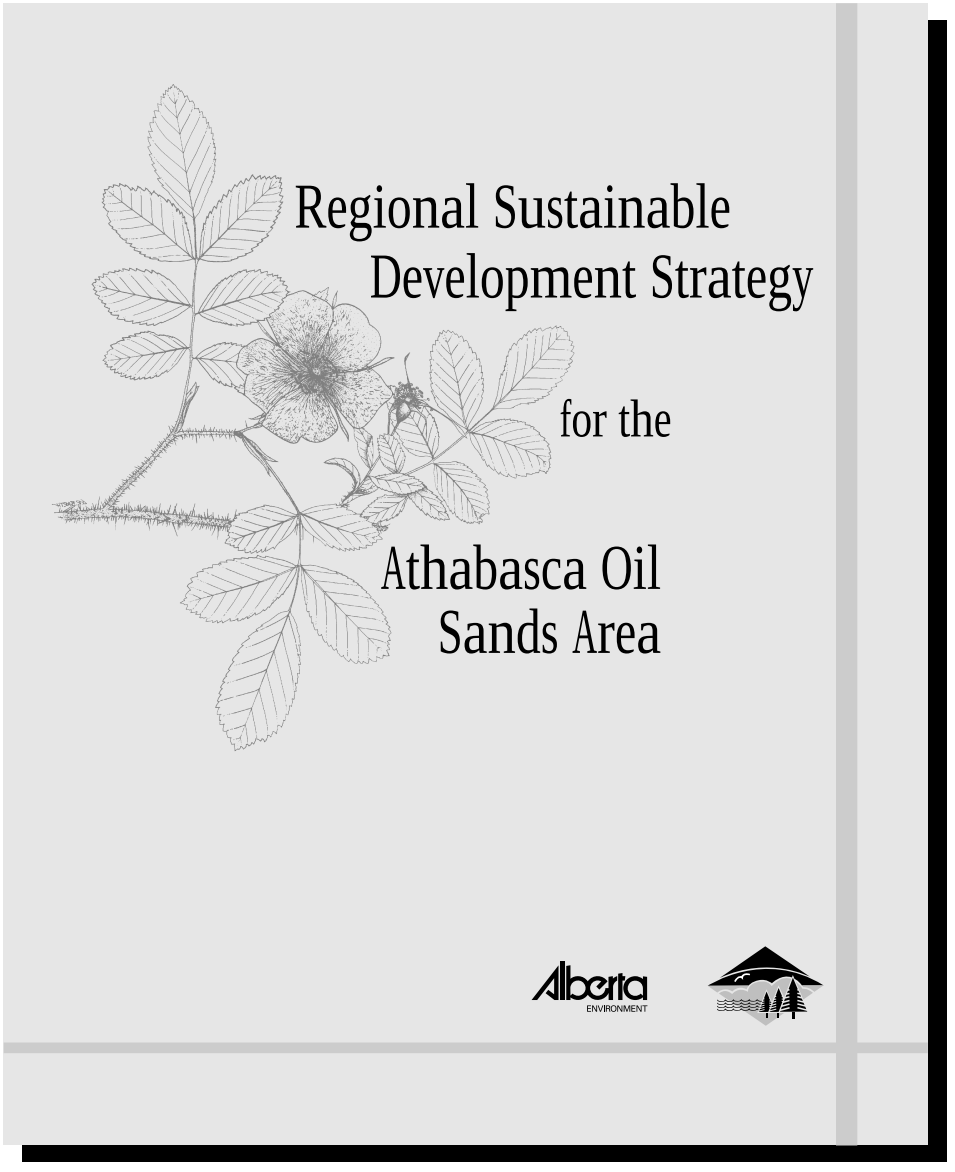
Technical Support Document

for the



Alberta
ENVIRONMENT

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EXECUTIVE SUMMARY

Alberta's environmental and natural resource management systems are designed to make sure the environmental impact of development is minimised, and the air, land, surface water and drinkable groundwater all meet provincial guidelines. In addition, they are used to ensure disturbed areas are properly reclaimed, renewable resources regenerate successfully, wildlife populations are sustained and wilderness is conserved.

Alberta's current system is very effective and highly regarded — the standards set in Alberta meet or exceed most national and North American standards. The unprecedented pace of development in the Athabasca Oil Sands area, however, presents new challenges for the environmental and resource management systems of governments and industry. These include overlapping needs for access to public land, competition for renewable public resources such as forests, wildlife and water, and increased potential for effects on environmental quality, species diversity and abundance, and human health.
In September of 1998, in anticipation of further oil sands resource development in Northern Alberta, Alberta Environment (AENV) committed to leading the creation of the Regional Sustainable Development Strategy (RSDS) for the Athabasca Oil Sands area. The development was led by the Northeast Boreal Region of AENV with a strong partnership involving regional stakeholders and regulators. The partners include First Nations and Aboriginal Communities, industry, environmental interest groups and government agencies (provincial [Alberta and Saskatchewan], municipal and federal).

The RSDS builds on Alberta's current environmental and resource management system by creating the framework for the following:

- Providing support for continued economic development in the region that addresses environmental needs and resource sustainability.
- Creating an enhanced management framework that will adapt to the changing needs of the area which will guide government's environmental and resource managers.
- Developing a strong foundation of environmental information and science to assist in making decisions on sustainable resource and environmental management in the region.
- Creating a way to identify priority regional environmental issues, and to organize the science and monitoring work needed to understand these issues.

An inventory of environmental and resource management systems, the identification and analysis of issues, and the drafting of the RSDS were completed on July 30, 1999. The 72 issues addressed by the RSDS were identified from project-specific environmental impact assessments in the region, the Athabasca Oil Sands Cumulative Effects Assessment Framework Report 1, and from issues raised during Alberta Energy and Utilities Board (EUB) hearings on oil sands mines and in situ bitumen production projects. The issues were grouped according to similarities in their information gaps, and a list of 14 themes was created. Blueprints for action were then developed to resolve the issues within these theme groups. The groups were separated into the following three categories:

Category A (based on information gaps/urgency) — sustainable ecosystems; cumulative impacts on wildlife; soil and plant species diversity; effects of air emissions on human health, wildlife and vegetation; and bioaccumulation of heavy metals.

[1] *Athabasca Oil Sands Cumulative Effects Assessment Framework Report* Prepared for the Cumulative Environmental Effects Management Initiative; February 1999. Golder Associates Ltd.

Category B (based on information gaps and work underway) — access management; cumulative impacts on fish habitat and populations; effects of tailings pond emissions; effects of acid deposition on sensitive receptors; and impacts on surface water quality.

Category C (based on information gaps, work underway, and lower level of urgency) — end pit lake water quality; impacts on surface water quantity; and impacts on groundwater quantity and quality.

It is recognized and acknowledged that the issues of tomorrow may be different from those of today. RSDS provides a framework and a process to review and adapt environmental and resource management in a continuous learning format, and to improve and respond quickly to changing circumstances.

APPENDIX 1

APPENDIX 1. ACRONYMS RELEVANT TO THE ATHABASCA OIL SANDS REGION

AAAQG	Alberta Ambient Air Quality Guidelines
AAM	Ambient Air Monitoring (run by WBEA)
AAWQG	Alberta Ambient Surface Water Quality Guidelines
ACD	Alberta Community Development
ACFN	Athabasca Chipewyan First Nation
ACRAH	Alberta Council for Research on Air and Health
ADRP	Acid Deposition Research Program
AENV	Alberta Environment
AEP	Alberta Environmental Protection (former name of AENV)
AES	Atmospheric and Environmental Service (Environment Canada)
AFBMP	Alberta Forest Biodiversity Monitoring Program
AFRAC	Alberta Forest Research Advisory Council
AFRD	Agriculture, Food and Rural Development
ALPAC	Alberta-Pacific Forest Industries Inc.
AOSCEHEAP	Alberta Oil Sands Community Exposure and Health Effects Assessment Program
AOSDFC	Athabasca Oil Sands Development Facilitation Committee
AOSERP	Alberta Oil Sands Environmental Research Program
AOSTRA	Alberta Oil Sands Technology and Research Authority
ARC	Alberta Research Council
ARET	Accelerated Reduction / Elimination of Toxics
ARNEWS	Acid Rain Network Early Warning System (CFS program)
ARUG	Air Research Users Group (AENV internal group)
ATC/IWG	Athabasca Tribal Council/Industry Working Group
ATRL	Alberta Tourism Recreational Leasing
AVI	Alberta Vegetation Inventory
BACT	Best Available Control Technology
BADT	Best Available Demonstrated Technology
BCC	Boreal Caribou Committee
BCRP	Boreal Caribou Research Program
BHP	Broken Hill Property Ltd.
BOD	Biochemical oxygen demand
BSOD	Biodiversity/Species Observation Database
CANMET	Canada Centre for Mineral and Energy Technology
CAPP	Canadian Association of Petroleum Producers
CASA	Clean Air Strategic Alliance
CCFM	Canadian Council of Forest Ministers
CCIW	Canada Centre for Inland Waters
CCME	Canadian Council of Ministers of the Environment
CDA	Canadian Dam Association
CEA	Cumulative Effects Assessment
CEAA	Canadian Environmental Assessment Act (or Agency)
CEATAG	CONRAD Environmental Aquatics Technical Advisory Group
CEC	Cation exchange capacity (for soil)
CEEM	Cumulative Environmental Effects Management (see CEEMP)
CEEMI	Cumulative Environmental Effects Management Initiative (former name of CEEMP)
CEEMP	Cumulative Environmental Effects Management Partnership
CEMS	Continuous Emission Monitoring System
CEPA	Canadian Environmental Protection Act

CFS	Canadian Forest Service
CMDRC	Crown Mineral Disposition Review Committee
C&R	Conservation and Reclamation
CO_2	Carbon dioxide
CONRAD	Canadian Oil Sands Network for Research and Development
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRR	Conservation and Reclamation Regulation
CS_2	Carbon disulphide
CSA	Canadian Standards Association
CSR	Comprehensive Study Report (Environment Canada)
CT	Consolidated tailings
CWQG	Canadian Water Quality Guidelines
CWRC	CANMET Western Research Centre
CWS	Canadian Wildlife Service (Environment Canada)
CWS	Canada-Wide Standards
DBH	Diameter at breast height (for trees)
DFO	Department of Fisheries and Oceans
DIAND	Department of Indian Affairs and Northern Development
EEM	Environmental Effects Monitoring (now TEEM)
EIA	Environmental Impact Assessment
ELU	End land use
ELUC	End Land Use Committee (now RAC)
EMAN	Ecological Monitoring and Assessment Network (Canadian)
EMAP	Ecological Monitoring and Assessment Program (USEPA)
ENGO	Environmental non-governmental organisation
EPEA	Alberta Environmental Protection and Enhancement Act
EPL	End pit lake
ES	Environmental Service (AENV)
ESTAC	Environmental Science and Technology Alliance Canada
ERC	Environmental Resource Committee
ERCB	Energy Resources Conservation Board (Former name of EUB)
EUB	Alberta Energy and Utilities Board
F&W	Fish and wildlife
FCSA	Fish Conservation Strategy for Alberta
FGD	Flue gas desulphurisation
FHPG	Fish Habitat Protection Guideline
FMA	Forest Management Agreement
FMAOSSIRP	Fort McMurray Athabasca Oil Sands Subregional Integrated Resource Plan
GHG	Greenhouse gases
H_2S	Hydrogen sulphide
HSI	Habitat suitability index
IAM	Integrated Assessment Model (used by NWRI)
IMS	Integrate Management Strategy
INAC	Indian and Northern Affairs Canada
IRC	Industry Relations Corporation (Fort McKay)
IRM	Integrated Resource Management
IRP	Integrated Resource Plan (see FMAOSSIRP)
KIR	Key Indicator Resource
LAD	Land Administration Division
LCCS	Land Capability Classification System
LFS	Land and Forest Service (AENV)
LOC	License of Occupation
LRTAP	Long-Range Transport of Air Pollutants

