

**FINAL TERMS OF REFERENCE  
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT**

**FOR THE PROPOSED**

**NORTHERN LIGHTS PARTNERSHIP'S  
NORTHERN LIGHTS UPGRADER PROJECT**

**Sturgeon County, Northeast of Edmonton**

**ISSUED BY:** Alberta Environment

**DATE:** September 1, 2006

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## 1. INTRODUCTION

### 1.1 PURPOSE

The purpose of this document is to identify for the Northern Lights Partnership (NLP) and the public, the information required by government agencies for an Environmental Impact Assessment (EIA) report. The NLP will prepare and submit an EIA report that examines the environmental and socio-economic effects of the construction, operation and reclamation of the proposed Northern Lights Upgrader Project (the “Project” or the “Upgrader”) in Sturgeon County.

The proposed site for the Upgrader is within the Industrial Heartland of Sturgeon County and is located at

- NW & NE 28-56-21W4M
- Portion of SW 28-56-21W4M
- NW, NE, SW & SE 32-56-21W4M
- NW, NE, SW & SE 33-56-21W4M

Subject to the outcome of environmental, economic and engineering evaluations, NLP plans to build an upgrader facility that will process and convert heavy oil into synthetic crude oil for the refinery market. Feedstock for the proposed Upgrader will be from NLP’s proposed oil sands Mining and Extraction Project located approximately 100 kilometres northeast of Fort McMurray and potentially through commercial arrangements with producers. The proposed Upgrader will have an initial design capacity of 100,000 barrels (15,900 cubic metres) of oil sands bitumen feed per day plus pipeline transport diluent and will be developed in two phases. Each phase will be designed to process 50,000 barrels (7,950 cubic metres) of oil sands bitumen feed per day plus pipeline transport diluent.

### 1.2 SCOPE OF ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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

- a) assist the public and government in understanding the environmental and socio-economic consequences of the Project’s development, operation and reclamation plans, and will assist NLP in its decision-making process;
- b) 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. As appropriate for the various types of impacts, predictions should be presented in terms of magnitude, frequency, duration, seasonal timing, reversibility and geographic extent;
- c) discuss possible measures, including established measures and possible improvements based on research and development to:
  - i) prevent or mitigate impacts;
  - ii) assist in the monitoring of environmental protection measures; and
  - iii) identify residual environmental impacts and their significance including cumulative and regional development considerations.

- d) include tables that cross-reference the report (subsections) to the EIA Terms of Reference; and
- e) include a glossary of terms including definition source and a list of abbreviations to assist the reader in understanding the material presented.

The EIA report will form part of NLP's Application to the Alberta Energy and Utilities Board (EUB). A summary of the EIA report will also be included as part of the EUB 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, documenting the results of these consultations (see Section 9). The public consultation is to 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**

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

## **2. PROJECT OVERVIEW INFORMATION REQUIREMENTS**

NLP is expected to provide: an overview of the Project, the key environmental, resource management, and socio-economic issues that, from the proponent's perspective, are important for a public interest decision; and the results of the Environmental Assessment process.

Present a corporate profile of the proponent and state who is responsible for the development, management and operation of the Project.

### **2.1 PROJECT NEED AND ALTERNATIVES CONSIDERED**

Discuss the need for the Project, the alternatives to the Project, and the potential alternative of not proceeding with development. Address 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 with the 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 during any phase prove to be unfeasible or do not perform as expected;
- d) potential cooperative development opportunities for the Project and the implications of the Project for ongoing regional management and research initiatives; and
- e) discuss the environmental performance of the technology selected and compare to the alternative technologies considered.

### **2.2 PROJECT COMPONENTS AND DEVELOPMENT TIMING**

Provide an overview of the project activities and physical components. Specifically, address the following:

- a) a summary list, brief description and drawings of the project components and activities which are addressed in detail under Section 3.1; and

- b) the proposed stages or phases of the activities and a likely development schedule, explaining:
  - i) the timing of key construction, operation and reclamation activities including mitigation and compensation plans;
  - ii) the expected duration of each for the life of the Project;
  - iii) the key factors controlling the schedule and uncertainties; and
  - iv) the implications of a delay in the Project, and include the regulatory process as a consideration in the likely development schedule.

### **2.3 REGULATORY AND PLANNING FRAMEWORK AND CLASSIFICATIONS**

Identify the legislation, policies, approvals, and current multi-stakeholder planning initiatives applicable to the review of this Project. List the major components of the Project that will be applied for and constructed within the duration of any potential approvals under the EPEA and the *Water Act* and address the following:

- a) other regulatory approvals that are required and any approvals that have already been issued including provincial, municipal, and applicable federal government requirements;
- b) the primary focus of each regulatory requirement, such as resource allocation, environmental protection, land use/development, and the element(s) of the Project subject to the regulation;
- c) any regulatory classification systems which apply to the Project, such as solid waste or air pollution classifications and land use zones; and
- d) a summary of the objectives, standards, or guidelines which have been used by NLP to assist in the evaluation of the significance of effects.

### **2.4 PRINCIPAL DEVELOPMENT AREA AND EIA STUDY AREA**

The Principal Development Area (PDA) includes all lands subject to direct disturbance from the Project and associated infrastructure, including access and utility corridors. For the PDA, provide:

- a) the legal land description;
- b) the boundaries of the PDA;
- c) a map that identifies the locations of all proposed development activities; and
- d) a map and photo mosaic showing the area proposed to be disturbed in relation to existing topographic features, township grids, wetlands and water bodies.

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

- e) illustrate boundaries, and identify Local and Regional Study Areas chosen to assess impacts on maps of appropriate scale; and
- f) the rationale used to define Local and Regional Study Areas (see also Section 4.5).

