FINAL TERMS OF REFERENCE
ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

FOR THE

OPTI CANADA INC./NEXEN INC.
LONG LAKE PHASE 2 SAGD OIL SANDS PROJECT

Approximately 14 km South of Anzac, Alberta

Issued by: Alberta Environment

Date: November 30, 2005

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to identify for OPTI Canada Inc., Nexen Inc. (OPTI/Nexen) and the public the information required by government agencies for an Environmental Impact Assessment (EIA) report. OPTI/Nexen will prepare and submit an EIA report that examines the environmental and socio-economic effects of the construction, operation and reclamation of its proposed Project.

OPTI/Nexen plans to expand its current Long Lake operations through development of an additional 70,000 barrels per day of Steam Assisted Gravity Drainage (SAGD) production. OPTI/Nexen currently has approval for 70,000 bbls/day of bitumen production and 140,000 bbls/day of upgrading at the Long Lake project. The additional 70,000 bbls/day of SAGD Bitumen production will provide feed stock for the 140,000 bbls/day upgrader. This additional 70,000 bbls/day of SAGD Bitumen production will be located in an area referred to as Kinosis, approximately 11 km south of the current OPTI/Nexen Long Lake facility. The Long Lake Phase 2 SAGD Project (Phase 2) will be integrated with the existing Long Lake operations. As a result of this proposed expansion the Long Lake project will have 140,000 bbls/day of SAGD bitumen production and 140,000 bbls/day of upgrading. Phase 2 will have a production life of approximately 40 years. Pending regulatory approval, it is OPTI/Nexen's intention to begin construction in Q3 of 2008 with subsequent start-up expected in Q3/Q4 of 2010.

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, the *Oil Sands Conservation Act* (OSCA) and Regulations, the *Canadian Environmental Assessment Act* (CEAA) and Regulations, and any other federal legislation which may apply to Phase 2. The EIA report will:

a) assist the public and government in understanding the environmental and socio-economic consequences of the Phase 2 development, operation and reclamation plan and will assist OPTI/Nexen in its decision-making process;
b) address:
   i. project impacts,
   ii. mitigation options, and
   iii. residual effects relevant to the assessment of Phase 2 including, as appropriate, those related to other industrial operations;
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 future monitoring of environmental protection measures, and
   iii. identify residual environmental impacts and their significance including cumulative and regional development considerations. As appropriate for the various types of impacts, discussion of impact predictions should be presented in terms of magnitude, frequency, duration, seasonal timing, reversibility, and geographic extent;
d) include tables that cross-reference the report (subsections) to the EIA Terms of Reference; and
e) include a glossary of terms and list of abbreviations to assist the reader in understanding the material presented.

The EIA report will form part of OPTI/Nexen'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 9.0). The public consultation program is to communicate with those members of the public who may be affected by Phase 2 and to provide them with an opportunity to participate in the Environmental Assessment process.

1.4 Proponent's Submission

OPTI/Nexen is responsible for the preparation of the EIA report and related applications. The EIA report 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 Phase 2;
c) a corporate profile;
d) a brief history of OPTI/Nexen's operations including existing facilities;
e) an overview of the recent EIAs and the associated developments completed by OPTI/Nexen in the Regional Municipality of Wood Buffalo; and
f) an overview of the proposed Project.

2.2 Phase 2 Area and EIA Study Area

The Principal Development Area (PDA) includes all lands subject to direct disturbance from Phase 2 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 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 include the PDA and other areas based on individual environmental components where an effect from the proposed development can reasonably be expected. Provide:

e) the rational used to define Local and Regional Study Areas (see Section 4.1), considering the location and range of probable project and cumulative effects, included those related to regional or cumulative effects consistent with the direction of the Regional Sustainable Development Strategy (RSDS) process where possible; and
f) an illustration of boundaries and identify Local and Regional Study Areas chosen to assess impacts on maps of appropriate scale.

2.3 Project Components and Development Schedule

Provide a development plan and description and/or figures of Phase 2 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) quantify and characterize wastes produced;

f) identify 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, identify 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:

o) pre-construction;
p) construction;
q) operation;
r) decommissioning;
s) reclamation and closure;
t) timing of key construction, operational and reclamation activities and the expected duration of each for the life of Phase 2;
u) a detailed schedule for any reclamation and related activities envisaged during the first decade of operations; and
v) the key factors controlling the schedule and uncertainties.

2.4 Project Need and Alternatives

Discuss the need for Phase 2 and consider the implications of not going ahead with Phase 2 addressing the following:

a) identify any alternative means of carrying out Phase 2 and indicate their potential environmental effects and impacts;
b) compare identified alternatives to Phase 2 and their anticipated environmental effects and impacts of the alternatives;
c) discuss reasons for not selecting any identified alternatives;
d) discuss the implications of a delay in proceeding with Phase 2, or any phase of Phase 2; and
e) identify potential cooperative development opportunities for Phase 2.

2.5 Regulatory Review

Provide the following:

a) identify the environmental and other specific regulatory approvals and legislation that are applicable to Phase 2 at the municipal, provincial and federal government levels;
b) identify government policies, resource management, planning or study initiatives pertinent to Phase 2 and discuss their implications;
c) identify and delineate major components of the whole Phase 2 Project and identify those being applied for and constructed within the duration of approvals under the:
    i. EPEA,
    ii. *Water Act*,
    iii. *Public Lands Act* (PLA),
    iv. *Canada Fisheries Act*, and
    v. *Navigable Waters Protection Act*; and

d) a summary of the regional, provincial or national objectives, standards or guidelines which have been used by OPTI/Nexen to assist in the evaluation of any predicted environmental impacts.

2.6 EIA Summary

Provide a summary of the results of the EIA report including:

a) Phase 2 components and development activities which have the potential to affect the environment;
b) existing conditions in the Study Area, including existing uses of lands, resources and other activities which have potential in combination with proposed development activities, to effect the environment;
c) the anticipated environmental effects including cumulative considerations;
d) proposed mitigation measures and appropriate monitoring plans; and
e) any residual effects.