LSA	Local study area
MFT	Mature fine tails
MLUEP	Mildred Lake Upgrader Expansion Project
MOU	Memorandum of Understanding
MRC	Medical Research Council of Canada
MSL	Miscellaneous surface lease
NAPL	Not aqueous phase liquids
NAWAMP	North American Waterfowl Management Plan
NCE	Networks of Centres of Excellence
NCUT	National Centre for Upgrading Technology
NEB	Northeast Boreal (Region)
NERSC	Northeast Region Standing Committee on Woodland Caribou (now BCC)
NGO	Non-governmental organisation
NHRI	National Hydrology Research Institute
NLRHA	Northern Lights Regional Health Authority
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NREI	Northern River Ecosystem Initiative
NRBS	Northern River Basins Study
NRCan	Natural Resources Canada
NRCB	Natural Resources Conservation Board
NRS	Natural Resources Service (AENV)
NSERC	Natural Sciences and Engineering Research Council of Canada
NSMWG	NO_x/SO_2 Management Working Group
NTFOSS	National Task Force on Oil Sands Strategy
NWRI	National Water Research Institute
NWRSCC	Northwest Regional Standing Committee on Woodland Caribou (now BCC)
O.C.	Order in Council
OERD	Office of Energy Research and Development
OMWG	Ozone Modelling Working Group
OSC	Oil sands companies
OSCA	Oil Sands Conservation Act
OSEC	Oil Sands Environmental Coalition
OSMA	Oil Sands Monitoring Audit
OSVRC	Oil Sands Vegetation Reclamation Committee
OWG	Ozone Working Group (or OMWG)
PAC	Polyaromatic compound
PAD	Peace-Athabasca Delta
PAH	Polycyclic aromatic hydrocarbon
PAI	Potential acid input
PCOG	Petro-Canada Oil and Gas
PERD	Program of Energy Research and Development (funding by NRCan)
PIAD	Pembina Institute for Appropriate Development
PLA	Public Lands Act
PM	Particulate matter
$PM_{2.5}$	Particulate matter less than 2.5 μm in diameter
PM_{10}	Particulate matter less than 10 μm in diameter
PNG	Petroleum and natural gas
PNT	Protective Notation
PSP	Permanent Study Plots
PTAC	Petroleum Technology Alliance of Canada
RAC	Reclamation Advisory Committee

RAMP	Regional Aquatics Monitoring Program
RAQCC	Regional Air Quality Co-ordinating Committee (now WBEA)
RAPIDS	Regional Air Pollutant Inventory Development System
RBD	Regional Board of Directors (RBD)
RFP	Request for proposal
RIWG	Regional Infrastructure Working Group
RMA	Resource management area
RMWB	Regional Municipality of Wood Buffalo
RRRUG	Reclamation and Rehabilitation Research Users Group (AENV internal group)
RSA	Regional study area
RSDS	Regional Sustainable Development Strategy
SAB	Science Advisory Board (for TEEM)
SAGD	Steam-assisted gravity drainage
SCL	Syncrude Canada Limited
SERM	Saskatchewan Environment and Resource Management
SFM	Sustainable Forest Management
SFMN	Sustainable Forest Management Network
SFRN	Syncrude Forest Reclamation Network
SO_2	Sulphur dioxide
SSHRC	Social Sciences and Humanities Research Council of Canada
SWB-EEM	Southern Wood Buffalo – Environmental Effects Monitoring (now TEEM)
SWBZ	Southern Wood Buffalo Zone (within CASA)
TCLP	Toxicity Characteristic Leaching Procedure
TEEM	Terrestrial Environmental Effects Monitoring (run by WBEA)
TERRE	Terrestrial Reclamation Research on Challenging Materials
TFT	Thin fine tails
THC	Total hydrocarbon
TLS	Target Loading Subgroup
ToC	Table of contents
ToR	Terms of reference
TPG	Technical Planning Group (CONRAD)
TROLS	Terrestrial, Riparian Organisms, Lakes and Streams
TSP	Total suspended particulates
TRS	Total reduced sulphur
TSRU	Tailings solvent recovery unit
UAM	Urban Airshed Model
USEPA	United States Environmental Protection Agency
VCR	Voluntary Challenge and Registry Program
VOC	Volatile organic compound
WBEA	Wood Buffalo Environmental Association (formerly RAQCC)
WEPA	Western Economic Partnership Agreement
WHO	World Health Organization
WMU	Wildlife Management Unit
WRA	Water Resources Act
WRUG	Water Research Users Group (AENV internal group)
WSC	Water Survey of Canada (Environment Canada)
WWG	Wetlands Working Group

APPENDIX 2

APPENDIX 2A. ENVIRONMENTAL LEGISLATION AND REGULATIONS IN THE ATHABASCA OIL SANDS AREA

Federal, provincial and municipal governments each have a role in the sustainable development of natural resources. In some instances, federal and provincial legislation may overlap to a degree. The federal, provincial and municipal regulatory tools that are relevant to resource development and environmental protection are:

- Legislation – provincial and federal acts, regulations and codes of practice
- Agreements – between levels of government and also between departments within one level.
- Policies – written statements of government/departmental intent regarding an issue.
- Plans – a broad range of plans with varying degrees of approval and authority.
- Guidelines – documents that set out operational or procedural guidelines.
- Information Letters – letters clarifying procedures, guidelines, policies, revenue values, etc., that are formally designated as Information Letters.

FEDERAL LEGISLATION

The federal legislation most applicable to environmental protection and resource development in the Athabasca Oil Sands Area is outlined below:

Migratory Birds Convention Act — Protection of migratory birds and nests.

Fisheries Act — regulates all waters in the fishing zones of Canada, all waters in the territorial seas of Canada and all internal waters of Canada. Any proposed development that will potentially affect these waterbodies requires a separate approval from the federal government.

Navigable Waters Protection Act — protects any body of water created or altered as a result of the construction of any work.

Canadian Environmental Assessment Act (CEAA) — establishes a federal environmental assessment process. The CEAA's goal is to achieve sustainable development by conserving and enhancing environmental quality, and by encouraging and promoting economic development that conserves and enhances environmental quality.

Canadian Environmental Protection Act (CEPA) — protects the environment and the health of Canadians from toxic substances and other pollutants.

PROVINCIAL LEGISLATION

Alberta Environment is responsible for the protection of the province's air, land and water, and for the management and conservation of renewable resources such as forests, fish and wildlife. The provincial legislation and other tools most applicable to sustainable development in the Athabasca Oil Sands region are briefly described below.

Environmental Protection and Enhancement Act (EPEA) — provides for the protection of the environment through seven core strategies:

1. Project Assessment/Evaluation – used to assess a project to determine the potential environmental, social, economic and cultural consequences of a proposed activity, and for assessment of plans to mitigate any resulting adverse impacts.
2. Approvals – an approval under *EPEA* addresses reclamation, water releases, air emissions, waste disposal, and impacts on ambient air, water, land, fish, wildlife and vegetation.

3. Monitoring – within the approval, AENV sets out requirements for monitoring and reporting of potential effects and environmental impacts.
4. Enforcement – AENV conducts regular inspections of development activities, and investigates complaints received from the public or other departments. Based on the results, AENV may take enforcement action to prevent or minimise environmental degradation.
5. Pollution prevention – Approaches that anticipate and prevent creation of pollutants and waste are promoted, rather than waiting until these concerns are evident and then treating the substances or conducting costly clean-up programs to mitigate the damage.
6. Standards, objectives, and guidelines – Acceptable levels of protection are established for air, land and water resources.
7. Decommissioning and reclamation – *EPEA* promotes the concept of return of equivalent land capability, which is the ability of the reclaimed landscape to support various appropriate land uses such as agriculture, forestry, wildlife, fisheries and recreation.

Water Act — provides for the management, protection and allocation of water, and regulates all activities that affect watercourses or waterbodies.

Wildlife Act — provides for management of Alberta's wildlife resources, primarily by regulating consumptive uses (e.g., hunting and trapping).

Public Lands Act — authorises the allocation of public land through mechanisms such as licences, permits and leases. It also provides for management of forest land-use activities such as recreation areas, trails and land use zones.

Forests Act — provides for the management of Alberta's forest resources, including their conservation and use. It also requires acceptable regeneration of forested lands following industrial disturbance.

Forest and Prairie Protection Act — authorises the Minister to make regulations to provide for the management of activities in forested areas, and to set standards for debris disposal, pollution, soil erosion, the control of wildfire, controlled use of fire, and control of pest infestation of forest trees.

Fisheries Act — federal statute that requires conservation and protection of fish and fish habitat (see description under federal legislation).

Public Health Act — requires that no person shall create, commit or maintain any nuisance (a condition that is or might become injurious or dangerous to the public health or that might hinder in any manner the prevention or suppression of disease).

Historical Resources Act — requires a proponent to assess whether the project will result in the alteration, damage or destruction of historic resources, and can require that action be taken to protect any historic resources.

Energy Resources Conservation Act — provides for the appraisal of the reserves and productive capacity of energy resources and energy in Alberta, and appraising the requirements for energy resources and energy both within and outside Alberta.

Oil and Gas Conservation Act — covers the conservation of, and the prevention of waste from, the oil and gas resources of Alberta. It also requires safe and efficient practices to be followed in operations for the production of oil and gas, as well as locating, spacing, drilling, equipping, completing, reworking, testing, operating and abandoning wells.

Natural Resources Conservation Act — provides for an impartial process to review projects that will or may affect the natural resources of Alberta, in order to determine whether, in the NRCB's opinion, the projects are in the public interest with regard to the social and economic effects of the projects and the effects of the projects on the environment.

ALBERTA'S RESOURCE MANAGEMENT RESPONSIBILITY

The following government policies are most applicable to sustainable development in the Athabasca Oil Sands Region.