### **2.5 EIA SUMMARY**

Provide a summary of the EIA report, addressing:

- a) environmental and land use conditions in the EIA Study Area without the Project;
- b) activities and components of the Project that are anticipated to influence environmental and land use conditions;
- c) the anticipated environmental effects, with emphasis on regional and cumulative considerations;
- d) proposed mitigation measures, monitoring and management plans; and
- e) any project-related residual effects, their contribution to regional cumulative effects, and their implications for the future management of regional cumulative effects; and
- f) effects of the environment on the project.

List and discuss key environmental issues and issues which are important for the achievement of sustainable environmental and resource management that were identified during the preparation of the EIA report and public consultation. Differentiate between emerging issues (with ongoing

uncertainties), issues with quantifiable and significant environmental effects, and issues that can be resolved through available technology and existing management approaches. Provide a matrix or summary chart to describe this section.

### **3. PROJECT DESCRIPTION AND MANAGEMENT PLANS**

Describe activities and components of the Project and relevant management plans. Provide sufficient scope and detail in the project description information to allow quantitative assessment of the environmental consequences. If the scope of information varies among components or phases of the Project, provide rationale demonstrating that the information is sufficient for assessment purposes.

Technical information required in this section may also be required for an EPEA approval application or a *Water Act* application. Information required in this section may be provided in other parts of NLP's submission(s) provided that the location of the information is referenced in the EIA report. NLP should ensure consistency in the information provided, whenever it is discussed in more than one section of the submission.

#### **3.1 PROJECT COMPONENTS AND SITE SELECTION**

##### **3.1.1 Project Components**

Describe the nature, size, location and duration of the significant components of the Project including, but not limited to, the following:

- a) the plant site and any chemical/fluids storage locations;
- b) the design capacities of the Project and the changes in design capacities;
- c) temporary structures, dewatering, water control facilities, and processing/treatment facilities;
- d) buildings and infrastructure, transportation, utilities, access routes, and storage areas;
- e) water source well locations and intakes;
- f) the types and amounts of waste materials, and locations of waste storage, and disposal sites;
- g) a site development plan to illustrate the locations of components including an outline of the proposed phasing and sequencing of components (include pre-construction, construction, operation, reclamation, decommissioning, and end land use);
- h) how NLP has used community input for project design and development; and
- i) potential cooperative ventures to minimize environmental impacts.

##### **3.1.2 Site Selection**

Discuss the site selection process including, but not limited to, the following:

- a) factors that were considered in determining the preferred plant site and associated processing facilities;
- b) the site selection process for the proposed location of project components;
- c) the rationale for choosing the proposed sites instead of alternative sites;
- d) the technical, geotechnical, economical, and environmental criteria considered;
- e) potential impacts on environmental and land use conditions; and
- f) suitable maps showing the location of proposed project facilities.

#### **3.2 PROCESS DESCRIPTION**

Provide material balances, energy balances, process flow diagrams, and descriptions of the processes including:

- a) energy efficiency and process efficiency of the technologies chosen;
- b) alternative technologies considered;
- c) shared facilities and utilities with the Project;

- d) catalysts and chemicals needed for the upgrading and refining processes included in the Project;
- e) project inputs such as energy and water, and the outputs such as emissions and wastes;
- f) effect of technology on waste generation and storage requirements, air and water discharges, water requirements, waste streams, and effects to reclamation programs; and
- g) source of major feed materials for the upgrading process including bitumen feedstock and limestone, as well as other feedstocks.

### **3.3 PRODUCT HANDLING**

Identify the location and amount of all on-site storage associated with production including storage of catalysts, chemicals, products, by-products, intermediates and wastes (additional detail can be found in Section 3.7). Explain containment and environmental protection measures.

### **3.4 UTILITIES AND TRANSPORTATION**

Describe and discuss the project energy requirements, and associated infrastructure and other infrastructure requirements including, but not limited to, the following:

- a) the amount and source of energy required for the Project;
- b) the options considered for supplying the thermal energy and electric power required for the Project and their environmental implications, including opportunities to increase the energy efficiency of the Project with the use of waste heat or cogeneration of heat and electrical power;
- c) worker accommodations and travel routes to the plant site during construction and operation phases, including:
  - i) desired traffic routing,
  - ii) control methods, and
  - iii) road use agreements;
  - iv) any expected changes and impacts in traffic volume by Average Annual Daily Traffic (AADT) and any seasonal variability in traffic volume;
- d) the result of consultation with the local transportation authorities including transportation studies that are underway or planned;
- e) the alignment, contents, and size of any raw material or product pipelines to be located within the EIA Study Area. If regional pipeline and storage infrastructure is required, identify the locations and routes of these facilities and the authority responsible for their approval, installation and operation; describe sulphur storage, transportation (from the Upgrader site) and the effects on local residents;
- f) the adequacy in design and upgrades required of all utility lines, roads, and pipeline crossings of roads, rivers and streams with respect to the construction and operation of the facilities;
- g) design features to prevent spills, contingencies for spill response, and any environmental risks associated with product releases or management practices;
- h) the natural gas source and pipeline, electrical power transmission and access to the Project. Illustrate the proposed location of these facilities. If regional infrastructure is required, identify the locations and routes, and who would be responsible for installation and approval for the facilities;
- i) identify cumulative impacts on the transportation network, including secondary highways leading to project areas; and
- j) plans to minimize impacts on area residents and businesses.