3.0 PROJECT DESCRIPTION

Describe all of the activities and components of Phase 2 that are proposed for approval. The scope and detail of Phase 2 description information shall be sufficient to allow quantitative assessment of the environmental consequences. If the scope of information varies among components or phases of Phase 2, OPTI/Nexen shall provide a rationale demonstrating that the information is sufficient for EIA purposes. Describe Phase 2 components, infrastructure and activities. Discuss the alternatives considered, the alternative selection process, the potential effects that activities and infrastructures may have on the environment and the natural resources to be used for Phase 2. Outline the management plans to minimize the discharge of pollutants, manage wastes, reclaim disturbed lands and waterbodies, optimize resource use, manage and monitor environmental effects. 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 OPTI/Nexen's submission(s) provided that the location of the information is appropriately referenced in the EIA report. OPTI/Nexen 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 Phase 2, and:

a) provide a map showing the location of all existing infrastructure (e.g., roads) and the location of the proposed central and field facilities;
b) show all existing leases and clearings including exploration clearings and illustrate how OPTI/Nexen intends to use these areas for Phase 2 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 Phase 2;
d) describe the process and criteria used to select the sites for facilities and infrastructure for Phase 2 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,
v. pipelines, and
vi. utilities and other site preparation activities;

h) indicate the amount of surface disturbance from plant, field and infrastructure-related activities; discuss:
   i. how surface disturbance (extent and duration) will be minimized,
   ii. whether the timber is merchantable and if so, indicate anticipated volumes from clearing activities, and
   iii. how visual aesthetics will be managed, where required;
i) discuss opportunities to integrate Phase 2 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 Phase 2 and how it relates to local communities or activities, and:

a) discuss the amount and source of energy required for Phase 2;
b) discuss the options considered for supplying the thermal energy and electric power required for Phase 2 and their environmental implications;
c) describe road access to and within the Phase 2 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 Phase 2. 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 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 Phase 2. 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 Phase 2 will affect aggregate reserves that may be located on OPTI/Nexen 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 Phase 2 design will minimize the amount of disturbance; outline design features to prevent spills, contingencies for spill response and environmental risks associated with spills; and
m) 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 Phase 2 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 Phase 2;
b) the amount and nature of any acidifying emissions, probable deposition patterns and rates, and programs OPTI/Nexen 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; and
e) the use of alternative fuels in this project. Provide emission profiles for each fuel under consideration.

3.3.1 Emission Control Technologies

a) Discuss the emission control technologies proposed for Phase 2 within the following context:
   i. minimizing air emissions such as sulphur dioxide (SO_2), hydrogen sulphide (H_2S), 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 Heate*rs,
   iii. applicability of sulphur recovery, acid gas re-injection, flue gas desulphurization 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 Phase 2,
   v. control technologies for minimization of venting and flaring,
   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* and the CCME *Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Above Ground Storage Tanks*; and
b) discuss monitoring programs OPTI/Nexen will implement to assess the air quality and the effectiveness of mitigation during the Phase 2 development and operation. Discuss how these monitoring programs are compatible with those in use by regional multi-stakeholder air initiatives (e.g., CEMA, WBEA).

3.3.2 Greenhouse Gas Emissions

Provide the following:

a) the expected annual and total greenhouse gas (GHG) emissions over the construction, operation and decommissioning phases of Phase 2;
b) Phase 2's marginal 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 Phase 2 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) OPTI/Nexen's overall GHG management plans, 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 Phase 2, including, but not limited to, the following:

a) the annual and seasonal water balance(s) for each project phase and overall. Discuss assumptions made or methods chosen to arrive at the water balance(s);
b) the process, potable and non-potable water requirements and sources for construction, startup, normal and emergency operating situations, decommissioning and reclamation. Provide an evaluation of alternative water sources and include a description of the criteria and rational for selecting the preferred source(s) and identify the volume of water to be withdrawn from each source;
c) the variability in the amount of water required on an annual and seasonal basis as Phase 2 is implemented. Show the location of sources/intakes and associated infrastructure (pipelines);
d) contingency plans for water supply, including the potential effects of extended periods of drought on the proposed water supply; and
e) a water source evaluation consistent with the recommendations of the Advisory Committee on Water Use Practice and Policy (August 2004).

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. potable 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 displacement of freshwater with saline sources, 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 streams;
c) type and quantity of chemicals used in water and wastewater treatment, including any NPRI, PSL1, PSL2, or ARET substances relevant to Phase 2;
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. 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) potable water and sewage treatment systems that will be installed as components of Phase 2 for both the construction and operation stages; and
k) the principles that have been incorporated into Phase 2'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 proposed storage and handling methods and disposal for each waste stream. Consider both central plant and field operations;
c) identify the amount of drilling wastes produced by Phase 2, 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;
d) discuss the strategy for on-site waste disposal versus off-site waste disposal, including but not limited to the following:
    i. identify 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; and
    iii. on- and off-site waste treatment and storage areas;
e) describe plans for waste minimization, recycling, and management over the life of Phase 2; and
f) 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 Phase 2. 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, how these items will be stored and managed to ensure adequate protection to both the environment and to 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 for Additional Requirements)

Provide a conceptual reclamation and closure plan for Phase 2 with consideration to 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) re-vegetation 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 Central Mixed wood Sub region 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;
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; and
p) wetlands or other alternatives to reclaim the land.

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

q) appropriate productivity equivalent to pre-development levels;
r) biodiversity;
s) integration and interconnectivity to the surrounding landscapes;
t) integrating surface and near-surface drainage within the development area;
u) incorporating into project planning and development;
v) resemblance to the pre-disturbed landscape;
w) 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
x) 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 OPTI/Nexen's existing or proposed environment, health and safety management system and discuss how it will be integrated into Phase 2, addressing the following:

a) plans for monitoring air emissions, wastewater releases, and waste tracking for Phase 2 and associated facilities;
b) the key elements of the operating plans and performance standards to be developed prior to the commissioning of the plant, 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;
c) plans to minimize the production or release into the environment of substances that may have an adverse effect, including the modification of existing plans;
d) proposed monitoring, including:
    i. monitoring done independently by OPTI/Nexen,
    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 Phase 2;
e) 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; and
f) a fire control plan highlighting:
    i. measures taken to ensure continued access for fire fighters to adjacent wildland areas,
    ii. forest fire prevention measures, and
    iii. using the "FireSmart" Wildfire Assessment System to assess areas adjacent to proposed facilities and identify mitigative measures;
g) describe OPTI/Nexen's participation in the Cumulative Environmental Management Association (CEMA), Wood Buffalo Environmental Association (WBEA), Regional Aquatic Monitoring Program (RAMP), and the mechanisms to incorporate the outputs from these and other relevant regional initiatives into management practices; and
h) 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 OPTI/Nexen will prevent the establishment and control the spread of restricted and noxious weeds (as listed in the *Alberta Weed Control Ac*t) within Phase 2 Area.