Fort McMurray-Athabasca Oil Sands Subregional Integrated Resource Plan — provides government direction, policy information and guidance for developing and assessing future actions by provincial government agencies and the private sector. Resource management areas (RMAs) have been identified on the basis of a common landscape with common management goals, objectives and guidelines.

Oil Sands Mining: End Land Use Committee Recommendations — to minimize the impacts of oil sands operations on other users and industries (e.g., forestry) while recognizing Oil Sands Mining as an important regional activity. Recommendations focus on activities such as reclamation plan co-ordination and land use categories and allocation. End Land Use Committee Recommendations are considered when making a decision under *EPEA*.

Special Places — a provincial government initiative that balances preservation of Alberta's natural heritage with tourism and economic development, outdoor recreation, and heritage appreciation. Alberta's strategy is to complete a network of Special Places that represent the environmental diversity of the province's six Natural Regions (20 subregions).

Fish and Wildlife Policy for Alberta (1982) — provides general direction regarding outdoor recreation, wildlife resources, fisheries resources and regulatory aspects of fish and wildlife management. The primary focus is to protect these resources from severe decline and to maintain viable populations.

Fish Conservation Strategy for Alberta (1997) — guides the management of fish resources in a manner consistent with the federal *Fisheries Act* and the *Fish and Wildlife Policy for Alberta*. Fisheries resource stewardship provides a healthy environment by sustaining the biodiversity, productivity, structure and functions of ecosystems. AENV's role is to sustain the abundance, distribution and diversity of fish populations within the carrying capacity of their habitats.

Statement of Commitment to the Canadian Biodiversity Strategy (1995) — a joint agreement between the provincial and territorial governments and the federal government that acts as a guide for conserving biodiversity and ensuring the sustainability of biological resources. It provides a strategic framework of action to ensure the productivity, diversity and integrity of natural systems is maintained. Alberta implements the strategy through its legislation, policies, and programs as outlined in the document titled *Sustaining Alberta's Biodiversity: An Overview of Government of Alberta's Initiatives Supporting the Canadian Biodiversity Strategy.*

Wetlands Policy for Alberta — (currently approved for interim implementation) provides for the following: "sustain the environmental, economic and social benefits that wetlands provide, now and in the future". Three primary tools used to achieve this goal are protecting wetlands from use, allowing careful development of wetland resources, and requiring the restoration or creation of wetlands in areas where they have been lost.

Recommended Native Grasses and Legumes for Revegetating Disturbed Lands in the Green Area — a list of native grasses and legumes specific to designated natural regions and subregions of Alberta that applies in the Green Area. In addition to controlling erosion, native species are used in revegetation to maintain the genetic integrity of a site's native vegetation and to ensure appropriate habitat for wildlife after reclamation.

Low Impact Seismic Guidelines (1996) — define different line cutting methods designed to reduce the surface disturbance and the amount of merchantable timber that is affected. The primary method is "avoidance" or "meandering" lines to avoid stands of merchantable timber.

Provincial Geophysical Guidelines (1990) — provides a basic understanding of the standard land use expectations required of operators conducting geophysical exploration on public land (both White and

Green Area). It addresses topics ranging from project conception to project completion and reclamation. It also defines restrictions in place for habitat (e.g., wildlife and Trumpeter Swan).

ALBERTA'S APPROVAL PROCESS

Provincial Environmental Assessment and Approval Process

The provincial environmental assessment process is guided by *EPEA*. The process provides for a comprehensive environmental impact assessment report to address relevant environmental issues and to provide decision makers with the information required to make a decision as to whether the project is in the public interest. The process provides extensive opportunities for public consultation. The environmental assessment is linked directly to the AEVN approval process. In cases where approvals are required from multiple provincial agencies (e.g. EUB and AENV), or under multiple acts (e.g. EPEA, and Water Act), the proponent can opt for a single regulatory application. If both a federal and provincial environmental assessment is required, a single assessment will be conducted through co-operation of federal and provincial environmental assessment agencies. After this first stage, the proponent can proceed to the subsequent detailed licensing stage.

Approval Process for Projects

Energy resource mining projects are subject to review by the Alberta Energy and Utilities Board (EUB); however, the responsibility for the review of non-energy mineral projects is the responsibility of the Natural Resources Conservation Board (NRCB) which reports to the Minister of Environment. Quarries require a surface lease under the *Public Lands Act* and, if over a threshold size (45,000 tonnes/year), are subject to a mandatory environmental impact assessment (EIA) and a review by the NRCB. Projects under the threshold may be subject to screening for an EIA.

Environmental Protection and Enhancement Act Approval Process

Activities that could adversely affect the environment and would require an approval are listed in the *Activities Designation Regulation*. The five categories or divisions of activities are:

- division 1 – waste management,
- division 2 – substance release,
- division 3 – conservation and reclamation
- division 4 – miscellaneous (i.e. pesticides, designated materials, water well drillers) and
- division 5 – potable water.

The approval is issued under the category that best describes the overall purpose of the project. *EPEA* supports a streamlined "single-window" approach to approvals, whereby one Director is responsible for co-ordinating and integrating the review of potential impacts of proposed projects on the environment. The approval process consists of five stages, as described below.

1. **Filing of Application** — Sections 2, 3 and 4 of the *Approvals and Registrations Procedure Regulation* identify the common information required for the application. Examples of this information include location, capacity and size of the activity, the nature of the activity, and a description of any public consultation undertaken or proposed by the applicant. Additional guidelines exist that provide detailed requirements related to specific types of activities (e.g., the EUB-AENV Memorandum of Understanding on the Regulation of Oil Sands Development). The Director is given the discretion to waive certain requirements not applicable to a project and will not make a decision on whether to issue an approval unless the application is complete.
2. **Notice Requirements** — The public must be notified of all applications for an approval. Those persons who are directly affected by the application may submit a written statement to the Director outlining their concerns. If the activity is considered to be routine by the Director (specific definitions apply), and where adequate notice has already been given, the notice requirement may be waived. This is set out in the *Approvals and Registrations Procedure Regulation*.

3. **Review of Application** — The Director reviews the completed application, including the public's statements of concern, to determine whether the general and overall impact on the environment of the activity is in accordance with *EPEA* and its regulations. The Director has the option of referring the application to a Referral Committee, as set out under section 7 of the *Approvals and Registrations Procedure Regulation*. To complete the review, the Director may require additional information from the applicant or may require the applicant to hold meetings so that the public may obtain information respecting the application.

4. **Decision to Issue an Approval** — The Director decides whether an approval will be issued and what conditions will be required. In making this decision, the Director will consider whether or not any Environmental Assessment requirements under Part 2 of Division 1 have been complied with. Any related public hearings by the ERCB or NRCB must be taken into consideration. Before making the decision, the Director will consider any statements of concern. The Director may then circulate particulars of his proposed decision, for comment, to the applicant or approval holder and the persons filing statements of concern. If an approval is issued, it will contain the requirements or terms and conditions that must be followed.

5. **Provisions for Appeal —** Requests for appeals are submitted to the Environmental Appeal Board, an administrative tribunal established under EPEA. Where notice of application was provided, the approval holder or those who previously submitted a statement of concern and are directly affected by the approval may appeal the decision. Where the notice of application was waived, the approval holder and any person who is directly affected by the Director's decision may appeal. Where the Director refuses to issue the approval, the applicant may appeal the decision.

Approvals may be issued for specified periods but generally the term is 10 years; however, the Director can set a shorter term. An approval may be amended within this time period, in certain situations (set out in EPEA). The applicant or the Director may initiate an amendment to an approval. All amendments and changes to an activity are subject to the approval process. Under certain situations (set out in EPEA), an approval can be suspended or cancelled. Notice requirements and appeals also apply to suspensions and cancellations.

WHERE TO FIND INFORMATION ON LEGISLATION/APPROVAL PROCESSES

Detailed information on the various governmental legislation applicable in Alberta is available through the Government of Alberta's Queens Printer. This website (http://www.gov.ab.ca/) under the subheading of Laws & Publications, contains Alberta statues and regulations. Similar information is also available on the ERM (Environmental and Natural Resources Management) Views website, which can be accessed through AENV's internal site (www.env.gov.ab.ca/˜env/ermviews/index.htm). The ERM Views will be made available to the public in the near future.

APPENDIX 2B. MANAGEMENT INVENTORY SUMMARY

The following information is a summary of the Management Inventory in Appendix 2c. The summary is broken into five tables, as outlined below:

1. ***Sector Specific Federal Acts, Regulations, Guidelines and Codes of Practice for Use in RSDS*** — Includes the federal legislation applicable to sustainable development in the Athabasca Oil Sands Area, along with the specific sectors to which they apply.
2. ***Sector Specific Alberta Acts, Regulations, Guidelines and Codes of Practice for Use in RSDS*** — Includes legislation from a variety of Alberta Government departments and a summary of the specific sectors to which each applies (e.g., Oil Sands Mining, Forestry).
3. ***General (all sectors) Alberta Acts, Regulations and Guidelines for Use in RSDS*** — Includes applicable legislation from a variety of Alberta Government departments. The environmental component(s) of concern (air quality, water quality, etc.) is listed for each regulatory tool.
4. ***EUB Acts, Regulations and Guidelines for Use in RSDS*** — Includes legislation under the jurisdiction of the Alberta Energy and Utilities Board, cross-referenced to the sectors to which the Regulations and Guidelines apply.
5. ***Sector-specific Saskatchewan Acts, Regulations and Guidelines for Use in RSDS*** — Includes legislation applicable to sustainable development in Saskatchewan.

APPENDIX 2B. MANAGEMENT INVENTORY SUMMARY

Sector Specific Federal Acts, Regulations and Guidelines for Use in RSDS

Acts / Regulations	Oil Sands Mining	Oil Sands In-Situ	Conventional Oil & Gas	Forestry	Peatland
Federal Pulp and Paper Effluent Regulation				x	
Fish Health Protection Regulation	x	x	x	x	
Fish Toxicant Regulation	x	x		x	

Guidelines	Oil Sands Mining	Oil Sands In-Situ	Conventional Oil & Gas	Forestry	Peatland
Canadian Council of Ministers of the Environment (CCME): -National Emission Guidelines for Commercial/Industrial Boilers and Heaters -Environmental Code of Practice for the Measurement and Control of Fugitive VOC Emissions from Equipment Leaks -Environm	x	x	x		

Acts are denoted by a shaded cell with associated Regulations listed below.

General (All Sectors) Federal Acts, Regulations and Guidelines for Use in RSDS

Acts / Regulations	Air Quality	Water Usage	Water Quality	Groundwater	Terrestrial Quality	Fisheries and Fish Habitat	Wildlife and Wildlife Habitat	Protected Areas
Canadian Environmental Assessment Act	x	x	x	x	x	x	x	x
Canadian Environmental Protection Act	x		x	x	x			
Fisheries Act (Canada)		x	x			x		
Migratory Birds Convention Act - Minister of the Environment - Environment Canada - Wildlife							x	x
Navigable Water Protection Act		x	x					

Guidelines	Air Quality	Water Usage	Water Quality	Groundwater	Terrestrial Quality	Fisheries and Fish Habitat	Wildlife and Wildlife Habitat	Protected Areas
Canadian Water Quality Guidelines			x	x		x	x	
DFO: Policy for the Management of Fish Habitat (1986)			x	x		x	x	

Acts are denoted by a shaded cell with associated Regulations listed below.