### **3.5 WATER SUPPLY, WATER MANAGEMENT AND WASTEWATER MANAGEMENT**

#### **3.5.1 Water Supply**

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

- a) the overall water balance(s);
- b) the water requirements for construction, start-up, normal, worst case conditions and emergency operating situations, decommissioning and reclamation;
- c) the variability in the amount of water required on an annual and seasonal basis as the Project is implemented;
- d) the supply options including on-site storage referencing, as appropriate, technical information in the *Water Act* application;
- e) the location of sources/intakes and associated infrastructure (pipelines) and potential modifications with the Project; and
- f) intake design, where water is to be sourced from local waterbodies.

#### **3.5.2 Water Management**

Provide a Water Management Plan including, but not limited to, the following:

- a) measures taken by NLP to contribute to the improvement in efficiency and productivity of water use as identified in Water For Life: Alberta's Strategy for Sustainability to ensure efficient use of water for the Project;
- b) permanent or temporary alterations or diversions to watercourses and waterbodies;
- c) factors used in the design of water management facilities including expected flood levels, and flood protection; and
- d) provide an explanation of how these plans will be incorporated into project design.

#### **3.5.3 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 proposed facilities;
- b) those waste substances produced by the Project to be reportable under National Pollutants Release Inventory (NPRI), Priority Substances List 1 (PSL1), Priority Substances List 2 (PSL2), or Accelerated Reduction and Elimination of Toxics (ARET) substances relevant to the Project;
- c) design of facilities that will handle, treat, and store wastewater streams;
- d) type (chemical name) and quantity of chemicals used in wastewater treatment;
- e) options considered for wastewater treatment and management strategies, and reasons (including water quality and environmental considerations) for selecting the preferred options;
- f) potable water and sewage treatment systems that will be installed as components of the Project for both the construction and operation;
- g) the discharge of aqueous contaminants (quantity, quality, and timing) beyond plant site boundaries and the potential environmental effects of such releases;
- h) description of how the plan will be incorporated into project design;
- i) design parameters for managing site runoff during precipitation or snowmelt events;
- j) programs to monitor the effects of project operations on local surface and groundwater quantity and quality; and
- k) options for wastewater disposal (including zero liquid discharge) as well as the rationale for choosing the preferred options.

### 3.6 AIR EMISSIONS MANAGEMENT

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

- a) any NPRI, PSL1, PSL2, or ARET substances relevant to the Project;
- b) any odorous or visual emissions from the proposed facilities;
- c) the amount and nature of any acidifying emissions, probable deposition patterns and rates and programs NLP may implement to monitor the effects of this deposition;
- d) fugitive emissions control program to detect, measure and control emissions and odors from equipment leaks and the applicability of the Canadian Council of Ministers of the Environment (CCME) *Code of Practice for Measurement and Control of Fugitive Emissions from Equipment Leaks* and the *CCME Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Above Ground Storage Tanks*;
- e) the emission control technologies proposed for the Project in the context of best-available commercial technologies, and the applicability of Alberta Environment and *CCME Emission Control Technology Guidelines*;
- f) gas collection, conservation, and applicability of technology for vapour recovery for the Project's air emissions;
- g) control technologies used to minimize air emissions such as sulphur dioxide (SO<sub>2</sub>), hydrogen sulphide (H<sub>2</sub>S), oxides of nitrogen (NO<sub>x</sub>), volatile organic compounds (VOC) and particulate matter;
- h) technology or management programs to minimize emissions which lead to formation of particulate matter (PM) and ozone (O<sub>3</sub>) having regard to the provisions of the Canada Wide Standard for particulate matter and O<sub>3</sub>;
- i) the incremental contribution of the Project to regional (Edmonton Census Metropolitan Area) emissions of PM<sub>2.5</sub> and PM<sub>10</sub> and ozone precursors including NO<sub>x</sub>, SO<sub>2</sub>, VOC and ammonia;
- j) applicability of sulphur recovery, acid gas re-injection, or flue gas desulphurization to reduce sulphur emissions and applicability of EUB *Sulphur Recovery Guidelines* (Interim Directive ID 2001-3);
- k) non-routine flaring scenarios (e.g., emergencies, upsets and maintenance) and proposed measures to ensure flaring events are minimized; and
- l) monitoring programs NLP will implement to assess air quality and the effectiveness of mitigation, during the Project's development and operation. Discuss how these monitoring programs are compatible with those in used by regional multi-stakeholder air initiatives.

#### 3.6.1 Greenhouse Gas Emissions

Provide the following:

- a) the expected annual and total greenhouse gas (GHG) emissions over the construction, operation and decommissioning phases of the Project including calculations;
- 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 bitumen processed through the Upgrader 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 their consideration of the national *Climate Change Plan for Canada* and *Alberta's Climate Change Action Plan*; and
- e) NLP's overall GHG management plans, any plans for the use of offsets, (nationally or internationally) and the expected results of implementing the plans.

### 3.7 HYDROCARBON, CHEMICAL AND WASTE MANAGEMENT

Characterize and quantify the anticipated hazardous, non-hazardous, recyclable and dangerous goods wastes generated and used by the Project. Demonstrate that the selected management options are consistent with the current regulatory requirements and industry practice. Describe and address the following:

- a) 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 comply with provincial and federal legislations including EPEA's *Waste Control Regulation* and Alberta Environment's *Hazardous Waste Storage Guidelines*;
- b) a listing of chemical products to be used for the Project. Identify products containing substances that are:
  - i) Canadian Environmental Protection Act (CEPA) toxics;
  - ii) on the PSL1, PSL2 and ARET and those defined as dangerous goods pursuant to the federal Transportation of Dangerous Goods Act. Classify the wastes generated and characterize each stream under Alberta Environment's *User's Guide for the Waste Managers*;
  - iii) on the NPRI; and
  - iv) on Track 1 substances targeted under Environment Canada's *Toxic Substances Management Policy* for virtual elimination from the environment due to their persistent, bio-accumulative and toxic nature;
- c) in general terms, how chemical products will be stored and managed to ensure safety and environmental protection;
- 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;
- e) the type and amount of water softening sludge associated with the Project, if any. Describe disposal plans;
- f) the strategy for on-site waste disposal versus off-site disposal and identify:
  - i) the location of on-site waste disposal, including landfills, where applicable;
  - ii) the suitability of the site(s) from a groundwater perspective (provide geo-technical information to support the siting of disposal facilities);
  - iii) the site suitability with regard to existing and potential human activities in the area;
  - iv) potential effects on the environment; and
- g) plans for waste minimization, recycling, pollution prevention and management over the life of the Project. Discuss methods and technologies to reduce waste quantities to the lowest practical levels.