3.9 Participation in Cooperative Efforts

Demonstrate and document OPTI/Nexen's involvement in regional co-operative efforts to address environmental and socio-economic issues associated with oil and gas development during the life of Phase 2. Include initiatives such as:

a) Regional Infrastructure Working Group (RIWG);
b) CEMA;
c) WBEA;
d) RAMP; and
e) potential co-operative ventures that OPTI/Nexen is participating in with oil and gas and resource users (e.g., minerals and forestry)

4.0 ENVIRONMENTAL ASSESSMENT

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 Phase 2; and
c) a Cumulative Effects Assessment (CEA) Case, which includes past studies, existing and anticipated future environmental conditions, existing and approved projects or activities, plus other planned projects.

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 prior to the issuance of the terms of reference or up to six months prior to the submission of Phase 2 Application and EIA report, whichever is submitted sooner.

4.1 Study Areas

The EIA Study Area shall include the PDA 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 the Regional and the Local Study Area.

Illustrate boundaries and identify the 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.

4.2 Information Requirements for the Environmental Assessment

The EIA report will include the following environmental information for the three assessment scenarios:

a) from a broad-based examination of all ecosystem components including previous environmental baseline work, describe and rationalize the selection of environmental attributes, parameters, or properties examined;
b) for each selected environmental attribute, parameter, or property:
    i. describe existing conditions. Comment on whether the available data are sufficient to assess impacts and mitigative measures. Identify environmental disturbance from previous, current and approved 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,

iii. present plans to minimize, mitigate, or eliminate negative effects and impacts. Discuss the key elements of such plans,
iv. present a plan to manage environmental changes and identify any follow-up programs necessary to verify the accuracy of the environmental assessment and to determine the effectiveness of measures taken to mitigate adverse environmental effects, and
v. identify residual impacts and comment on their significance;

c) discuss the sources of information used in the assessment including a summary of previously conducted environmental assessments related to OPTI/Nexen's operations:
   i. information sources will include literature and previous EIA reports and environmental studies, operating experience from current oil sands operations, industry study groups, traditional knowledge and government sources, and
   ii. 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 EIA report;
d) identify where deficiencies in information exist and describe OPTI/Nexen's plan, including rationale, for providing the necessary information. Where required, undertake studies and investigations to obtain additional information to address the information deficiencies;
e) 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. Impact significance will be quantified where possible and assessed including consideration of spatial, temporal and cumulative aspects; and
f) if applicable, present a plan that addresses the adverse impacts associated with Phase 2 that may require joint resolution by government, industry and the community. Describe how this plan will be implemented and how it will incorporate the participation of government, industry and the community.

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) including sources of error and relative accuracy.

4.4 Cumulative Environmental Effects Assessment

Assessment of cumulative effects will be an integral component of the EIA report. OPTI/Nexen will conduct a cumulative environmental effects assessment of Phase 2 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 Phase 2 will:

a) define the spatial and temporal Study Area boundaries with due consideration for RSDS recommendations, 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) and the activities that have created the current conditions;
c) assess the incremental consequences that are likely to result from Phase 2 in combination with other existing, approved and planned projects in the region;
d) demonstrate that relevant information or data used from previous oil sands and other development projects is appropriate for use in this EIA report;
e) consider and describe deficiencies or limitations in the existing database for relevant components of the environment; and

f) 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.

4.5 Climate, Air Quality and Noise

4.5.1 Collection of 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 OPTI/Nexen's participation in any regional forums.

4.5.2 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, worst case and upset conditions;
b) the selection criteria used to determine the Study Areas, including information sources and assessment methods;
c) 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) complete the air dispersion modelling 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/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 CEMA 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
h) compare predicted air quality concentrations with the appropriate air quality guidelines available.

4.5.3 Impact Assessment

Identify, describe and discuss the following:

a) the appropriate air quality parameters including, but not limited to, SO_2, H_2S, Total Reduced Sulphur Compounds (TRS), total hydrocarbons (THC), NO_x, VOC, individual hydrocarbons of concern in the THC and VOC mixtures, particulates matter (PM_{10} and $PM_{2.5}$), ozone (O_3), 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, 99.9^{th} percentile for hourly predictions and 98^{th} percentile for 24-hour $PM_{2.5}$ predictions;
c) the formation of secondary pollutants such as ground-level O_3, 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 and visibility) resulting from Phase 2 and discuss any implications of the expected air quality for environmental protection and public health;
f) air quality impacts resulting from Phase 2, and their implications for other environmental resources, including habitat diversity and quantity, vegetation resources, water quality and soil conservation;
g) the cumulative effects on the air quality of the Study Areas and include any related emission increases from adjacent operations and publicly disclosed projects in the area;
h) the use of alternative fuels on the air quality in the Study Areas, if applicable;
i) how air quality impacts resulting from Phase 2 will be mitigated;
j) ambient air quality monitoring that will be conducted during construction and operation of Phase 2;
k) components of Phase 2 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, Noise Control Directive, include the following:
    i. potentially-affected people and wildlife,
    ii. an estimate of the noise resulting from the development,
    iii. the implications of any increased noise levels, and
    iv. proposed mitigation measures;
m) discuss interactive effects that may occur as a result of co-exposure of a receptor to all emissions and discuss limitations in the present understanding of this subject; and
n) describe air quality impacts resulting from Phase 2 and their implications for other environmental resources, including habitat diversity and quantity, vegetation resources, water quality and soil conservation.

4.5.4 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 Phase 2 that are sensitive to changes or variability in climate parameters. Discuss what impacts the change to climate parameters may have on elements of Phase 2 that are sensitive to climate parameters; and
c) comment on the adaptability of Phase 2 in the event the region's climate changes. Discuss any follow-up programs and adaptive management considerations.

4.6 Land Use, Access to Public Lands and Aggregate Resource Conservation

4.6.1 Collection of Baseline Information

Provide the following:

a) the existing recreational, commercial, residential, institutional, industrial and traditional land uses, in the Local and Regional Study Areas;
b) an identification of unique sites or special features in the Study Areas, such as Natural Areas or Environmentally Significant Areas. Discuss any impacts of Phase 2 on these features. Indicate the location and values of other protected areas, if present; and
c) discuss the quantity and quality of aggregate resources in the Study Areas.