Sector Specific Alberta Acts, Regulations, Guidelines and Codes of Practice for Use in RSDS

Acts and Regulations	Oil Sands Mining	Oil Sands In-Situ	Conventional Oil & Gas	Forestry	Peatland
Mines and Minerals Act (Department of Resource Development)	x	x	x		
Motor Transport Act				x	x
Exploration Regulations (Public Lands Act)	x	x	x		
Mineral Surface Lease Regulation (Public Lands Act)	x	x	x		
Public Lands Pipe Line Regulation (Public Lands Act)	x	x	x		

Policy / Guidelines	Oil Sands Mining	Oil Sands In-Situ	Conventional Oil & Gas	Forestry	Peatland
Air Monitoring Directive	x	x	x	x	
Alberta Environmental Protection Municipal Policies and Procedures Manual (May, 1997)	x		x		
Alberta Environmental Protection Standards and Guidelines for Municipal Waterworks and Storm Drainage Facilities	x		x		
Alberta Pacific Timber Harvest Planning and Harvesting Ground Rules.	x	x	x	x	
Alberta Stack Sampling Code	x	x	x	x	
Alberta User Guide for Waste Managers	x	x	x	x	
Annual Operating Plan (Forests Act)	x	x		x	
Approaches for Reclaimed Oil Sand Leases	x	x	x		
Approaches to Oil Sands Water Releases Document prepared by the Oil Sands Water Release Technical Working Group (March, 1996)	x	x			
Approval to cut and manage timber resources (Forests Act)				x	
Approval to harvest timber (Forests Act)	x			x	
Approvals for Division 2, Part 8 Oil and Gas (EPEA)			x		
Athabasca-Clearwater RMA Access and Infrastructure Guidelines 1-4	x	x	x	x	
Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia Magna	x	x	x	x	
Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout	x	x	x	x	
Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnows	x	x	x	x	
Biological Test Method: Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia	x	x	x	x	
Clearwater River Management Plan (Heritage River Program)		x	x	x	
Conservation and Reclamation Plan for Specified Lands	x	x	x		x
Continuous Emission Monitoring System (CEMS) Code	x	x	x	x	
Draft End Pit Lake Recommendations	x				

Acts are denoted by a shaded cell with
associated Regulations listed below.

Policy / Guidelines	Oil Sands Mining	Oil Sands In-Situ	Conventional Oil & Gas	Forestry	Peatland
Draft Guidelines for Wetlands Establishment	x	x	x		x
End Land Use Guideline Recommendations (1997)	x	x	x		
EPEA Approval for a Peat Operation if EIA required					x
EPEA Approval for recovery of oil sands or heavy oil by drilling	x	x	x		
Fish & Wildlife Policy	x		x	x	x
Fundamentals of Mechanical Site Prep.				x	
G-50 Guidelines, Drilling Waste Disposal		x	x		
General Development Plan				x	
Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region	x	x	x		x
Herbicide Reference Manual	x	x	x	x	
Industrial Waste Identification and Management Options	x	x	x	x	
Land Capability Classification for Forest Ecosystems in the Oil Sands	x	x		x	x
Methods Manual for Chemical Analysis of Atmospheric Pollutants	x	x	x	x	
Post-Harvest Assessment				x	
Pre-disturbance watershed Assessment Manual				x	
Pre-Harvest Assessment Manual				x	
Reforestation (Areas cut before/after Transition date)				x	
Resource Road Planning Guidelines	x		x	x	
Rights and Duties of the Operator (Forests Act)			x		
Rights of the Land Reforestation Forest Management Plan (Forests Act)				x	
Soil Conservation Guidelines for Mechanical Site Prep.				x	
Soil Conservation Guidelines for Timber Harvesting				x	
Soil Quality Criteria Relative to Disturbance and Reclamation	x	x	x		
Standard Methods for the Examination of Water and Wastewater	x	x	x	x	
The 1995 CCFM document Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators	x	x	x	x	x
Timber Harvest Operations Erosion Potential Index				x	
Timber Harvesting Operations				x	x
Toxicity Characteristic Leaching Procedure (TCLP)	x	x	x	x	
U.S. Code of Federal regulations 40 Part 60	x		x	x	
United States EPA Pulp and Paper Rules				x	

Codes of Practice	Oil Sands Mining	Oil Sands In-Situ	Conventional Oil & Gas	Forestry	Peatland
Code of Practice for Compressor and Pumping Stations and Sweet Gas Processing Plants			x		
Code of Practice for Exploration Operations	x	x	x		
Code of Practice for Oil Production Sites	x	x	x		

Acts are denoted by a shaded cell with
associated Regulations listed below.

General (All Sectors) Alberta Acts, Regulations, Guidelines for Use in RSDS

Acts / Regulations	Air Quality	Water Usage	Water Quality	Groundwater	Terrestrial Quality	Fisheries and Fish Habitat	Wildlife and Wildlife Habitat	Protected Areas
Alberta's Arctic Grayling Management and Recovery Plan			x			x		
Alberta's Walleye Management and Recovery Plan			x			x		
Log Haul Regulation (Motor Transport Act)	x	x	x	x	x	x	x	
Metallic and Industrial Minerals Exploration Regulation					x			x
The Alberta Guide to Sport Fishing Regulations						x		
Environmental Protection and Enhancement Act (EPEA)	x		x	x	x	x	x	
Conservation and Reclamation Regulation					x	x	x	
Environmental Assessment (Mandatory and Exempted Activities) Regulation	x	x	x	x	x	x	x	
Substance Release Regulation	x		x	x	x			
Waste Control Regulation	x		x	x	x			
Activities Designation Regulation	x		x	x	x			
Approvals Procedure Regulation	x		x	x	x			
Fisheries Act (Alberta)			x			x		
Forests Act					x	x	x	x
FMA Agreement			x		x	x	x	x
Timber Management Regulation			x		x	x	x	
Forest and Prairie Protection Act Part II			x		x	x	x	
Historical Resources Act								x
Mines and Minerals Act					x			x
Municipal Government Act (Department of Municipal Affairs)								x
Natural Heritage Act		x	x		x	x	x	x
Occupational Health and Safety Act	x		x	x	x			
Public Lands Act			x		x	x	x	x
Miscellaneous Lease Regulations			x		x	x	x	
License of Occupation Regulation			x		x			
Water Act		x	x	x		x		
Weed Control Act					x		x	
Wildlife Act							x	
Regulation 143/97 Wildlife; Schedule 6: Endangered Species, Part 1: Endangered Animals							x	

Acts are denoted by a shaded cell with associated Regulations listed below.

Policy / Guidelines	Air Quality	Water Usage	Water Quality	Groundwater	Terrestrial Quality	Fisheries and Fish Habitat	Wildlife and Wildlife Habitat	Protected Areas
A Fish Conservation Strategy for Alberta, 1997-2005						x		x
Alberta Ambient Air Quality Guidelines	x				x			
Alberta Ambient Surface Water Quality Interim Guidelines			x			x		
Alberta Environmental Protection Guidelines (Natural Heritage Act)						x	x	x
Alberta Environmental Protection Industrial Effluent Limits Policy and Overview document (Dec., 1995)			x			x		
Alberta Environmental Protection Water Quality Based Effluent Limits Procedures Manual (1995)			x			x		
Alberta Native Plant council - Guidelines for Rare Plant Surveys (1997)					x	x	x	x
Alberta's Woodland Caribou Conservation Strategy					x		x	
AlPac Timber Harvest Planning and Operating Ground Rules (1993)			x		x	x	x	
Aquatic Vegetation Cutting (2pp. + 21 maps)		x				x		
Boreal Region Caribou Standing Committee					x		x	x
Culvert Sizing and Stream Crossing Guidelines			x	x		x		
Debris Disposal			x		x	x	x	
Development Permit (Public Lands Act)					x	x	x	
Disposal of Crown Timber			x		x		x	
Disposition Reservations (Protective Notations; Consultative Notations)					x	x	x	x
DRAFT Policy for Managing Alberta's Peatlands and Non-settled Area Wetlands		x	x		x		x	
Ecological Land Survey Site Manual					x	x	x	x
Ecological Resources (FM-AOSSIRP)						x	x	x
Energy Exploration (Mines & Minerals Act)					x	x	x	
F&W guidelines for water resources referrals for the Water Management Division, NEB Region		x	x			x		x
F&W Surface Disposition (and operating condition) Guidelines					x	x	x	
Fish & Wildlife Policy for Alberta (1982)						x	x	
Fish and Wildlife Division Strategic Plan (April 1991)						x	x	
Fisheries Habitat Protection Guidelines						x		
Forest Landscape Management Strategy for Alberta					x	x	x	x
Fort McMurray Athabasca Oil Sands Subregional IRP: '-Athabasca Clearwater Resource Management Area -Mildred Kearl Lake Resource Management Area		x	x	x	x	x	x	x
Freshwater Intake End-of-Pipe Fish Screen Guidelines		x				x		
General Operating Conditions (Public Lands Act)					x	x	x	

Acts are denoted by a shaded cell with
associated Regulations listed below.

Policy / Guidelines	Air Quality	Water Usage	Water Quality	Groundwater	Terrestrial Quality	Fisheries and Fish Habitat	Wildlife and Wildlife Habitat	Protected Areas
Guidelines and Conditions for Exploration Approvals on Water Covered Areas			x		x	x		
Integrated Resource Management Plans			x		x	x	x	
LFS Policy Directives			x		x	x	x	x
Management of Fish Habitat						x		
Manual on Soil Sampling and Methods of Analysis					x		x	
NERSC - Land Use Strategies for Industrial Activity in Key Caribou Areas of the Northeast Boreal Region					x		x	
Oil Sands Mining: End Land Use Committee			x		x	x	x	
Oil Spill Exercise Criteria Requiring No Approvals			x	x	x	x	x	
Procedural Guide for Petroleum and Natural Gas Activity on Caribou Range (Attachment 1. To information letter 91-17)							x	
Recommended Native Grasses & Legumes					x		x	
Regeneration Survey Manual (Forest Regeneration Standards)			x		x	x	x	
Regional Landuse Policies			x		x	x	x	
RM Wood Buffalo Municipal Development Plans			x		x	x	x	
Special Places						x	x	x
Status of Alberta Wildlife 1996							x	
Sustaining Alberta's Biodiversity					x	x	x	x
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods			x	x	x			
The Alberta Forest Legacy					x	x	x	x
The Boreal Natural Region of Alberta (1998)		x			x		x	x
Timber Harvesting and Operating Ground Rules			x		x	x	x	
Transport of Lumber			x		x	x	x	
Unoccupied Lands Duties re. Weeds			x		x		x	
Watershed Management Guidelines		x	x		x	x	x	x
Wastewater and Storm Drainage Regulation			x			x		

Acts are denoted by a shaded cell with
associated Regulations listed below.