### 3.8 ENVIRONMENTAL MANAGEMENT SYSTEM AND CONTINGENCY PLANS

Summarize key elements of NLP's environmental, health, and safety management system and discuss how it will be integrated into the Project, addressing the following:

- a) corporate policies and procedures, operator competency training, spill and air emission reporting procedures, and emergency response plans;
- b) plans to minimize the production or release into the environment of substances that may have an adverse effect;
- c) a conceptual contingency plan that considers environmental effects associated with operational upset conditions such as serious malfunctions, accidents or extreme weather events; and
- d) the emergency response plan's capability to deal with unpredicted negative impacts.

### **3.9 ADAPTATION PLANNING**

Describe the flexibility built into the plant design and layout to accommodate future modifications required by any change in emission standards, limits and guidelines. Discuss any follow-up programs and adaptive management considerations.

### **3.10 PARTICIPATION IN REGIONAL COOPERATIVE EFFORTS**

Document NLP's involvement in regional cooperative efforts to address environmental, health and socio-economic issues associated with the regional industrial development during the life of the Project, including:

- a) NLP's current and planned participation in regional monitoring and management activities such as the Fort Air Partnership to address environmental, health and socio-economic issues;
- b) NLP's current and planned cooperative ventures with other operators to minimize the environmental impact of the Project or the environmental impact of regional industrial development;
- c) how NLP will work to develop and implement such cooperative opportunities;
- d) monitoring activities that will be undertaken to assist in managing environmental protection strategies. Discuss how any result will contribute to NLP's participation in the regional efforts; and
- e) how NLP will use information from regional cooperative efforts to design and implement mitigation measure (to mitigate specific effects and cumulative effects), monitoring programs (project-specific monitoring and regional monitoring), and research programs outside of these initiatives where necessary.

## **4. ENVIRONMENTAL INFORMATION AND CUMULATIVE EFFECTS ASSESSMENT INFORMATION REQUIREMENTS**

### **4.1 ASSESSMENT 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, which includes past studies, existing and anticipated future environmental conditions, existing projects or activities, plus other planned projects or activities.

Note: For the purposes of defining assessment scenarios, "approved" means approved by any 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 Application and EIA report.

### **4.2 INFORMATION REQUIREMENTS FOR THE ENVIRONMENTAL ASSESSMENT**

Basic environmental information requirements for NLP's EIA report include for each relevant section:

- a) quantitative and qualitative information about the existing environmental and ecological processes in the EIA Study Area;
- b) information about the existing and planned human activities in the EIA Study Area, and the nature, size, location and duration of their potential interactions with the environment, sometimes described as stressors (e.g., land disturbance, discharges of pollutants, changes to access status, consumption of renewable resources);
- c) information about ecological processes and natural forces which are expected to produce changes in environmental conditions (e.g., climate change, forest fires, flood or drought conditions, predator-prey population cycles);

- d) the demonstrated use of appropriate predictive tools and methods, enabling quantitative estimates of future conditions with the highest possible degree of certainty;
- e) quantitative and qualitative descriptions of the effects;
- f) evaluation of the significance of the effects, including the probability of the effect occurring and the importance of the consequences (measured quantitatively against management objectives and guidelines or baseline conditions and described qualitatively with respect to the views of NLP and stakeholders);
- g) a description of air quality impact assessment as it relates to the *Alberta Ambient Air Quality Objectives*. Evaluate this against the regional, provincial and national objectives for air quality including the Canada Wide Standards for particulate matter and ozone;
- h) management plans to prevent, minimize or mitigate adverse effects and to monitor and respond to expected or unanticipated conditions, including any follow-up plans to verify the accuracy of predictions or determine the effectiveness of mitigation plans;
- i) a record of all assumptions, including an evaluation of impact prediction confidence in data and analysis to support conclusions;
- j) a description of residual effects and their consequences for the environment as well as for regional management initiatives that are underway or in development; and
- k) provide data and clearly identify their sources.

#### **4.3 MODELLING**

Document any assumptions used to obtain modelling predictions submitted as part of the EIA report. 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.

#### **4.4 CUMULATIVE ENVIRONMENTAL EFFECTS**

Assessment of cumulative effects will be an integral component of the EIA report. NLP 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 any potential adverse effects. The identification and assessment of the cumulative environmental effects of the Project will:

- a) define the spatial and temporal Study Area boundaries and provide the rationale for assumptions used to define those boundaries for each environmental component examined;
- b) describe the current (baseline) state of the environment in the Regional Study Area (used for the cumulative effects assessment);
- c) assess the incremental consequences that are likely to result from the Project in combination with other existing, approved and planned projects in the region;
- d) demonstrate that relevant information and data used from previous development projects is appropriate for use in this EIA report;
- e) explain the approach and methods used to identify and assess cumulative effects including cooperative opportunities and initiatives undertaken to further the collective understanding of cumulative effects. Provide a record of relevant assumptions, confidence in data and analysis to support conclusions;

#### **4.5 EIA STUDY AREA**

The EIA Study Area shall include the PDA and associated infrastructure, as well as the spatial and temporal areas of individual environmental components outside the PDA boundaries where an effect can be reasonably expected. The EIA Study Area includes both Regional and Local Study Areas.