4.6.2 Methodology

Provide the following:

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) discuss the implications of those land and resource use policies for Phase 2, including any constraints to development; and
d) outline the process for addressing the needs of other users in the Local Study Area.

4.6.3 Impact Assessment

Discuss the following:

a) the potential impact of Phase 2 on the identified land uses;
b) describe the impact of development and reclamation on commercial forest harvesting in the Phase 2 Area. Include opportunities for timber salvage, re-vegetation, reforestation and harvest for the reduction of fire hazard;
c) describe the impact of the development on aggregate resources in the Study Area; and
d) discuss the implications of Phase 2 for regional recreation activities, public access and other land uses during and after the development activities. Identify anticipated impacts on public access for land use in the region.

4.6.4 Mitigation

Discuss the following:

a) identify measures to mitigate the potential land use impacts resulting from Phase 2; and
b) mitigative measures to conserve aggregate resources.

4.7 Terrestrial and Aquatic Ecosystems

Describe ecosystem characteristics in the Study Areas. Explain the significance of any anticipated environmental changes for ecosystem integrity. Include the sustainability of biodiversity, critical wildlife sites and fisheries habitat, wildlife corridors, habitat quality, and productivity and potential changes to fish and wildlife populations. Discuss the existing use of plants and animals in traditional lifestyles, recreational pursuits and industrial activities and, if appropriate, provide the locations of these sites.

4.7.1 Biodiversity

Using the definition for biodiversity provided in the Canadian Biodiversity Strategy (1995), determine and describe the metrics that will be used to assess biodiversity in terrestrial and aquatic ecosystems in order to characterize the existing ecosystems and probable effects of project development.

4.7.1.1 Collection of Baseline Information

Provide the following:

a) within selected taxonomic groups, discuss the regional presence and abundance of species in each ecosite phase or ecological type; and
b) species lists and summaries of observed and estimated species richness and evenness.

4.7.1.2 Methodology

Provide and discuss the following:

a) baseline information collected in each terrestrial and aquatic community, accompanied by sufficient plots in each ecosite phase to provide statistically sound data using a suitable proportional sampling method;
b) the selection process and rationale used to select biotic and abiotic biodiversity indicators;

c) the rank of each ecological unit for biodiversity potential by combining measures of species richness, overlap in species lists, importance of individual species or associations, uniqueness and other appropriate measures. Describe the techniques used in the ranking process; and
d) the techniques used in the fragmentation analysis.

4.7.1.3 Impact Assessment

Discuss the following:

a) the contribution of Phase 2 to any anticipated changes in regional biodiversity;
b) the implications of Phase 2's incremental contribution to habitat fragmentation on biodiversity with regard to regional levels of habitat fragmentation; and
c) the comparison of pre- and post-topography, soil and parent material conditions and their contribution to biodiversity.

4.7.1.4 Mitigation

Identify and discuss possible measures to minimize any change in regional biodiversity.

4.7.2 Geology, Soils, Terrain

4.7.2.1 Collection of Baseline Information

Provide the following:

a) describe the bedrock and surficial geology, soils and terrain in the Study Areas. Where appropriate, use maps of suitable scale, cross-sections and figures to illustrate these features;
b) describe the overburden geology and mineralogy; and
c) describe and map the soil types and their distribution in the Local Study Areas. The soil survey maps should show approximate soil inspection and sampling locations corresponding to appropriate survey intensities in the Study Areas. The soil survey report should include necessary landscape and soil characteristics for land capability rating.

4.7.2.2 Methodology

Provide the following:

a) the selection criteria 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 modeled predictions of acid deposition patterns to assess the potential acidification impact on soils in the Local and Regional Study Areas;
c) the distribution of soil types in the proposed Project Areas using appropriate soil survey 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) describe the suitability and availability of soils within Phase 2 for reclamation using Soil Quality Criteria Relative to Disturbance and Reclamation (Alberta Agriculture, 1987);
e) provide an inventory of the pre- and post-disturbance land capability classes for soils in the Local Study Area by using the Land Capability Classification for Forest Ecosystems in the Oil Sands Region (Leskiw, 1998); and
f) 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) to include:
    i. SIL (survey Intensity Level) 1 for the development footprint areas;
    ii. SIL 2 for other areas in the Local Study Area including potential wellpad sites and future phases; and
    iii. appropriate level of detail to determine the effect of Phase 2 on soil types and quality, with some emphasis on potential acidification, on the Regional Study Area.

4.7.2.3 Impact Assessment & Mitigation

Discuss the following:

a) the significance of any changes for the regional landscape, biodiversity, productivity, ecological integrity, aesthetics and the future use of the regional landscape area;
b) the predicted cumulative impact of acidifying emissions to local and regional soils resulting from Phase 2, with reference to local studies, current guidelines and management objectives for acidifying emissions consistent with the latest acid deposition management framework;
c) the implications of environmental effects on ecosystem sustainability and regional management, including:
    i. any constraints or limitations to achieving vegetation restoration based on anticipated soil conditions,
    ii. an assessment of soil types for reclamation suitability and the approximate volume of suitable soil materials for reclamation,
    iii. the potential for soil erosion and measures to minimize the effects of any such erosion, and
    iv. any other issues that will affect the soil capability of the Study Areas or the reclaimed landscape and the mitigation measures proposed;
d) an estimate of the effects of surface disturbance on geological features and soils, including:
    i. the type and extent of changes to the pre-disturbance topography, and
    ii. an assessment and maps of the pre- and post-disturbance land capability and resiliency of the Phase 2 Area and a description of the impacts to land capability resulting from Phase 2;
e) the environmental effects of proposed drilling methods and summarize waste treatment methods consistent with EUB G50 guidelines, locations, area required and environmental impacts of drilling over the life of Phase 2;
f) the potential for casing failures, including assessment of impacts and possible remediation options. Identify measures to reduce the environmental risks from casing failures (e.g., monitoring); and
g) the potential for changes in the ground surface during operations (e.g., ground heave and ground subsidence). Summarize applicable experience with 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. Identify any activities that may cause soil contamination and describe mitigative actions.

