response agencies; and
- o) describe and discuss the impacts of the proposed Project on potential shortages of affordable housing and the quality of health care services. Identify and discuss the mitigation plans that will be undertaken to address these issues. Provide a summary of any discussions that have taken place with the Municipality and the Regional Health Authority concerning potential housing shortages and health care services, respectively.

6.0 TRADITIONAL ECOLOGICAL KNOWLEDGE AND TRADITIONAL USE

Provide details on the consultation undertaken with potentially affected Aboriginal communities with respect to traditional ecological knowledge (TEK) and traditional land use including:

- a) results of consultation with Aboriginal communities to identify the extent of traditional use of the Study Area(s);
- b) the traditional land uses including fishing, hunting, trapping and plant harvesting (nutritional and medicinal) and cultural use in the Study Area(s);
- c) the vegetation and wildlife used for nutritional and medicinal purposes, and any potential effects the Project may have;
- d) cabin sites, spiritual sites and graves;
- e) the project and cumulative impact of development on these uses and identify possible mitigation strategies; and

- f) a description of how TEK was incorporated into the technical components of the EIA report.

7.0 HISTORIC RESOURCES

Describe those aspects of the Project that may have implications for historic resources and provide the following:

- a) a general overview of the results of any previous historic resource studies that have been conducted in the Local Study Area, including archaeological resources, palaeontological resources, historic period sites, and any other historic resources as defined within the *Historical Resources Act*, including Aboriginal traditional use sites that may be considered to be historic resources under the *Historical Resources Act*;
- b) details of the consultation with the Historic Resources Management Branch of Alberta Tourism, Parks, Recreation and Culture, First Nations and any other Aboriginal communities with respect to historic resources;
- c) the final report discussing the results of the Historic Resources Impact Assessment (HRIA) to the Historic Resources Management Branch, and any other interested parties, prior to or at the same time as the submission of the EIA report to Alberta Environment. The EIA is to include a summary of the results of the HRIA;
- d) documentation of the participation of local Aboriginal peoples in the field component of the consultation program, and any concerns that local First Nations and other Aboriginal communities have relative to project impacts on historic resources;
- e) documentation of any stakeholder concerns with respect to the development of the Project based on the historic significance of the Local Study Area; and
- f) an outline of the historic resources management program and schedule of field investigations that may be required to further assess and mitigate the effects of the Project on historic resources.

8.0 SOCIO-ECONOMIC FACTORS

8.1 Baseline Information

Describe the baseline socio-economic conditions and trends for the region and for the communities impacted by the Project.

8.2 Methodology

Describe the selection criteria for the Study Areas, information sources and assessment methods.

8.3 Impact Assessment

Provide information on the socio-economic effects of the Project:

- a) identify any concerns related to socio-economic conditions that have been raised by the local municipality or any other stakeholder in the region;
- b) provide information on the socio-economic impacts of the Project on the Regional Study Area and Alberta, related to:
 - i) local employment and training,
 - ii) local business opportunities,
 - iii) population changes,
 - iv) demands on local services and infrastructure,
 - v) effects on traffic and traffic safety,
 - vi) regional and provincial economic benefits,
 - vii) housing and availability of affordable housing,

- viii) effects on medical facilities and health services,
- ix) effects on trapping, hunting and fishing,
- x) effects on recreational activities, and
- xi) effects on First Nations and Métis (e.g., traditional land use and cultural well being);
- c) provide an analysis of the significance of the socio-economic impacts;
- d) discuss the timing of workforce requirements for construction and operation. Include a breakdown of the total number of jobs to be created along with a description of when peak activity periods will occur;
- e) describe the overall engineering and contracting plan for the project;
- f) provide a summary of any discussions that have taken place with the Municipality concerning potential housing shortages;
- g) discuss the location of proposed construction camps, the number of workers they are intended to house and outline what services will be provided in the camp (e.g., security, recreation and leisure, medical);
- h) evaluate the need for additional public services and infrastructure. Take into consideration other projects that are reasonably anticipated during the life of the Project. This will include consideration of housing, transportation, education/training, health and social services, urban and regional recreation use, law enforcement and emergency preparedness; discuss options for mitigating any impacts;
- i) discuss North American's policies and programs respecting the use of regional and Alberta goods and services; and
- j) provide an estimated breakdown of Alberta, other Canadian and non-Canadian industrial benefits for engineering and project management, equipment and materials, construction labour and total overall project.

8.4 Mitigation

Provide the following information on:

- a) current plans and strategies to mitigate the socio-economic impacts of the Project, including work undertaken with industry partners, local municipalities and other regional stakeholders; and
- b) North American's current and ongoing plans to work with First Nations and other local residents and local businesses with regard to employment, training needs, and other economic development opportunities arising from the construction and operation of the Project.