Illustrate boundaries and identify the Study Areas chosen to assess effects. 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.

#### **4.6 CLIMATE AND AIR QUALITY**

Discuss baseline climatic and air quality conditions. Review emission sources and discuss emissions from industrial development within the EIA Study Areas. Consider emission point sources as well as fugitive emissions. Identify components of the Project that will affect air quality from a local and regional perspective, and:

- a) identify any regional air monitoring done in the area and describe NLP's participation in any regional forum (e.g., Northeast Capital Industrial Association, Fort Air Partnership);
- b) discuss appropriate air quality parameters such as SO<sub>2</sub>, carbon monoxide (CO), H<sub>2</sub>S, total hydrocarbons (THC), NO<sub>x</sub>, VOC, individual hydrocarbons of concern in the THC and VOC mixtures, visibility, trace metals, particulates (PM<sub>10</sub> and PM<sub>2.5</sub>) and O<sub>3</sub>;
- c) estimate ground-level concentrations of appropriate air quality parameters include frequency distributions for air quality predictions in communities and sensitive receptors, and include an indication of 99.9 percentile for hourly predictions (98 percentile for any 24-hour modelling predictions of PM<sub>2.5</sub>). Discuss any expected changes to particulate deposition or acidic deposition (PAI). Justify the selection of the models used and identify any model shortcomings or constraints on findings. Complete modelling in accordance with Alberta Environment's *Air Quality Model Guidelines*. Include model input files;
- d) identify the potential for reduced air quality (including odors and visibility) resulting from the Project and discuss any implications of the expected air quality for environmental protection and public health;
- e) describe how air quality impacts resulting from the Project will be mitigated;
- f) identify ambient air quality monitoring and receptor monitoring that will be conducted during construction and operation of the Project to assess air quality and the effectiveness of mitigation;
- g) assess the project-specific air quality impacts and cumulative air quality impacts, and their implications for other environmental resources, including habitat diversity and quantity, vegetation resources, water quality and soil conservation; discuss the relative contribution of the Project (e.g., after mitigation) to regional cumulative effects;
- h) assess the cumulative effects on the air quality of the EIA Study Area and include any related emissions increases from upgrading bitumen; and
- i) describe the monitoring programs NLP will implement to assess air quality and the effectiveness of mitigation during the Project's development and operation.

##### **4.6.1 Climate Change**

Discuss the following:

- a) 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 NOISE AND LIGHT**

### **4.7.1 Noise**

Provide representative baseline noise levels and a description of the measurement/prediction methods used.

- a) provide the results of a noise assessment based on existing conditions as specified by EUB ID 99-08, Noise Control Directive, including:
  - i) an estimate of the potential for increased noise resulting from the Project;
  - ii) the identification of potentially-affected people and wildlife; and
  - iii) the implications of any increased noise levels;
- b) discuss the effects and mitigative measures to be utilized to minimize the production of noise at sensitive receptors.

### **4.7.2 Light**

Discuss baseline light level conditions. Identify components of the Project that will affect light level, include:

- a) the identification of potentially-affected people and wildlife and the implications of any increased light levels;
- b) identify facilities that will affect light levels at night and evaluate the potential effects of increased light on affected residents; and
- c) discuss the effects and mitigative measures to be utilized to minimize the production of light and flaring.

## **4.8 LAND USE, WATER USE AND RECLAMATION**

Review current land and water use issues and identify the anticipated changes in nature, location and duration of land and water use as a result of the Project. Discuss:

- a) conformity with land use objectives and planning parameters for the Sturgeon County, Alberta's Industrial Heartland Area Structure Plan; Heavy Industrial Policy Area, and the Planning Framework;
- b) potential project impact on local and regional land use management, residential areas, agricultural activities, areas with native vegetation, wildlife habitat, recreation uses, and other industrial uses in the region;
- c) mitigation plans to minimize these effects;
- d) reclamation concepts and objectives. Develop a conceptual reclamation/closure plan for the PDA considering regulatory requirements, stakeholder input, land use objectives and other factors necessary for a reclamation plan to be implemented;
- e) the navigability capability and resources, including plans for mitigation and plans to address residual effects;
  - i.) conduct necessary surveys to characterize the navigation resources in the Study Area; and
  - ii.) discuss components of the Project that will potentially affect navigable waterways.

Discuss how the reclamation/closure plan design will:

- f) return equivalent land capability as compared to pre-disturbance conditions;
- g) integrate the proposed landscape with the surrounding landscapes including inter-connectivity to the surrounding landscapes;
- h) integrate surface- and near-surface drainage within the PDA; and
- i) be incorporated into planning and development of the Project.

Provide and discuss:

- j) soil salvage plans indicating salvage areas, depths, types, quality and volumes of soil to be salvaged. Outline soil storage methods and locations; soil replacement plans specifying the techniques, timing, depth, volume and type of reclamation material;
- k) the anticipated timeframes for completion of reclamation activities;

- l) the applicable parameters that should be used to monitor and evaluate the reclaimed land;
- m) any constraints to reclamation such as timing of activities, availability of materials and influence of natural processes and cycles; and
- n) any soil-related constraints or limitations that may affect salvage and reclamation;
- o) revegetation for the disturbed terrestrial areas, identifying the species types that will be used for seeding or planting, and the vegetation and weed management practices.