EUB Acts, Regulations, Guidelines for Use in RSDS

Acts & Regulations	Oil Sands	In-Situ Oil	Conventional Oil & Gas
Energy Resources Conservation Act	x	x	x
-Rules of Practice	x	x	x
Oil and Gas Conservation Act	x	x	x
-Oil and Gas Conservation Regulations	x	x	x
Oil Sands Conservation Act	x		
-Oil Sands Conservation Regulations	x		
Pipeline Act	x	x	x
-Pipeline Regulations	x	x	x
Electric Utilities Act	x		
-Electric Utilities Regulations	x		

Information Letters	Oil Sands	In-Situ Oil	Conventional Oil & Gas
IL 80-11 Joint Use of Right of Way	x	x	x
IL 81-30 Experimental Schemes Involving a Large Array of Wells and Close Well Spacing		x	x
IL 84-07 Declaration of Oil Sands Areas to Facilitate Orderly Leasing	x	x	
IL 84-11 Approval Monitoring and Control of Sulphur Storage Sites	x		x
IL 85-12 Oil Sands Primary Production: Well Spacing Primary Recovery Scheme Approvals		x	
IL 88-06 Mine Safety Accord Revised	x		
IL 88-13 Sulphur Recovery Guidelines - Gas Processing Operations	x	x	x
IL 89-03 Amendment to the Athabasca Oil Sands Area	x		
IL 89-04 Public Involvement in the Development of Energy Resources	x	x	x
IL 89-05 Water Recycle Guidelines and Water use Information Reporting for In Situ Oil Sands Facilities	x	x	
IL 90-12 Steam Distribution Lines		x	
IL 91-02 Sour Gas Flaring Requirements and Changes to Regulations	x	x	x
IL 94-02 Injection and Disposal Wells, Well Classifications, Completion, Logging and Testing Requirements		x	x
IL 94-05 Oil and Gas Industry Notification Requirements		x	x
IL 94-17 Notification of Pipeline Project to Conservation and Reclamation Inspectors of AEP	x	x	x
Il 94-19 Dam Safety Accord	x		
IL 96-04 EUB Policy Update and Clarification on the Use of Earthen Pits	x	x	x
IL 96-06 Solution Gas Conservation and Emissions Reduction	x	x	x
IL 96-07 EUB/AEP Memorandum of Understanding on the Regulation of Oil Sands Developments	x		

Acts are denoted by a shaded cell with associated Regulations listed below.

Information Letters	Oil Sands	In-Situ Oil	Conventional Oil & Gas
IL 96-13 Revision of Guide 50 Drilling Waste	x	x	x
IL 97-04 Emissions from Glycol Dehydrators	x	x	x
IL 97-02 Well Spacing/Lease boundary Setbacks Oil Sands Area Development	x	x	
IL 98-01 A Memorandum of Understanding between AEP and the AEUB Regarding Coordination of Release Notification Requirements and Subsequent Regulatory Response	x	x	x
IL 98-06 Stress Corrosion Cracking On Pipelines	x	x	x
IL 99-01 Spill equipment Deployment, Training Exercise, Approvals and Report Summaries	x	x	x

Interim Directives	Oil Sands	In-Situ Oil	Conventional Oil & Gas
ID 89-02 Blowout Prevention and Drilling Practices for Core Holes and Oil Sands Evaluation Wells in Surface Mineable Areas	x		
ID 91-03 Heavy Oil/Oil Sands Operations	x	x	
ID 94-04 Noise Control Directive	x	x	x
ID 95-02 Storage Requirements for the Upstream Petroleum Industry	x	x	x
ID 96-02 Facility Application Requirements	x	x	x
ID 96-03 Oilfield Waste Management Requirements for the Upstream Petroleum Industry	x	x	x
ID 97-03 CSA Standard CSAZ662-96 Oil and Gas Pipeline Systems	x	x	x
ID 99-01 Gas/Bitumen production in Oil Sands Areas - Application, Notification and Drilling Requirements		x	x
ID 99-04 Deposition of Oilfield Waste into Landfills	x	x	x

General Bulletins	Oil Sands	In-Situ Oil	Conventional Oil & Gas
GB 94-04 Requirements for Sulphur Storage Facilities	x	x	x
GB 98-14 Pipeline Amendment Regulations	x	x	x
GB 98-30 New or Revised Alberta Environmental Protection Documents	x	x	x
GB 99-05 List of EUB Approved Oilfield Waste Management Facilities	x	x	x
GB99-07 Hydrogen Sulphide Release Rate Assessment and Audit Form Guidelines	x	x	x
GB 99-09 Submission of Oil Sands Core	x	x	
GB 99-10 Review of Sulphur Recovery Guidelines	x	x	x

Acts are denoted by a shaded cell with associated Regulations listed below.

Guides	Oil Sands	In-Situ Oil	Conventional Oil & Gas
G-23 Guidelines Respecting an Application for Commercial Crude Bitumen Recovery and Upgrading Project	x	x	
G-38 Noise Control Guidelines	x	x	x
G-50 Drilling Waste Management	x	x	x
G-55 Storage Requirements for the Upstream Petroleum Industry	x	x	x
G-56 Energy Development Application Guide and Schedules		x	x
G-58 Oilfield Waste Management Requirements	x	x	x

EUB Licences and Permits	Oil Sands	In-Situ Oil	Conventional Oil & Gas
Project specific approval conditions may contain provisions to: limit sulphur inlet volumes and SO2 emissions, monitor and report environmental effects, report on tailings management, surface reclamation, etc.	x	x	x

Acts are denoted by a shaded cell with associated Regulations listed below.

Sector Specific Saskatchewan Acts, Regulations, and Guidelines for Use in RSDS

Acts and Regulations
Clean Air Act
Clean Air Regulations
Ecological Reserves Act
Environmental Assessment Act (1980)
Environmental Management and Protection Act
Fisheries Act (1994)
Forest Resources Management Act
Forest Resources Management Regulations
Parks Act
Provincial Lands Act
Wildlife Habitat Protection Act

Policy / Guidelines
A Policy Framework: Public Involvement in the Management of Saskatchewan's Environment and Natural Resources
Conservation Strategy for Sustainable Development in Saskatchewan(1992)
Environemental Impact Statement
Environmental Challenges (1991)
Partnership for Renewal Strategy
Saskatchewan Environmental Assessment and Review Process
Saskatchewan Wetland Policy Working Group
Wellness Model

Acts are denoted by a shaded cell with
associated Regulations listed below

APPENDIX 2C. EFFECTS MANAGEMENT — REGULATIONS, GUIDELINES AND STANDARDS INVENTORY TABLE

TABLE OF CONTENTS

OIL SANDS MINING SECTOR

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
1a. Oil Sands Mining (Air)	• EUB Acts and Regulations (e.g. Oil Sands Conservation Act, Energy Resources Conservation Act) • Environmental Protection and Enhancement Act	• Alberta Ambient Air Quality Guidelines • Air Monitoring Directive	**Sulphur Dioxide (SO_2)** 450µg/m^3 (1 hr) 150µg/m^3 (24 hr) 30µg/m^3 (Annual) **Hydrogen Sulphide (H_2S)** 14µg/m^3 (1 hr) 4µg/m^3 (24 hr) **Nitrogen Dioxide (NO_2)** 400µg/m^3 (1 hr) 200µg/m^3 (24 hr) 60µg/m^3 (Annual) **Carbon Monoxide (CO)** 15mg/m^3 (1 hr) 6mg/m^3 (8 hr) **Ground Level Ozone (O_3)** 160µg/m^3 (1 hr) 50µg/m^3 (24 hr) **Suspended Particulates** 100µg/m^3 (24 hr) 60µg/m^3 (Annual) **Ammonia (NH_4)** 2.0 ppm (24 hr) (*Guidelines may also apply for Dustfall, Coefficient of Haze, Static Sulphation, Static Hydrogen Sulphide, and Static Fluorides*)		• Monitoring of some mine related emission sources has at times been stipulated as a special condition in approvals • Emission limits have typically not been stipulated for mining emissions. A numerical performance target (for NOx) has been used in one case (Syncrude Aurora) • Ambient Air monitoring (SO_2, H_2S, NO_2, CO, O_3, THC, and PM) • Reporting on ambient air monitoring and emissions

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
1b. Oil Sands Mining (Water)	• EUB Acts and Regulations (e.g. Oil Sands Conservation Act, Energy Resources Conservation Act) • Environmental Protection and Enhancement Act • Water Act • Public Lands Act	• Alberta Ambient Surface Water Quality Interim Guidelines • Canadian Water Quality Guidelines • Alberta Environmental Protection Industrial Effluent Limits Policy and Overview Document (Dec., 1995) • Alberta Environmental Protection Water Quality Based Effluent Limits Procedures Manual (1995) • Approaches to Oil Sands Water Releases Document prepared by the Oil Sands Water Release Technical Working Group (March, 1996) ▪ Ft. McMurray Athabasca Oil Sands IRP	• Conformance with the water quality guideline values stated in the Alberta Ambient Surface Water Quality Interim Guidelines (e.g. Suspended solids not more than 10 mg/l above background and dissolved oxygen not less than 6.5 mg/l) • Maintain Adequate in stream flows of water ▪ IRP, Water Resources Broad Objectives # 1,2,3,4 • IRP, Athabasca Clearwater Area, Mineral and Surface Material Resources Guideline #5	• Control and segregation of surface runoff waters from mining areas on a project-specific basis • Discharge limits for each discharge point. Limits may be stipulated on concentration of parameter (e.g. Total suspended solids at 10 mg/l above background, or 50 mg/l) or a mass amount that may be discharged (e.g. kg/day) • Monitoring of effluent discharge, receiving stream and ground water • Design requirements may be stipulated regarding construction and development of drainage, erosion controls, flow controls, water diversions, and clean and dirty water conveyance systems. • Limits may be stipulated on net amount of water that may be used by a project, the sources of water supply, timing of withdrawals and quality of water returned • Reporting on amounts of discharges and results of monitoring • Special monitoring for aquatic life, e.g. fish and benthic studies	•

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
		▪ Ft. McMurray Athabasca Oil Sands Subregional IRP	Manage water resources on a multi-purpose basis.(IRP) Maintain surface and groundwater flows and protect water quality and quantity for short and long term requirements for human needs, municipal, agricultural and industrial purposes, and for instream uses including fisheries, wildlife and recreation. (IRP) Minimize the impact of development on water resources (QA & QC) (IRP) Minimize the hazards and potential damage from flood events for settlement areas.(IRP)		

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
2a. Bitumen Extraction (Water)	• EUB Acts and Regulations (e.g. Oil Sands Conservation Act, Energy Resources Conservation Act) • Environmental Protection and Enhancement Act • Water Act	• Alberta Ambient Surface Water Quality Interim Guidelines • Canadian Water Quality Guidelines • Alberta Environmental Protection Industrial Effluent Limits Policy and Overview Document (Dec., 1995) • Alberta Environmental Protection Water Quality Based Effluent Limits Procedures Manual (1995) • Approaches to Oil Sands Water Releases Document prepared by the Oil Sands Water Release Technical Working Group (March, 1996)	• Conformance with the water quality guideline values stated in the Alberta Ambient Surface Water Quality Interim Guidelines • Maintain Adequate in stream flows of water		• Presently no discharge of process affected water during operations (extraction water is directed to tailings ponds and recycled) • Design requirements may be stipulated regarding construction of tailings impoundments • Reporting on amount of recycling of water to maximize the recycling/reuse of process affected water and minimize the use of freshwater. • Limits may be stipulated on net amount of water that may be used by a project, the sources of water supply, timing of withdrawals and net quality of water returned. • Pollution prevention studies that typically requires examination of new reuse, recycle or reduction alternatives • Monitoring of ponds and water bodies potentially affected by seepage, groundwater, runoff, etc.