4.7.3 Vegetation

4.7.3.1 Collection of Baseline Information

Identify and discuss the following:

a) ecosite phases based on their potential to support rare plant species, plants for traditional or medicinal purposes, old growth forests or other communities of limited distribution;
b) the relative abundance of species of rare plants and the ecosite phases where they are found, using reliable survey methods;
c) the distribution and relative abundance of peatlands and wetlands in the Local Study Area; and
d) the importance of peatlands and wetlands species, and landscape units for local and regional habitat, sustained forest growth, the hydrologic regime and water quality.

4.7.3.2 Methodology

Provide the following:

a) describe and map vegetation communities in the EIA Study Areas, using, as appropriate, the Alberta Vegetation Inventory (AVI) Standard AVI 2.1, *The Field Guide to Ecosites of Northern Alberta* (Beckingham and Archibald, 1996) and the Alberta Wetland Inventory Standards Manual (AWI) Version 1.0. Map the Phase 2 development footprint at a scale of 1:20,000;

b) the selection criteria used to determine the Study Areas, including information sources and assessment methods. Address the adequacy of these factors for a cumulative effects assessment; and
c) a description of how baseline information was collected to enable a detailed ecological land classification (ELC) of the Local Study Area to be completed.

4.7.3.3 Impact Assessment

Provide the following:

a) discuss any potential effects Phase 2 may have on rare plants 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;
b) 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 from both a local and regional perspective;
c) 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), and
    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;
d) predict the anticipated effect of Phase 2 on wetlands in conjunction with other project induced variations in hydrology;
    i. identify the amount of vegetation and wetlands to be disturbed during each stage of Phase 2; and
    ii. discuss the impact of any loss of peatlands or surface wetlands, as well as how this will affect land use, fragmentation and biodiversity;
e) determine the amount of commercial and non-commercial forest land base that will be disturbed by Phase 2. Compare the pre-disturbance and reclaimed percentages and distribution of all forested communities in Phase 2 Area. Provide Timber Productivity Ratings for the Local Study Area lands, including identification of productive forested, nonproductive forested and non-forested lands;
f) determine how Phase 2 disturbance impacts Annual Allowable Cuts and quotas within the Timber Management Unit. Discuss opportunities to integrate this project with other resource development activities such as logging;
g) provide a timber harvest/salvage plan, and tracking mechanism to ensure the appropriate utilization of the timber volumes, by species to salvage per year, or periodically as Phase 2 progresses;
h) discuss the significance of the changes to vegetation for:
    i. the availability of plants for traditional and medicinal purposes,
    ii. ecosystem fragmentation, and
    iii. introduction of non-native plant species on native species composition and potential plant changes to communities; and
i) comment on the significance of the residual effects on vegetation resources, peatlands and wetlands, and their implications for other environmental resources.

4.7.3.4 Mitigation

Provide the following:

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 plant communities;

c) an identification of any setbacks proposed around environmentally sensitive areas such as surface waterbodies, riparian areas and peatlands/wetlands. Also discuss the measures and techniques that will be used to minimize the potential impacts on wetlands;
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.

4.7.4 Wildlife

4.7.4.1 Collection of Baseline Information

Identify and describe the following:

a) existing wildlife resources (amphibians, reptiles, birds and terrestrial and aquatic mammals), their use and potential use of habitats in the Study Areas; and
b) wildlife species composition, distribution, relative abundance, key habitat areas, seasonal movements and movement corridors, habitat requirements, and general life history for all 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 2000*, or update) and federal *Species at Risk Act* (endangered, threatened, and special concern species).

4.7.4.2 Methodology

Provide the following:

a) the selection criteria used to determine the Study Areas, including information sources and assessment methods;
b) key indicator species and provide 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 calibrated and validated by comparing model predictions with wildlife data from the Study Areas.

4.7.4.3 Impact Assessment

Discuss the following:

a) the potential impacts on wildlife populations, habitat use, habitat availability/quality and food supply during all phases of Phase 2. 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 Phase 2;
b) the spatial and temporal changes to habitat (type, quality, quantity, diversity and distribution) and to wildlife indicator species distribution, relative abundance, movements, habitat availability include:
    i. anticipated effects on wildlife as a result of changes to air, water, including both acute and chronic effects on animal health,
    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, and
    iii. anticipated effects of habitat fragmentation the implications to wildlife by mapping the changes anticipated by Phase 2 and other planned activities on a local and regional scale;
c) the potential to return the area to pre-disturbed wildlife habitat/population conditions; and
d) residual impacts to wildlife and wildlife habitat and discuss their significance in the context of local and regional wildlife populations.

4.7.4.4 Mitigation

Discuss the following:

a) a strategy and mitigation plan to minimize impacts on wildlife habitat and populations through the life of Phase 2 and to return productive wildlife habitat to the area, considering:
   i. habitat enhancement measures in adjacent undisturbed lands within the leases, and a schedule for the return of habitat capability to areas impacted by Phase 2;
   ii. consistency of the plan with applicable regional, provincial and federal wildlife habitat/population objectives and policies;
   iii. the need for access controls or other management strategies to protect wildlife during and after project operations;
   iv. monitoring programs to assess predicted wildlife impacts from Phase 2 and the effectiveness of mitigation strategies and habitat enhancement measures; and
   iv. detailed descriptions of habitats for species, including those designated provincially as "at risk" and "may be at risk" on the reclaimed landscape after project closure;
b) how OPTI/Nexen will use setbacks to ensure the protection and maintenance of riparian habitats, interconnectivity of such habitat and the unimpeded movement by wildlife species using the habitat; and
c) the measures that will be taken to prevent habituation of wildlife and increasing the potential for human-wildlife encounters and consequent destruction of wildlife (e.g., black bears), including any staff training program, garbage containment or regular follow-up.