## **4.9 TERRESTRIAL**

### **4.9.1 General Terrestrial Considerations**

Review current biophysical conditions and identify the nature, location and duration of changes anticipated as a result of the Project. Provide and discuss the following:

- a) maps indicating the pre-disturbance landscape, elevation and drainage patterns of the Study Areas including location of proposed footprint;
- b) an assessment of the anticipated changes to the pre-disturbed topography, elevation and drainage patterns of the Study Areas;
- c) baseline biophysical conditions, including topography, soil and vegetation characteristics, and wildlife capability within the Study Area. Conduct the necessary surveys to characterize the biophysical resources in the Study Area, and to assist in reclamation planning;
- d) components of the Project that will potentially affect these biophysical resources, including soils, vegetation, wildlife and biodiversity;
- e) mitigation plans to minimize these effects; and
- f) an assessment of the relative contribution of the Project (after mitigation) to regional cumulative pressures on biophysical resources (e.g., project contributions to cumulative potential acid input [PAI]).

### **4.9.2 Soil**

Provide the following:

- a) describe and map the soil types and their distribution in the Project Area according to appropriate soil survey procedures and intensities;
- b) provide an ecological context of the soil resource by supplying a soil survey report and maps following Soil Survey Handbook, Vol. 1 (Agriculture Canada, 1987) and The Canadian System of Soil Classification Third Edition (Agriculture and Agri-Food Canada, 1998) to include:
  - i.) SIL (survey intensity level) 1 for the development footprint areas;
  - ii.) SIL 2 for other areas in the Local Study Area; and
  - iii.) appropriate level of detail to determine the effect of the Project on soil types and quality, with some emphasis on potential acidification, on the Regional Study Area.
- c) characterize the pre-disturbance morphological, physical and chemical properties of the soil types and assess the pre-disturbance land capability;
- d) develop a soil conservation and reclamation plan for the Study Areas. Describe the suitability and availability of soil materials within the Study Areas for reclamation. Outline the criteria and methods to be used in salvaging soils. Describe the procedures for soil handling and storage for reclamation within the Study Areas;
- e) discuss sensitivity of local and regional soils to acidic deposition for baseline, application and cumulative scenarios;
- f) identify any activities associated with the Project, which may cause soil contamination or soil deterioration and changes to land capability at the local and regional scale and discuss mitigation strategies to reduce potential impact; and

- g) discuss the regulatory requirements for soil monitoring or soil management for potential impacts of the Project to soils in the development area and areas that may be potentially affected.

#### **4.9.3 Vegetation**

Provide the following:

- a) conduct an inventory, map and describe the existing terrestrial, wetland and aquatic vegetation. Include any rare vascular and non-vascular plant species and rare plant communities in the Study Areas;
- b) describe and assess potential impacts of the project construction and operation on vegetation (abundance, diversity, health, rare species and rare plant communities) in the Study Areas;
- c) describe and discuss measures to be implemented to mitigate and monitor potential impacts of the Project on vegetation in the Study Areas; and
- d) discuss how vegetation monitoring programs will be used to adaptively manage the mitigation measures and monitoring programs.

#### **4.9.4 Wildlife**

Describe existing wildlife resources (amphibians, reptiles, birds and terrestrial and aquatic mammals), their use and potential use of habitats in the Study Areas. Document the anticipated changes to wildlife in the Study Areas. Specifically:

- a) document and describe those species listed by Alberta Fish and Wildlife (at risk, may be at risk and sensitive species in the *General Status of Alberta Wild Species 2000*) and COSEWIC (endangered, threatened, vulnerable in Canadian Species at Risk 2002) found within the Study Areas, using recognized survey protocols;
- b) describe and assess potential impacts of the Project on wildlife species found in the Study Areas. These include impacts on critical habitat, habitat availability and quality, and habitat fragmentation and loss. These impacts should be described for the various phases of the Project both locally and cumulatively with other activities in the Study Areas;
- c) proposed strategies to minimize and/or mitigate impacts on the species and their habitats that are found in the Study Areas. These strategies should be tailored to the various phases of the Project and meet the expectations of relevant wildlife legislation;
- d) identify and discuss proposed monitoring programs that will be implemented during various phases of the Project to evaluate the effectiveness of mitigative strategies to reduce impacts on the species and their habitats that are found in the Study Areas. Describe how the results from the monitoring programs will also be used to evaluate the effectiveness of the programs themselves; and
- e) discuss any existing wildlife studies that may be occurring in the Study Areas and how NLP plans to integrate its operational and mitigation activities with those studies.

#### **4.9.5 Biodiversity and Fragmentation**

Provide the following:

- a) discuss how the impacts defined in the EIA report could affect local and regional biodiversity and habitat fragmentation, both project specific and cumulatively. Use quantitative data where possible to describe the potential effects on biodiversity and habitat;
- b) discuss the contribution of the Project to any anticipated changes in regional biodiversity, including measures to minimize such changes;

- c) discuss how NLP's plans for mitigation and monitoring will meet the expectations of Sustaining Alberta's Biodiversity *An Overview of Government of Alberta Initiatives Supporting the Canadian Biodiversity Strategy* (Alberta Environmental Protection, 1998);
- d) determine the current and proposed level of habitat fragmentation for the Study Areas;
- e) describe the techniques used in the fragmentation analysis;
- f) identify and evaluate the extent of potential effects from fragmentation (e.g., potential introduction of nonnative plant species on native species composition and any changes to plant communities) resulting from project activities; and
- g) discuss measures to mitigate, monitor and reclaim impacts from fragmentation.