9.0 PUBLIC CONSULTATION

Document the public consultation program implemented for the Project including methods, the type of information provided, the level and nature of North American's response:

- a) describe the consultative process and show how public input was obtained and addressed;
- b) provide documentation individual participation and attendance at each meeting, including records of specific comments or issues raised by individuals present at the meetings;
- c) describe and document concerns, issues, and opportunities raised by the public, North American's analysis of those concerns and issues, and the actions taken to address those concerns and issues;
- d) describe how the resolution of the concerns and issues was incorporated into the Project development, impact mitigation and proposed monitoring; and

- e) provide plans to maintain the public consultation process following completion of the EIA review to ensure that the public will have an appropriate forum for expressing their views on the ongoing development, operation and reclamation of the Project.

Consultation will include discussions with the following:

- a) Alberta provincial representatives;
- b) Federal government representatives;
- c) Municipal government representatives;
- d) Residents in surrounding areas as identified during the consultation process;
- e) First Nations and Métis organizations;
- f) commercial, industrial, recreational and traditional users; and
- g) other potentially-affected parties.

APPENDIX

The following information is necessary to be submitted as part of the Application under the Water Act (WA) or the Environmental Protection and Enhancement Act (EPEA). It may not be necessary to be considered as part of the EIA report completeness decision-making process under Section 53 of EPEA. Upon review of the information submitted, a final determination will be made if it is necessary for the following information to be considered as part of the EIA report completeness decision.

AIR QUALITY ASSESSMENT

Provide via modelling maximum groundlevel concentration locations of nitrogen dioxide (NO₂) and sulphur dioxide (SO₂) near the vicinity of the central processing facility, plant or project. Provide ground-level concentrations in 50 or 100 m increments extending out from the central processing facility to 2 or 5 km.

CONSERVATION AND RECLAMATION PLAN

The reclamation plan in the Application will address the following:

- a) provide a soil conservation and reclamation plan for progressive reclamation in the Project Areas. Outline the anticipated major timelines for reclamation activities with reference to the life span of the proposed Project;
- b) provide an ecological context of the soil resource by supplying a soil survey report and maps following the *Soil Survey Handbook*, Volume 1 (Agriculture Canada, 1987) to include adequate sampling intensity for the development footprint;
- c) provide details about soil salvage indicating areas where salvage will occur (for the pads, transportation routes, and any other similar activities), the depth and volume of soil to be salvaged, soil storage locations and methods, and relate the information to predevelopment conditions;
- d) provide details on area of soil replacement indicating techniques, timing, depth, volume and type of reclamation material;
- e) discuss the potential to retain coarse woody debris for use in reclamation and to reduce the need for slash burning after clearing;
- f) provide information about the reclaimed topography for well pads, roads, and facilities. Identify contouring objectives, drainage restoration (surface and near-surface flow) and erosion control;
- g) discuss the methods that may be used to deal with potential soil compaction and contamination problems in the Project Areas;
- h) provide a timber salvage plan, highlighting end land users and identifying proposed volumes for removal by species and year for the Project. Provide a tracking mechanism to ensure the appropriate utilization of the timber volumes by species to salvage per year, or periodically as the Project progresses. Include opportunities for timber salvage, revegetation, reforestation and harvest for the reduction of fuel hazards;
- i) provide a weed management plan including provisions such as those outlined in the *Guidelines for Weed Management in Forestry Operations* (Forest Management Division Directive – 2001-06). This will detail how North American will prevent the establishment and control the spread of restricted and noxious weeds (as listed in the *Alberta Weed Control Act*) within the Project Area; and
- j) provide appropriately scaled maps of the area highlighting (where possible) the preceding points.

WATER SUPPLY, WATER MANAGEMENT AND WASTEWATER MANAGEMENT

Provide the following information:

- a) how the water requirements for the Project will be met, including annual volumes from each source (for non-saline groundwater sources, follow Alberta Environment's *Groundwater Evaluation Guideline*);
- b) if non-saline water is being considered for steam generation, then a Tier 2 evaluation using the *Water Conservation and Allocation Guideline for Oilfield Injection (2006)* is required;
- c) North American's plan to meet the objectives of the *Water Conservation and Allocation Policy* strategy to improve the water use efficiency and productivity;
- d) the design details of facilities that will handle, treat and store wastewater streams and runoff and include appropriate annual volumes;
- e) the type and quantity of any chemicals used in water/wastewater treatment; and
- f) design details for the non-saline water and sewage treatment systems for both the construction and operation stages.

GROUNDWATER

Provide a detailed plan and implementation program for the protection of groundwater resources, addressing:

- a) a groundwater monitoring program for early detection of potential contamination and assistance in remediation planning;
- b) groundwater remediation options to be considered for implementation in the event that adverse effects are detected; and
- c) a program to monitor the sustainability of groundwater production.

SURFACE WATER

Provide a detailed plan and implementation program for the protection of surface water addressing:

- a) a surface water monitoring program to assess the performance of water management systems; and
- b) water quality monitoring program for metals and other relevant substances.