4.7.5 Hydrogeology

4.7.5.1 Collection of Baseline Information

Provide the following:

a) a description of the geologic and hydrogeologic setting in Phase 2 and Study Areas from the ground surface down to and including oil producing zones and disposal zones;
b) descriptions of the lithology, stratigraphy, structural continuity, thickness, hydraulic properties and groundwater quality of the geologic units in Phase 2 and Study Areas, including structure contour maps, geologic cross-sections and isopach maps of the major stratigraphic units;
c) descriptions of major aquifers, aquitards and aquicludes, their spatial distribution and groundwater flow directions and velocities; include Quaternary deposits and bedrock formations down to the Precambrian including the bitumen-producing zones and the disposal zones; include hydraulic head data, hydraulic gradient data and descriptions of the hydraulic connections between hydrostratigraphic units; include groundwater chemistry data such as baseline concentrations of major ions, metals (including arsenic) and hydrocarbon indicators;
d) include with c) maps and cross-sections that include the water table and piezometric/potentiometric surfaces based on identifiable groundwater systems and accurate data sources, such as monitoring wells;
e) describe known and potential recharge and discharge areas, areas of groundwater-surface water interaction and areas of Quaternary aquifer-bedrock groundwater interaction; discuss the recharge potential for Quaternary aquifers;
f) describe groundwater availability and use within the Study Areas, including a field –verified water well survey of users;
g) confirm the disposal zones currently used at the existing projects for deep disposal of wastes (e.g., lime sludges) and wastewater will be sufficient for the new Project. Provide descriptions of the disposal formations including containment, water quality, and the chemical compatibility with the wastewater;
h) documentation of any new hydrogeologic investigations, including methodology and results, undertaken since the OPTI/Nexen Long Lake (2000) EIA and any investigations undertaken as part of the current EIA study. For figures, maps, diagrams, interpretations and concepts

developed from previous work that are submitted in the EIA report, demonstrate how, or if, they have been modified by the incorporation of any subsequent new data; and

i) locations of major facilities associated with Phase 2 including facilities for wastewater treatment waste disposal; describe site-specific aquifer and shallow groundwater conditions beneath these proposed facilities.

4.7.5.2 Methodology

Provide the following:

a) the selection criteria used to determine the Study Areas, including information sources and assessment methods; and
b) 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.

4.7.5.3 Impact Assessment

Discuss the following:

a) the components and activities of Phase 2 which have the potential to affect groundwater resource quantity and quality with Phase 2 and Study Areas during project construction, operation and closure;
b) the suitability of on-site waste disposal and supporting geotechnical information;
c) the potential for hydraulic connection between geological zones affected by Phase 2 (e.g., disposal zones, bitumen-production zones, groundwater production zones) as well as the land surface;
d) the potential for changes in the groundwater regime and the effects of these changes, including:
    i. potential or expected changes in groundwater quality for any aquifer resulting from project operations,
    ii. the effects from Phase 2 and cumulative effects on local and regional groundwater regimes, including vertical gradients and aquifer recharge rates and changes resulting from any proposed diversions,
    iii. potential conflicts with other groundwater users and proposed resolutions to these conflicts,
    iv. the potential impact of decreased recharge to aquifers under prolonged drought conditions and the potential impacts of groundwater withdrawal due to project activities under drought conditions, and
    v. the effect of groundwater withdrawal and its implications for other environmental resources, including habitat diversity and quantity, surface water quality and quantity, vegetation, wetlands and soil saturation.

4.7.5.4 Mitigation

Discuss the following:

a) a conceptual plan and implementation program for the protection of groundwater resources, including the following:
    i. the early detection of potential contamination and remediation planning. Surrogate parameters to be used as indicators of potential aquifer contamination could include, but not limited to, total phenols, dissolved organic carbon, total extractable hydrocarbons, chlorides, sulphides, benzene, toluene, ethylbenzene and xylenes (BTEX) and trace elements, including arsenic,
    ii. groundwater remediation options in the event that adverse effects on groundwater and/or groundwater users are detected, and
    iii. monitoring the sustainability of groundwater quantity and quality.

4.7.6 Hydrology

4.7.6.1 Collection of Baseline Information

Provide the following:

a) describe baseline hydrological conditions in the Study Areas;
b) available local and regional surface flow baseline data, including low, average and peak flows and seasonal variations for key creeks, river locations, and low, average and peak levels and seasonal variations for key lakes;
c) describe and map the drainage patterns in the Study Areas; and
d) provide a topographic map of the Local Study Area with an appropriate contour interval.

4.7.6.2 Impact Assessment

Describe the changes to groundwater and surface water movement as a result of Phase 2. Specifically:

a) describe 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;
b) assess the potential impact of any alterations in flow on the local and regional hydrology and identify all temporary and permanent alterations, channel realignments, or other disturbances;
c) discuss changes to watershed(s), including surface and near-surface drainage conditions, potential flow impediment, and potential changes in open-water surface areas caused by construction of access roads, drilling and well pads, and other facilities;
d) if any surface water withdrawals are considered, assess the potential impact of withdrawals including cumulative effects with respect to their magnitude, duration and frequency;
e) identify any users who have existing approvals, permits or licenses and discuss the impact on the users due to Phase 2. Identify any potential water use conflicts and potential solutions;
f) identify any potential erosion problems in the local creek channels due to existing or proposed project activities;
g) discuss changes in sediment concentrations in receiving waters caused by construction and describe mitigation measures to reduce sediment loadings;
h) identify and discuss any monitoring programs that may be considered to assess the impacts and significance of potential changes to surface water on aquatic resources, wildlife and vegetation;
i) discuss both the project and cumulative effect of the changes due to Phase 2 on hydrology (e.g., timing, volume, peak and minimum flow rates, river regime and lake levels), including the significance of effects for downstream watercourses;
j) discuss the potential for short and long term changes in the connection between surface water, groundwater, production zones and disposal zones as a result of Phase 2 activities;
k) describe water management plans, mitigation measures and monitoring programs, including participation in regional initiatives, for surface water recommended for the start-up, operations and reclamation phases; and
l) discuss related monitoring programs.

4.7.6.3 Mitigation

If potential impacts are predicted:

a) discuss how potential impacts of temporary and permanent roads and well pads on peatland/wetland types will be minimized and mitigated;
b) describe measures to reduce impacts to waterbodies and wetlands;
c) discuss remedial measures to alleviate any anticipated erosion; and
d) discuss participation in regional initiatives.

4.7.7 Surface Water Quality

4.7.7.1 Collection of Baseline Information

Provide the following:

a) a description of the baseline water quality of watercourses and waterbodies in the Study Areas; the description of water quality will consider all appropriate water quality parameters, their seasonal variations and relationships to flow and other controlling factors;
b) identify waterbodies that are sensitive to acid deposition; and
c) provide an inventory of all surface water users in the Study Areas.

4.7.7.2 Methodology

Provide the following:

a) the selection criteria used to determine the Study Areas, including information sources and assessment methods;
b) the current framework for the management of acid deposition; and
c) a comparison of existing and predicted water quality, using as appropriate, the *Surface Water Quality Guidelines for Use in Alberta*, the *Canadian Water Quality Guidelines* and relevant United States Environmental Protection Agency Guidelines. Consider the recommended procedures described in the document entitled: "*Protocol to Develop Alberta Water Quality Guidelines for Protection of Freshwater Aquatic Life*".