#### **4.10 SURFACE WATER AND GROUNDWATER**

##### **4.10.1 Surface Water Hydrology and Quality**

Discuss baseline surface hydrology conditions. Identify components of the Project that will affect these conditions from a local and regional perspective. Discuss:

- a) existing drainage patterns, surface water bodies, and wetlands within local and regional Study Areas, and the seasonal flow/water level characteristics of these water bodies;
- b) project-related temporary and permanent alterations to these drainage patterns, water bodies and wetlands;
- c) possible water diversions and return flows from these drainage channels and waterbodies under a variety of operating conditions and scenarios including, emergency conditions, low flow, or drought conditions;
- d) effects of site runoff management on flow/level characteristics in these drainage channels and waterbodies;
- e) mitigation plans to minimize these effects and the loss of wetland and function;
- f) the relative contribution the Project has (after mitigation) on regional cumulative pressures for surface water resources; and
- g) a monitoring program to assess hydrological impacts and assess performance of mitigation plans and water management systems;
- h) discuss cumulative impact of water withdrawal on the North Saskatchewan River or any other potential water source;
- i) discuss the potential impact of climate change on the requirement of water withdrawal during low flow periods;

Discuss baseline surface water quality. Identify components of the Project that will affect these conditions from a local and regional perspective. Discuss:

- j) water quality characteristics in surface waterbodies within the Study Area including, but not limited to: temperature, pH, conductivity, TDS, alkalinity, hardness, nutrients, hydrocarbons, cations and anions, metals, dissolved oxygen, suspended solids, phenolics, colour and other water constituents potentially relevant to the effluent discharges and impact assessment;
- k) the potential project related and cumulative impacts of acidifying and other air emissions on surface water quality in the local and regional waterbodies;
- l) effects of site runoff on water quality in surface waterbodies within the Study Area;
- m) the impacts on surface water quality within the Study Area from:
  - i.) change in groundwater movement;
  - ii.) spills;
  - iii.) contaminated groundwater resulting from spills; and
  - iv.) surface water withdrawals (Project and Cumulative);
- n) mitigation plans to minimize these effects during the construction, operation and reclamation phases of the Project;

- o) a plan and implementation program for the protection of surface water quality, addressing the following:
  - i) surface water monitoring program for early detection of potential contamination and assistance in remediation planning; and
  - ii) surface water remediation options to be considered for implementation in the event that adverse effects are detected;
- p) the relative contribution of the Project (after mitigation) to regional cumulative effects on surface water quality (e.g., project contributions to lake acidification); and
- q) the significant and potential impacts on surface water quality within the Study Areas resulting from the Project, including site runoff and project-related wastewater discharges, that may indicate a potential adverse effect or exceedance of the *Surface Water Quality Guidelines for Use in Alberta* (November 1999) or *Canadian Water Quality Guidelines*.

#### 4.10.2 Groundwater Quantity and Quality

Discuss baseline groundwater conditions and identify components (e.g. dewatering, well supply) of the Project that will affect groundwater from a local and regional perspective.

Provide the following:

- a) a discussion of the characteristics of major aquifers, aquitards, and aquicludes in the Project Area;
- b) lithology, thickness and stratigraphic continuity of both surficial and bedrock geologic units within the Study Area;
- c) hydrogeologic information including hydraulic properties, depth to water, flow direction, velocity and connectivity with surface waterbodies of the geologic units;
- d) groundwater quality information of the hydrogeologic units in the Study Area, including, but not limited to, background concentrations of major ions, dissolved metals and benzene, toluene, ethylenebenzene and xylene (BTEX);
- e) maps and cross-sections that include groundwater table and piezometric surfaces based on identifiable groundwater systems and accurate data sources, such as drill holes;
- f) results of any new hydrogeological investigations, including methodology;
- g) an inventory of groundwater users in the Project Area. Identify potential groundwater use conflicts and proposed resolutions;
- h) an assessment of potential effects of project-related water withdrawal on groundwater levels, effects on local and regional groundwater regimes, including vertical gradients and discharge areas;
- i) an assessment of the effects of groundwater withdrawal/dewatering and its implications for other environmental resources, including flows and water levels in local streams, wetlands, vegetation and soil saturation;
- j) an assessment of potential effects of project-related activities and surface releases (e.g., accidental contaminant spills) and down-hole wastewater and acid gas injection on groundwater quality;
- k) a justification for the selection of any hydrogeological models used, including identifying any model shortcomings or constraints on findings and any surrogate parameters that were used as indicators of potential aquifer contamination due to the Project;
- l) a plan and implementation program for the protection of groundwater resources, addressing the following:
  - i) groundwater monitoring program for early detection of potential contamination and assistance in remediation planning; and

- ii) groundwater remediation options to be considered for implementation in the event that adverse effects are detected; and monitoring the sustainability of groundwater production or dewatering effects.

#### **4.11 AQUATIC RESOURCES**

Identify components of the Project that will affect baseline conditions from a local and regional perspective. Discuss:

- a) baseline aquatic resource conditions, including fish, epilithic algae and benthic invertebrate habitat capability in waterbodies within the Study Area. Conduct the necessary surveys, to characterize the aquatic resources in the Study Area;
- b) discuss the potential for nutrient enrichment if nutrients are discharged to the aquatic environment from both the project and cumulative perspectives;
- c) components of the Project that will potentially affect aquatic resources within the Study Area, their impact on the Study Area and significance;
- d) cumulative effects of the impacts that already exist and potential project-related impacts on the aquatic resources in relevant waterbodies;
- e) mitigation plans to minimize these effects;
- f) an assessment of the relative contribution of the Project (after mitigation) to regional cumulative effects on aquatic resources (e.g., project contributions to lake acidification);
- g) the potential for contamination of fish and fish habitat by wastewater discharges relative to fish consumption guidelines;
- h) programs to monitor aquatic habitat quality and the effectiveness of mitigation strategies; and
- i) the key indicator species and stressors related to the Project.