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
3a. Bitumen Processing & Upgrading (Air)	• EUB Acts and Regulations (e.g. Oil Sands Conservation Act, Energy Resources Conservation Act) • Environmental Protection and Enhancement Act	• Alberta Ambient Air Quality Guidelines • Canadian Council of Ministers of the Environment (CCME) guidelines on air emission minimization/control for some specific sources (e.g.. Storage Tanks; Gas Turbines, Boilers and Heaters)	**Sulphur Dioxide (SO_2)** 450µg/m^3 (1 hr) 150µg/m^3 (24 hr) 30µg/m^3 (Annual) **Hydrogen Sulphide (H_2S)** 14µg/m^3 (1 hr) 4µg/m^3 (24 hr) **Nitrogen Dioxide (NO_2)** 400µg/m^3 (1 hr) 200µg/m^3 (24 hr) 60µg/m^3 (Annual) **Carbon Monoxide (CO)** 15mg/m^3 (1 hr) 6mg/m^3 (8 hr) **Ground Level Ozone (O_3)** 160µg/m^3 (1 hr) 50µg/m^3 (24 hr) **Suspended Particulates** 100µg/m^3 (24 hr) 60µg/m^3 (Annual) **Ammonia (NH_4)** 2.0 ppm (24 hr) (*Guidelines may also apply for Dustfall, Coefficient of Haze, Static Sulphation, Static Hydrogen Sulphide, and Static Fluorides*)		• SO_2 emission limits for the entire project and /or individual emission sources. Limits may be stipulated on emission concentrations, hourly and daily emissions, or long term rolling averages (90 or 365 days) • Sulphur recovery requirements for upgrading portions of a plant (percent sulphur recovery that is required on a quarterly basis) • Numerical performance criteria for SO_2 emissions (e.g. for flaring, and yearly average emissions) • Vapor collection and control requirements for specific processing units to reduce H_2S and VOC emissions. • NOx emission limits for some large sources • Conformance with CCME Guidelines in design of new equipment (e.g. storage tanks, gas turbines, boilers, and heaters) to minimize emissions (VOC's, NO_x) • Particulate emission limits for some large sources. • Monitoring of some large sources of emissions (SO_2, NOx, particulates) and ambient monitoring (SO_2, H_2S, NO_2, CO, O_3, particulates) • Reporting on emission source monitoring, ambient monitoring, emission control equipment performance, and special studies. • Immediate reporting of unauthorized emissions

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
3b. Bitumen Processing & Upgrading (Water)	• EUB Acts and Regulations (e.g. Oil Sands Conservation Act, Energy Resources Conservation Act) • Environmental Protection and Enhancement Act • Water Act • Fisheries Act…to add to policy/guidelines	• Alberta Ambient Surface Water Quality Interim Guidelines • Canadian Water Quality Guidelines • Alberta Environmental Protection Industrial Effluent Limits Policy and Overview Document(Dec. 1995) • Alberta Environmental Protection Water Quality Based Effluent Limits Procedures Manual (1995) • Approaches to Oil Sands Water Releases Document prepared by the Oil Sands Water Release Technical Working Group (March, 1996)	• Conformance with the water quality guideline values stated in the Alberta Ambient Surface Water Quality Interim Guidelines • Maintain adequate in-stream flows of water		• Presently no discharge of process affected water during operations, or discharges limited to relatively cleaner sources (e.g. once through cooling water). • Wastewater discharge limits stipulated for each discharge point. Limits may be stipulated on concentration of a parameter (e.g. 10 mg/l of oil and grease) or on a mass amount that may be discharged (e.g. kg/day of a particular compound) • Monitoring of effluent discharges, receiving stream, and ground water. • Design requirements may be stipulated to reduce risk of contaminating water, such as secondary containment for storage tanks • Monitoring of by-product storage sites (e.g. sulphur and coke) • Limits may be stipulated on net amount of water that may be used by a project, the sources of water supply, timing of withdrawls and quality of water returned • Annual reports on water use and management, wastewater quality, groundwater, hazardous and solid waste • Monthly reports on wastewater and runofl • National Pollution Release Inventory substances consumed in or added to the process
4. Transportation	• Fisheries Act • Public Lands Act	• Watershed Management Guidelines • Resource Road Planning Guidelines			

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
5. Oil Sands Related Activities and Facilities (including accommodation, camps, potable water, municipal wastewater systems) (Water)	• Environmental Protection And Enhancement Act • Water Act (if using potable water from site) • Public Lands Act	• Alberta Environmental Protection Standards and Guidelines for Municipal Waterworks and Storm Drainage Facilities • Alberta Environmental Protection Municipal Policies and Procedures Manual (May, 1997) • Wastewater and Storm Drainage Regulation • If using water from surface water or groundwater wells - Water Well Regulation and Potable Water Regulation • Ft. McMurray Athabasca Oil Sands Subregional IRP	• Conformance with the water quality guideline values stated in the Alberta Ambient Surface Water Quality Interim Guidelines Atha-Clearwater RMA Access & Infrastructure Guidelines 1-4(IRP, p.30)	• All new facilities within the River Valley will be screened from the river, and be architecturally designed and landscaped to complement the natural environment.	• Concentration limits on discharge with Biochemical Oxygen Demand (e.g. limit of 25 mg/l) and suspended solids (e.g. limit of 25 mg/l). • Standards to ensure good quality drinking water

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
Land Capability (Soils)	• Environmental Protection And Enhancement Act • EA (Mandatory & Exempted) • Conservation & Reclamation Regulation • Public Lands Act		Land Capability Classification for Forest Ecosystems in the Oil Sands Soil Quality Criteria Relative to Disturbance and Reclamation Ft. McMurray Athabasca Oil Sand Subregional IRP	Return equivalent land capability (soil salvage and replacement) salvage and direct place or store, for future use, sufficient material to meet capability objective Return an equivalent capability for Boreal Forest, Commercial forest , Wildlife and Recreation.(IRP) The restructured soil profile shall be capable of supporting a variety of native vegetation.(IRP)	Conservation of soil material for reclamation of disturbed lands is a requirement of all approvals issued under Environmental Protection And Enhancement Act. Sufficient soil material must be conserved to permit the restoration to the land equivalent to pre-disturbance capability; but not necessarily the same land uses. Monitoring to ensure that sufficient materials are salvaged are required by submission of annual reports.

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
Land Capability (Landscape)	• Environmental Protection And Enhancement Act • Conservation & Reclamation Regulation • Water Act • Oil Sands Conservation Act • Public Lands Act	• Fort McMurray – Athabasca Oil Sands Subregional IRP • Forest Landscape Management Strategy for Alberta • End Land Use Guideline Recommendations (1997)	Land Capability Classification for Forest Ecosystems in the Oil Sands Soil Quality Criteria Relative to Disturbance and Reclamation IRP, Athabasca Clearwater Area – Mineral and Surface Material Resources, Guideline No.4 - Water No. 5 – Recreation &Tourism IRP Mildred-Kearl Recreation & Tourism Objectives 1,2. ELU Guideline 2.1, Regional Coordination	Return equivalent land capability (landscape design): ▪ return land to an equivalent land capability ▪ ensure surface drainage system incorporates stable banks and is free draining ▪ ensure land surface contours are compatible with land capability and end land use objectives, and are non-erosive and stable ▪ ensure that a groundwater table is established that is compatible with land capability & end land use requirements ▪ IRP, Watershed shall resemble and function as a natural system. ▪ FLM, The visual resource will be managed as a valuable resource in areas of high public use and areas valued for their scenic quality. (FLM-GRR, p.5) ▪ ELU, The Reclamation Advisory Committee will provide coordination of reclamation plans to provide: - Continuity of land forms and watershed systems across lease boundaries - Productive Capability of the landscape equivalent or better than predisturbance on a regional basis - Land uses located in areas and on landforms that make physical, biological, social and economic sense. - Incorporation of LUF recommendations	Materials placement, backfilling and contouring guidelines and limits are stipulated as conditions of the approval. Reclamation to equivalent land capability is specified.

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
Land Capability (Vegetation)	• Forest Act • Timber Management Regulation • Environmental Protection And Enhancement Act • Conservation & Reclamation Regulation Public Lands Act	• Sustaining Alberta's Biodiversity • Special Places • Fort McMurray – Athabasca Oil Sands Subregional IRP • Fish & Wildlife Policy • Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region • Draft Guidelines for Wetlands Establishment • Approach for Reclaimed Oil Sand Leases • Forest Regeneration Standards • Recommended Native Grasses & Legumes • End Land Use Committee Recommendations • The 1995 CCFM document Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators • The Alberta Forest Legacy	IRP Mildred Kearl Area, Landscape Reclamation Strategy Guidelines • IRP, Athabasca Clearwater Area Mineral and Surface Material Resource Guideline #5	Return equivalent land capability (vegetation) - Establish a self sustaining, diverse vegetative cover of a composition and density that is compatible with land capability and end land use objectives - Establish a productive forest (meet standards for commercial forest) in areas so designated IRP, Revegetation to a mixedwood boreal forest, using native species will be the primary means by which the land based is reclaimed. - IRP, ELU, Disturbed forestlands shall be reclaimed to a level of capability and area equivalent to that which existed before disturbance. - IRP, Development must protect the Valley ecosystem with mitigation of adverse impacts	

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
	•	•	Forest Legacy; Ecological management of forestlands will allow forest landscapes to continue to evolve under the influences that shaped them in the past and maintain the ecosystem's ability to perpetuate it. The diversity and productivity of the forest landscape will be maintained.	- IRP, ELU, Maintain equivalent levels of commercial forest landbase, AAC and species composition. - CCFM Performance Indicators of Sustainable Forest Management are; 1. Conserve Biological diversity 2. Maintain healthy and productive forest ecosystems 3. Conserve soil and water 4. Maintain the forest's multiple benefits to society 5. Take responsibility for sustainable development	