4.7.7.3 Impact Assessment

Discuss the following:

a) identify project activities that may affect surface water quality during all stages of Phase 2, including site preparation, construction, operation, decommissioning and reclamation;
b) describe the potential impacts of Phase 2 on surface water quality within the Study Areas;
c) discuss any changes in water quality resulting from Phase 2 and identify any parameters that are inconsistent with *Surface Water Quality Guidelines for Use in Alberta* (November 1999) or *Canadian Water Quality Guidelines;*
d) assess the potential project related and cumulative impacts of acid deposition on water quality;
e) discuss the significance of any impacts on water quality and implications to aquatic resources (e.g., biota, biodiversity and habitat);
f) discuss the effect of water quality in surface waterbodies due to the change in surface runoff or groundwater discharge;
g) 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;
h) the residual effects for each stage of Phase 2, including post-reclamation. Predict and describe water conditions and suitability for aquatic biota in constructed waterbodies; and
i) discuss related monitoring programs.

4.7.7.4 Mitigation

Discuss the following:

a) measures to reduce impacts to waterbodies and wetlands;
b) the proposed mitigation measures to be considered during the construction, operation and reclamation phases of Phase 2, to maintain surface water quality. For any monitoring implemented for Phase 2, 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) any cooperative monitoring and assessment initiative(s), such as with regional stakeholders, in which OPTI/Nexen may consider participating.

4.7.8 Aquatic Ecology

4.7.8.1 Collection of Baseline Information

Provide the following:

a) historical and current studies on fish and other aquatic resources in the Local Study Area.;
b) describe existing aquatic resources using recognized sampling protocols, e.g., fish and benthic invertebrates, their use and potential use of associated habitats in watercourses, wetlands and other waterbodies in the Study Areas;
c) describe sensitive species listed by Alberta Environment (at risk, may be at risk, and sensitive list species in the *General Status of Alberta Wild Species* 2000, or update) and federal *Species at Risk Act* (endangered, threatened, and special concern species);
d) describe and map, as appropriate, the fish habitat of the lakes, rivers and other waters likely to be affected by Phase 2:
    i. identify key indicator species,
    ii. identify critical or sensitive areas such as spawning, rearing, and over-wintering habitats;
e) discuss seasonal habitat use including migration and spawning routes; and
f) 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 Study Areas.

4.7.8.2 Methodology

Provide the following:

a) the selection criteria used to determine the Study Areas, including information sources and assessment methods;
b) current field data should be gathered using recognized sampling protocols; and
c) the criteria and selection process for key indicator species.

4.7.8.3 Impact Assessment

Discuss the following:

a) potential changes, including cumulative, to aquatic resources in the Study Areas;
b) potential cumulative effects of the project in combination with other developments in the area on fish and fish habitat resources;
c) aquatic biological resources in waterbodies affected by Phase 2, including composition, distribution, relative abundance, critical or sensitive seasonal habitat use and movement patterns;
d) discuss the life stages requirements for key species and what effects the project will potentially have on them;
e) nature of the potential effects, their duration; whether they are site-specific, local or regional in spatial extent;
f) implications of any construction, operation and reclamation activities in the Study Areas for aquatic biological resources and habitat. Clarify how stream alterations, changes to substrate conditions, stream flow conditions and water quality may affect these resources and habitat;
g) survival of eggs and fry, chronic or acute health effects, changes in the invertebrate community and food base; and increased stress on fish populations from release of contaminants, sedimentation, flow variations and habitat changes;
h) potential impacts on riparian areas in the Local Study Area that could affect aquatic biological resources and productivity;
i) potential for increased fishing pressure and the potential impacts that could result from increased use of the area and increased access in the area;
j) resource users potentially affected by changes to local or downstream water quality, or to aquatic or fisheries resources (e.g., recreational, First Nations, commercial fisheries);
k) how potential changes to groundwater and surface water quantities and quality due to project activities may affect fisheries and aquatic resources under normal and drought conditions;
l) residual impacts on aquatic resources and their significance in the context of local and regional aquatic resources, including fisheries; and

m) related monitoring programs, including programs to monitor and detect changes of fish habitat quality and quantity, and the effectiveness of mitigation strategies.

4.7.8.4 Mitigation

Discuss the following:

a) the implications of potential effects on fish productivity and the need for access controls or other management strategies to protect the resources. Discuss plans to offset any incremental loss in the productivity. Indicate how environmental protection and compensation plans for Phase 2, will address applicable provincial and federal policies for fish habitat including the "No Net Loss Principle";
b) if applicable, the mitigation measures and habitat enhancement techniques that will be implemented to prevent or minimize any anticipated adverse effects; and
c) environmental management procedures should monitoring indicate that mitigation strategies are not effective.

5.0 PUBLIC HEALTH AND SAFETY

Describe those aspects of Phase 2 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 Phase 2. Specifically:

a) identify and discuss the data and methods OPTI/Nexen used to assess impacts of Phase 2 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 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, air quality and soil quality taking into consideration all project activities;
f) 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;
g) 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;
h) 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;
i) identify and discuss the potential health and safety impacts due to higher regional traffic volumes and the increased risk of accidental leaks and spills;
j) document the health and safety concerns raised by stakeholders during consultation on Phase 2;
k) provide a summary of OPTI/Nexen's emergency response plan and discuss mitigation plans to ensure workforce and public safety during pre-construction, construction, operation and reclamation of Phase 2. 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;

l) describe how local residents will be contacted during an emergency and the type of information that will be communicated to them;
m) describe the existing agreements with area municipalities or industry groups such as safety cooperatives, emergency response associations and municipal emergency response agencies; and
n) 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 LAND USE

Provide details on the consultation undertaken with Aboriginal communities with respect to Traditional Ecological Knowledge (TEK) and traditional land use:

a) provide results of consultation with Aboriginal communities to identify the extent of traditional land use of the Local Study Area. Discuss the vegetation and wildlife used for nutritional and medicinal purposes, and any potential effects Phase 2 may have;
b) identify the traditional land uses including fishing, hunting, trapping and plant harvesting (nutritional and medicinal) and cultural use in the Study Area(s). Determine their extent and location, where possible. Identify cabin sites, spiritual sites and graves;
c) determine Phase 2 and cumulative impact of development on these uses and identify possible mitigation strategies; and
d) describe how TEK was incorporated into the technical components of the EIA report.