### **5. ENVIRONMENTAL EFFECTS MONITORING**

Describe environmental effects monitoring (EEM) activities that NLP will undertake to manage effects and confirm the performance of mitigative measures. Specifically addressing:

- a) monitoring activities and initiatives that NLP is proposing to conduct independently of other stakeholder activities in the region;
- b) monitoring activities that NLP is proposing to conduct collaboratively with other stakeholders. Include in this discussion the role that NLP anticipates taking in each of the programs; and
- c) mechanisms for sharing results, reviewing findings and adjusting programs should monitoring identify unanticipated consequences of NLP's operations or mitigation plans, including:
  - i) corporate adaptive management strategies; and
  - ii) consultation with regulators, public stakeholders, and, if necessary, regional management forums.

### **6. PUBLIC HEALTH AND SAFETY**

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

- a) identify and discuss the data and methods used by NLP to assess the 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 potential contamination of country foods and natural food sources taking into consideration all project activities;
- d) provide information on samples of selected species of vegetation known to be consumed by humans;

- e) discuss the potential to increase human exposure to contaminants from changes to water quality and drinking water, air quality and soil quality;
- f) document the health and safety concerns raised by stakeholders during consultation on the Project;
- g) assess cumulative health effects to receptors, that are likely to result from the project in combination with other existing, approved, and planned projects;
- h) as appropriate, identify 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;
- i) identify and discuss potential health and safety impacts due to higher regional traffic volumes and the increased risk of accidental leaks and spills;
- j) provide a summary of NLP's emergency response plan and discuss mitigation plans that will be implemented to ensure workforce and public safety during the pre-construction, construction, operation and reclamation of the Project. Include prevention and safety measures for wildfire occurrences, water saturated plume from the cooling towers, icy roads in winter months, accidental release or spill of chemicals to the environment and failures of structures retaining water or fluid wastes;
- k) describe how local residents will be contacted during an emergency and what type of information will be communicated to them;
- l) describe existing agreements with area municipalities or industry groups such as, safety co-operatives, emergency response associations and municipal emergency response agencies; and
- m) describe mitigation strategies that will be utilized to ensure public safety as moist air is emitted from cooling towers.

## 7. HISTORICAL RESOURCES

Provide the following:

- a) evidence of consultation with and clearance from Alberta Community Development. Provide a general overview of the results of any previous resource studies that have been conducted in the historical resources Study Area, including archaeological resources, palaeontological resources, historic period sites, and any other historical resources as defined within the *Historical Resources Act*;
- b) a summary of the results of the Historical Resources Impact Assessment that is carried out with respect to the Upgrader Project. The Historical Resources Impact Assessment must encompass all projected development and impact areas with boundaries of the Upgrader Project; and
- c) an outline of the historical resources management program and schedule of field investigations that may be required to further mitigate the effects of the Upgrader Project on historical resources.

## 8. SOCIO-ECONOMIC FACTORS

Provide information on the economic effects of the Project. Specifically provide and address the following:

- a) the number and distribution of people who may be affected by the proposal;
- b) information on the economic status of the area and the contribution of the proposed development;
- c) information on the social impacts of the Project on the Study Area and on Alberta including:
  - i) local employment and training;
  - ii) local procurement;
  - iii) population changes;
  - iv) demands on local services, and infrastructure; and
  - v) regional and provincial economic benefits;
- d) the impacts of the Project during construction and operation phases, on transportation planning, traffic and local services;

- e) the economic impacts of the Project on the Study Area and on Alberta, having regard for capital, labour, and other operating costs and revenue from services;
- f) NLP's policies and programs respecting the use of local, Alberta, and Canadian goods and services;
- g) an estimated breakdown of Alberta, other Canadian and non-Canadian industrial benefits for project management/engineering; equipment and materials; construction labor, and total overall project;
- h) employment and business development opportunities the Project may create for local communities and the region;
- i) a breakdown of the labor force, type of employment, and number of employees with respect for the construction and operational workforces. Identify when the peaks in labour requirements will occur, the extent of the peaks and the source of labour for the Project; and
- j) 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.

## 9. PUBLIC CONSULTATION REQUIREMENTS

NLP shall undertake a consultation program during the preparation of the EIA report including, but not limited to, the following stakeholders:

- a) residents of surrounding communities;
- b) recognized land users of the Local Study Areas;
- c) industrial, recreational, environmental groups and individuals expressing a formal interest in the Project;
- d) federal, provincial, and municipal regulators, as applicable;
- e) other operating or planned developers in the region.

Describe and document the public consultation program implemented including plans to coordinate consultation activities with other developers in the area. Record any concerns or suggestions made by the public and demonstrate how these concerns have been addressed. Discuss:

- f) how the concerns and issues identified by NLP and stakeholders influenced the Project development, design, impact mitigation and monitoring, or how it was addressed or discounted;
- g) the type of information provided and the issues discussed, including those that have been resolved and those that remain outstanding;
- h) in consideration of unresolved issues, the key alternatives which have been identified by NLP and stakeholders for future consultations as well as mechanisms and timelines for that resolution;
- i) plans to maintain and support the public consultation process following completion of the EIA review; and
- j) any agreements reached with stakeholders regarding NLP's operations and activities.

## **APPENDIX**

*The following information is necessary to be submitted as part of the request for an application to 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.*

### **Water Supply, Water Management and Wastewater Management**

Provide the following information:

- a) technical information on how the water requirements for the Project will be met including annual volumes from each source: for non-saline groundwater sources and site dewatering activities, follow Alberta Environment's *Groundwater Evaluation Guideline*;
- b) the design of facilities that will handle, treat and store wastewater streams;
- c) the type and quantity of any chemicals used in wastewater treatment; and
- d) design details for the potable 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.