End Land Use	• Public Lands Act • Environmental Protection And Enhancement Act • Conservation & Reclamation Regulation • Water Act • Wildlife Act • Fisheries Act	• Oil Sands Mining End Land Use Committee Recommendations • Fish & Wildlife Policy • Fort McMurray – Athabasca Oil Sands Subregional IRP • RM Wood Buffalo Municipal Development Plans • Municipal Planning Act • Draft End Pit Lake Recommendations • Draft Guideline for Wetland Establishment on Reclaimed Oil Sands Leases	• IRP, Athabasca Clearwater Area, Mineral and Surface Mineral Resources, Guidelines 4, 5. • IRP, Mineral and Surface resources Broad Guideline 3, p. 11 • IRP, Broad Forestry Resources Guidelines 1 – 4 • IRP, Broad Recreation and Tourism Obj. 1 • IRP, Broad Wildlife Obj. 2, 3 • IRP, Mildred – Kearl Area, Recreation and Tourism, Obj. 2 • IRP, Mildred – Kearl Reclamation Strategy	• Surface disturbances resulting from mineral exploration and development will be progressively reclaimed. Sites will be reclaimed to a level of capability equivalent to he pre-disturbance level, optimizing the values of watershed, timber, wildlife, fish, recreation or other resources. • Maintain sustainable levels of AAC . • Promote the coordination of timber harvest planning in conjunction with other surface disturbances. • Reclaim the forest capability on reclaimed land to at least predisturbance levels and yet recognize other resource needs. • Manage and protect areas with significant recreation and tourism capability such as the river valleys • Maintain and/or enhance the diversity, abundance and distribution of wildlife resources such as; Black Bear, Moose, Deer, Birdgame, upland and aquatic habitats required to retain the current furbearer populations. • Maintain the recreational potential of the Fort Hills • Future uses of reclaimed land should also be compatible with existing and planned uses for adjacent lands.	

		End Land Use Committee	• ELU Guidelines - 3.2.2 - 3.4.1 - 3.4.3 - 4.1 - 4.2	• The return of disturbed lands to commercial forest equivalent to the pre-disturbance area is stipulated as an approval condition. Wildlife habitats must be re-established to diversity consistent with pre-disturbance site characteristics. • As conditions of the approval, the operator is required to undertake a program & schedule for research to substantiate the viability of composite or consolidated tailings reclamation and viable, self-sustainable end pit lakes capable of supporting fisheries & recreation. • ELU 3.2.2 and 3.4.3 Reclaimed lands will be established with consideration for biodiversity, Aesthetics, Traditional Uses, General Community hunting, fishing and gathering of plants. • ELU 3.4.1 Reclamation will establish forested areas to productivity equal to or better than predisturbance levels, with at least an equal land area. To maintain biodiversity, the forested areas will be planted to a similar species mix as existed at predisturbance. These forest stands are to be developed in contiguous blocks as appropriate for efficient forestry operation.	

				• ELU 4.2 Where mining has displaced predisturbance landuses, priority will be given to reestablishment of these land uses, subject to advice of the Reclamation Advisory Committee. • ELU 4.1 Land reclamation and the establishment of end land uses will be carried out on a progressive basis with a minimum amount of elapsed time from disturbance to completion of reclamation. • ELU 4.2 Where mining has displaced predisturbance land uses, priority will be given to reestablishment of these land uses, subject to advice of the Reclamation Advisory Committee.	

OIL SANDS IN-SITU SECTOR

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
1. Facilities					
1a. Facilities (Air)	• EUB Acts and Regulations (e.g. Oil Sands Conservation Act, Energy Resources Conservation Act) • Environmental Protection And Enhancement Act	• Alberta Ambient Air Quality Guidelines • Canadian Council of Ministers of the Environment (CCME) guidelines on air emission minimization/control for some specific sources (e.g. Storage Tanks; Gas Turbines, Boilers and Heaters) • Air Monitoring Directive	**Sulphur Dioxide (SO_2)** 450µg/m^3 (1 hr) 150µg/m^3 (24 hr) 30µg/m^3 (Annual) **Hydrogen Sulphide (H_2S)** 14µg/m^3 (1 hr) 4µg/m^3 (24 hr) **Nitrogen Dioxide (NO_2)** 400µg/m^3 (1 hr) 200µg/m^3 (24 hr) 60µg/m^3 (Annual) **Carbon Monoxide (CO)** 15mg/m^3 (1 hr) 6mg/m^3 (8 hr) **Ground Level Ozone (O_3)** 160µg/m^3 (1 hr) 50µg/m^3 (24 hr) **Suspended Particulates** 100µg/m^3 (24 hr) 60µg/m^3 (Annual) **Ammonia (NH_4)** 2.0 ppm (24 hr) (*Guidelines may also apply for Dustfall, Coefficient of Haze, Static Sulphation, Static Hydrogen Sulphide, and Static Fluorides*)		• SO_2 emission limits for the entire project and /or individual emission sources. • Conformance with CCME Guidelines in design of new equipment (e.g. storage tanks, gas turbines, boilers, and heaters) to minimize emissions (VOC's, NO_x) • Monitoring of some large sources of emissions (SO_2 , NO_x) and ambient monitoring (SO_2, H_2S) • Reporting on emission source monitoring, ambient monitoring, emission control equipment performance, and special studies

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
1b. Facilities (Water)	• EUB Acts and Regulations (e.g. Oil Sands Conservation Act, Energy Resources Conservation Act) • Environmental Protection And Enhancement Act • Water Act	• Alberta Ambient Surface Water Quality Interim Guidelines • Canadian Water Quality Guidelines • Alberta Environmental Protection Industrial Effluent Limits Policy and Overview Document (Dec., 1995) • Alberta Environmental Protection Water Quality Based Effluent Limits Procedures Manual (1995)	• Conformance with the water quality guideline values stated in the Alberta Ambient Surface Water Quality Interim Guidelines • Maintain Adequate in stream flows of water		• Presently , no discharge of process affected water (deepwell disposal may be used) • Design requirements may be stipulated to reduce the risk of contaminating water, such as secondary containment for storage tanks • Control of surface runoff water on a project specific basis • Monitoring of surface runoff releases and groundwater • Reporting on the amount of recycling of water to maximize the recycling/reuse of produced water and minimize the use of freshwater. • Limits may be stipulated on the net amount of water that may be used by the project, the sources of water supply, and timing of withdrawals. • Annual reports on water use and management • Discharge of boiler blowdown, cooling water, etc. may have COD, TSS, BOD oil and grease, and pH limits imposed

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
1c Facilities (Terrestrial)	Environmental Protection And Enhancement Act Public Lands Act Forest and Prairie Protection Act Part II, Conservation and Reclamation Regulations, Activities Designation Regulations and Approvals Procedure Regulations Municipal Government Act	Code of Practice for Oil Production Sites Code of Practice for Exploration Operations Boreal Region Caribou Standing Committee Miscellaneous Lease Regulations 376/61 Mineral Surface Lease Regulations General Operating Conditions Conservation and Reclamation Plan Development Permit Ft. McMurray Athabasca Oil Sand IRP Forest Landscape Management Strategies for Alberta	Approval for oil sand processing plant Debris Disposal IRP, Athabasca Clearwater Area, Access and Infrastructure Guideline #4.	• To ensure that the disturbed land is returned to an equivalent land capability • Minimize impact of development and use of the environment • Facilitate directing development to most capable lands. • IRP, Resource development and structures that must be located in the RMA should be screened from the river, using natural features and architecturally designed and landscaped to complement the natural surroundings. Most structures associated with resource development are not permitted in this Area ▪ FLM, The visual resource will be managed as a valuable resource in areas of high public use and areas valued for their scenic quality.	ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT, Part 2, Div. 2 On forested land, salvage of minimum of LFH plus 15 cm of mineral soil unless material is unsuitable Sec.19.1c/ Letter of Authority/Schedule 'A' Sec. 6(1), 8, Miscellaneous Lease Regulations Sec.3(1), Mineral Surface Lease Regulations Sec. 12, 15,16

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
2. Transportation					
2a. Transportation (Air)	N/A				
2b. Transportation (Water)					

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
2c (Transportation) (Terrestrial)	Environmental Protection And Enhancement Act	Code of Practice for Oil Production Sites	Environmental Protection And Enhancement Act approval for Oil Sands mine	• Ensure that the disturbed land is returned to an equivalent land capability	ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT, Part II, Div. 2
	Public Lands Act	License of Occupation Reg. Public Lands PipeLine Reg.	Rights and Duties of the Operator	• To ensure that substances released to the environment are within standards • Ensure development of access is coordinated • Minimize environmental impacts of development and use	Sec.19.1c/Letter of Authority/Schedule 'A' Sec. 7,16, 17(License of Occupation Regulation) Sec. 21,22,23,30 (Public Lands Pipeline Regulations)
	Mines and Minerals Act	Metallic and Industrial Minerals Exploration Regulations Debris Disposal		• Ensure development of facilities is on suitable lands	
	Forest and Prairie Protection Act Part II,		Approval to mine quarriable minerals listed in the Mines and Mineral Act		
		Ft. McMurray Athabasca Oil Sand IRP	IRP, Access and Infrastructure Broad Objectives and Guidelines.	• Minimize negative impacts of development to the environment	Letter of Clearance Part 6, Sec. 122-124 Part 10, Sec. 52
	Conservation and Reclamation Regulation	Conservation and Reclamation Plan		• Linear development projects will be encouraged to use existing or planned corridors. Access will be developed and reclaimed that considers environmental concerns as well as economically efficient options.	Sec. 15, 16
				• Minimize land use conflicts • To ensure that disturbed land is satisfactorily reclaimed to an acceptable environmental standard	

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
3. Injection Scheme					
3a. Injection Scheme (Air)					
3b. Injection Scheme (Water)					
3c Injection Scheme (Terrestrial)	EUB Acts and Regulations	G-50 Guidelines, Drilling Waste Disposal.		• Protect soil and water table from excessive loading of contaminants • Ensure company drilling wastes meet EUB G-50 guidelines	Information Letter 96-13
	Environmental Protection And Enhancement Act	Code of Practice for Oil Production Sites Environmental Protection And Enhancement Act approval for recovery of Oil Sands or heavy oil by drilling		• Minimize negative impacts of development to the environment	ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT, Part 2, Div. 2
	Public Lands Act	Mineral Surface Lease Regulation Public Lands Pipeline Regulation	Rights and Duties of the Operator	• Minimize environmental impacts of development and use • Ensure development of access is coordinated	Sec.191©/Letter of Authority/Schedule A Sec. 21,22,23,30 (Public Lands Pipeline Regulations)
	Forest and Prairie Protection Act Part II	Debris Disposal			
	Conservation and Reclamation Regulation	Conservation and Reclamation Plan		• To ensure that disturbed land is satisfactorily reclaimed to an acceptable environmental standard	Sec. 15, 16, 21(1)a, 21(2)
	Mines and Minerals Act	Exploration Regulations			
	Public Lands Act	Code of Practice for Exploration Operation			Letter of Clearance Part 10, Sec. 52