7.0 HISTORICAL RESOURCES

Provide details of the consultation with Alberta Community Development and Aboriginal communities with respect to Historical Resources. Include the Historical Resource Impact Assessment (HRIA) for Phase 2, and:

a) provide a general overview of the results of any previous historical resource studies that have been conducted in the Study Areas, including archaeological resources, palaeontological resources, historical period sites, and any other historical resources as defined within the *Historical Resources Act*;
b) summarize the results from the field program conducted to assess archaeological, palaeontological and historical significance of Phase 2;
c) document any stakeholder concerns with respect to the development of Phase 2 based on the historical significance of the Study Areas; and
d) as appropriate, provide an outline of the program and schedule of field investigations that may be required to further assess and mitigate the effects of Phase 2 on historical resources.

8.0 SOCIO-ECONOMIC FACTORS

8.1 Collection of Baseline Information

Provide the following information:

a) document the baseline (existing) socio-economic conditions and trends (e.g., changes in population and labor force) for the region and for the communities within the region; and
b) identify any concerns related to socio-economics that have been raised by the local municipality or any other stakeholder in the region.

8.2. Methodology

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

8.3 Impact Assessment

a) Discuss the socio-economic impacts of Phase 2, with the following:
   - i local employment opportunities,
   - ii local business opportunities,
   - iii stresses placed on public services and infrastructure,
   - iv housing and availability of affordable housing,
   - v effects on recreational activities,
   - vi effects on trapping, hunting and fishing,
   - vii effects on First Nations and Métis (e.g., traditional land use and culture),
   - viii effects on medical facilities and health services,
   - ix regional and provincial economic benefits, and
   - x traffic and traffic safety;

b) if a construction camp is needed during the construction phase, identify its location, the number of workers it is intended to house and outline what services will be provided in the camp (e.g., security, recreation and leisure, health);

c) describe the economic impacts of Phase 2 on the Study Areas and on Alberta, considering capital, labor and other operating costs and revenue from services;

d) discuss OPTI/Nexen's policies and programs respecting the use of local, Alberta and Canadian goods and services;

e) provide an estimated breakdown of Alberta, other Canadian and non- Canadian industrial benefits from project management and engineering; equipment and materials; construction labor and total overall project costs;

f) provide a description of the overall engineering and contracting plan for Phase 2;

g) provide a breakdown of the type of employment, number of employees and timing required for construction and operational activities. Take into consideration peak activity periods and the potential for overlap with other projects that are reasonably anticipated during the life of the project. Identify the source of labor for the proposed Project; and

h) evaluate the need for additional public services or infrastructure taking into consideration the potential for overlap with other projects that are reasonably anticipated during the life of Phase 2. This will include consideration of housing, transportation, education/training, health and social services, urban and regional recreation use, municipal infrastructure, medical facilities, health services, law enforcement and emergency preparedness.

8.4 Mitigation

Discuss the following information:

a) outline current and ongoing plans to work with Aboriginal and other local residents and businesses with regards to employment, training needs, and other economic development opportunities arising from the construction and operation activities of Phase 2; and

b) provide an analysis of the significance of socio-economic impacts, discuss strategies to mitigate the socio-economic impacts and document any steps that have been undertaken by industry, governments and others to address socio-economic concerns.

9.0 PUBLIC CONSULTATION REQUIREMENTS

Document the public consultation program implemented for Phase 2 including methods, the type of information provided, the level and nature of OPTI/Nexen's response, and provide following:

a) describe the consultative process and show how public input was obtained and addressed;

b) document individual participation and attendance at each meeting and record specific comments or issues raised by individuals present at the meetings;

c) describe and document the concerns, issues, and opportunities raised by the public, OPTI/Nexen's analysis of those concerns and issues, and the actions taken to address those concerns and issues;
d) describe how resolution of the concerns and issues was incorporated into Phase 2 development, impact mitigation and proposed monitoring; and
e) describe 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 Phase 2.

The EIA report will document the public consultation process, record any concerns or suggestions made by the public and will demonstrate how these concerns have been addressed. Consultation will include discussions with:

f) Alberta provincial representatives,
g) Saskatchewan provincial representatives,
h) Federal government representatives,
i) Regional Municipality of Wood Buffalo representatives (including elected officials and residents) and others as identified during the consultative process,
j) First Nations and Métis organizations,
k) commercial, industrial, recreational and traditional users, and
l) 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 ground-level concentration locations of nitrogen dioxide (NO_2) and SO_2 near 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.

RECLAMATION PLAN

The reclamation plan in the Application will address the following:

a) provide a soil conservation and reclamation plan for progressive reclamation in Phase 2 Areas. Outline the anticipated major timelines for reclamation activities with reference to the life span of the proposed Project;
b) 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;
c) provide details on area of soil replacement indicating techniques, timing, depth, volume and type of reclamation material;
d) discuss the potential to retain coarse woody debris for use in reclamation and to reduce the need for slash burning after clearing;
e) 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;
f) discuss the methods that may be used to deal with potential soil compaction and contamination problems in Phase 2 Areas;
g) identify the location and distribution of post-disturbance land capability on a map;
h) compare the pre-disturbance and post reclamation percentages and distribution of all forested communities in the Local Study Area;
i) provide a timber salvage plan, highlighting end users and identifying proposed volumes for removal by species and year for Phase 2. 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;
j) 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 OPTI/Nexen will prevent the establishment and control the spread of restricted and noxious weeds (as listed in the *Alberta Weed Control Act*) within the PDA;
k) provide appropriately scaled maps of the area highlighting (where possible) the preceding points; and
l) provide an updated and detailed monitoring plan (including soils, vegetation, wildlife and aquatic resources) with schedules and methodologies to measure and evaluate reclamation performance and success.

WATER SUPPLY, WATER MANAGEMENT AND WASTEWATER MANAGEMENT

Provide the following information:

a) how the water requirements for Phase 2 will be met, including annual volumes from each source (for non-saline groundwater sources, follow Alberta Environment's *Groundwater Evaluation Guideline*);
b) the design details of facilities that will handle, treat and store wastewater streams and runoff and include appropriate annual volumes;
c) the type and quantity of any chemicals used in water/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.

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.