FORESTRY SECTOR

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
1. Facilities					
1a. Facilities (Air)	• Environmental Protection And Enhancement Act • Substance Release Regulation • Waste Control Regulation	• Alberta Ambient Air Quality Guidelines • Air Monitoring Directive	• **Sulphur Dioxide (SO_2)** • 450µg/m^3 (1 hr) · 150µg/m^3 (24 hr) · 30µg/m^3 (Annual) • **Hydrogen Sulphide (H_2S)** • 14µg/m^3 (1 hr) · 4µg/m^3 (24 hr) • **Nitrogen Dioxide (NO_2)** • 400µg/m^3 (1 hr) · 200µg/m^3 (24 hr) · 60µg/m^3 (Annual) • **Carbon Monoxide (CO)** • 15mg/m^3 (1 hr) · 6mg/m^3 (8 hr) • **Ground Level Ozone (O_3)** • 160µg/m^3 (1 hr) · 50µg/m^3 (24 hr) • **Suspended Particulates** · 100µg/m^3 (24 hr) · 60µg/m^3 (Annual) • **Ammonia (NH_4)** • 2.0 ppm (24 hr) • (*Guidelines may also apply for Dustfall, Coefficient of Haze, Static Sulphation, Static Hydrogen Sulphide, and Static Fluorides*)	•	• A few large facilities, such as wood processing plants and pulpmills, require an approval under the ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT. • Emission limits stipulated for some point sources • Monitoring of some large sources of emissions are required and ambient monitoring may be required (e.g. near Alpac pulp mill) • Reporting on emission source monitoring ambient monitoring, emission control equipment performance, and special studies.

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
1b. Facilities (Water)	• Environmental Protection And Enhancement Act • Water Act • (Federal Fisheries Act) • (Federal Pulp and Paper Effluent Regulation)	• Alberta Ambient Surface Water Quality Interim Guidelines • Canadian Water Quality Guidelines • Alberta Environmental Protection Industrial Effluent Limits Policy and Overview Document (Dec., 1995) • Alberta Environmental Protection Water Quality Based Effluent Limits Procedures Manual (1995) • United States EPA Pulp and Paper Rules • Alberta User Guide for Waste Managers	• Conformance with the water quality guideline values stated in the Alberta Ambient Surface Water Quality Interim Guidelines • Maintain Adequate in stream flows of water • Meet technology specific limits established for an industry		• A few large facilities, such as wood processing plants and puplmills, require an approval under the ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT. Listed below are the terms and conditions related to pulp mills - Discharge limits for each discharge point. Limits may be stipulated on a number of parameters and are often expressed as a mass amount that may be discharged (e.g. kg/day) - Monitoring of effluent discharge, receiving stream and ground water - Reporting on amounts of discharges and results of monitoring - Limits may be stipulated on net amount of water that may be used by a project, the sources of water supply, timing of withdrawals and quality of water returned - Monitoring of persistent organic pollutants (e.g. dioxins and furans) - Specific environmental effects monitoring studies, as required both federally and provincially, to assess water quality and health of aquatic ecosystems

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
1c Facilities (Terrestrial)	Municipal Government Act. Public Health Act. Forest and Prairie Protection Act Public Lands Act Forest Act	Development Permit Administration Debris Disposal Ft. McMurray Athabasca Oil Sands IRP Forest Landscape Management Strategies for Alberta			Sec. 23,30,36 Sec. 12
2. Transportation	Forest Act Public Lands Act				
2a. Transportation (Air)					
2b. Transportation (Water)					

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
2c Transportation (Terrestrial)	Forests Act, /Timber Management Amendment Regulation. /FMA Agreement Public Land Act/ Weed Control Act. Environmental Protection And Enhancement Act Forest and Prairie Protection Act Part II	Transport of Lumber Timber Harvesting and Operating Ground Rules. General Development Plan. Integrated Resource Management Plans. General Operating Conditions. License of Occupation Reg. Unoccupied lands Duties re Weeds Debris Disposal Miscellaneous	Culvert Sizing and Stream Crossing Guidelines. Timber Harvest Operations Erosion Potential Index. Pre-disturbance watershed Assessment Manual. Pre-Harvest Assessment Manual. Stream Crossing Guidelines. Annual operating Plan. General Development Plan.	• Ensure stands are reforested • Ensure land use conflicts are minimized • Ensure timber harvest is within sustainable levels • Plan for management over 20 years with long-term perspective • Support adaptive management approach • Timber salvage cutting will occur wherever possible, before any development activity, or in the event of fire, insect or disease damage…. • Progressive and effective harvesting and reforestation methods will be practiced in accordance with the Forests Act, Timber Management Regulations, Timber harvest Planning and Operating Ground Rules and established policies • Ensure development of access is coordinated • Minimize environmental impacts of development and use	Sec. 15, 16, 17 Refer to amended Timber management Regulation (1996) for addition of sections 122 Sec. 3.4 .1 Sec. 3.4. 2 Sec. 16, 17 (License of Occupation Regulation) ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT, Part 2, Div. 2 Sec. 13, 31

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
2c Transportation (Terrestrial) - continued	Motor Transport Act/ Log Haul Regulation. Mines and Minerals Act Public Lands Act	License of Occupation Roads Metallic and Industrial Minerals Exploration regulations Surface Materials Regulation			Part 2, Section 10
3. Harvesting Operations					
3a. Harvesting Operations (Air)					
3b. Harvesting Operations (Water)					

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
3c Harvesting Operations (Terrestrial)	Forest Act /Timber Management Regulation /FMA Agreement Forest and Prairie Protection Act Part II Occupational Health and Safety Act	Disposal of Crown Timber Timber Harvesting and Operating Ground Rules. Timber Harvesting Operations Reforestation (Areas cut before/after Transition date) Miscellaneous Rights of the Land Reforestation Forest Management Plan Alberta Pacific Timber Harvest Planning and Harvesting Ground Rules. Logging Operations Integrated Resource Management Plans. LFS Policy Directives.	Approval to harvest timber Annual Operating Plan Approval to cut and manage timber resources Soil Conservation Guidelines for Timber Harvesting. Forest Landscape Management Strategies for Alberta Fundamentals of Mechanical Site Prep. Soil Conservation Guidelines for Mech. Site Prep. Post-Harvest Assessment Manual Herbicide Reference Manual. Regeneration Survey Manual	• Ensure design and implementation of harvest are conducted to minimize environmental impact • Ensure timber harvest is within sustainable levels • Ensure stands are reforested • Ensure volume of timber harvested is at a level that is sustainable over time • Plan for management over 20 year term with long term perspective • To promote the coordination of timber harvest planning in conjunction with other surface disturbances	Sec. 15, 16(1), 17(1) (Forests Act) Sec. 2.3.1 (Timber Harvest Planning and Operating Ground Rules) An area is reforested if at least 80% of 10 m^2 In the appendix, refer to Sections: 98-100 P.21(Timber Management Regulations) Sec. 132,137,141, Part 6. P.22 –29 (Timber Management Reg.) 146,149,150 P. 32-33 (Timber Management Reg.) Sec 23 (1) (FMA Agreement) Sec 7(1) – 2b, 8b Alpac plan not to harvest overstorey from high density category (>600 evenly distributed stems/ha) Coniferous AAC of 458 500 m^3 Deciduous AAC of 488, 000 m^3 (FMU A2, A3, A5, A7) Sec. 8,9,12

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline	Objective	Terms & Conditions, Approval (Standards)
3c Harvesting Operations (Terrestrial)	Environmental Protection And Enhancement Act			• To ensure that the disturbed land is returned to an equivalent land capability	ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT, Part 2. Div. 2

CONVENTIONAL OIL AND GAS SECTOR

1. Exploration (lines/roads)					
1a. Exploration (lines/roads)(Air)					
1b. Exploration)(Wat)					
1c Exploration (lines/roads) (Terrestrial)	Environmental Protection And Enhancement Act Public Lands Act Forest and Prairie Protection Act Part II, Mines and Minerals Act Conservation and Reclamation Regulations Municipal Governments Act.	Approval for oil sand mine Code of Practice for Oil Production Sites Code of Practice for Exploration Operations License of Occupation Reg. The Resource Handbook, Resource Road Planning Guidelines General Operating Conditions Debris Disposal Exploration Regulations Conventional Oil and Gas Conservation and Reclamation Plan. Regional Landuse Policies. Development Permit	Rights and Duties of the Operator Regulations Respecting Petroleum and Natural Gas Agreements	• Ensure that the disturbed land is returned to an equivalent land capability • To ensure that substances released to the environment are within standards • Ensure development of access is coordinated • Minimize environmental impacts of development and use • Ensure development of facilities is on suitable lands • Minimize negative impacts of development to the environment • Minimize land use conflicts • To ensure that disturbed land is satisfactorily reclaimed to an acceptable environmental standard	ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT, Part 2, Division 2 Sec. 7,16,17 (License of Occupation Regulations) Sec. 15, 16,21(1)b Part 5, Sec. 93

Conventional Oil & Gas Sector 1c **Exploration (lines/roads) (Terrestrial) - Continued**	EUB acts	Drilling Waste Guidelines, plus many others.		• Protect soil and water table from excessive loading of contaminants • Ensure company drilling wastes meet ERCB G-50 guidelines	Information Letter 96-13
2. Development (wellsites/batteries, sour-gas processing/compressor stations)					
2a. Development (wellsites/batteries, sour-gas processing/compressor stations) (Air)	• EUB Acts and Regulations (e.g. Oil Sands Conservation Act, Energy Resources Conservation Act) • Environmental Protection And Enhancement Act	• Alberta Ambient Air Quality Guidelines • Canadian Council of Ministers of the Environment (CCME) guidelines on air emission minimization/control for some specific sources (e.g.. Storage Tanks; Gas Turbines, Boilers and Heaters) • Code of Practice for Compressor and Pumping Stations and Sweet Gas Processing Plants	**Sulphur Dioxide (SO_2)** 450µg/m^3 (1 hr) 150µg/m^3 (24 hr) 30µg/m^3 (Annual) **Hydrogen Sulphide (H_2S)** 14µg/m^3 (1 hr) 4µg/m^3 (24 hr) **Nitrogen Dioxide (NO_2)** 400µg/m^3 (1 hr) 200µg/m^3 (24 hr) 60µg/m^3 (Annual) **Carbon Monoxide (CO)** 15mg/m^3 (1 hr) 6mg/m^3 (8 hr) **Ground Level Ozone (O_3)** 160µg/m^3 (1 hr) 50µg/m^3 (24 hr) **Suspended Particulates** 100µg/m^3 (24 hr) 60µg/m^3 (Annual) **Ammonia (NH_4)** 2.0 ppm (24 hr) (*Guidelines may also apply for Dustfall, Coefficient of Haze, Static Sulphation, Static Hydrogen Sulphide, and Static Fluorides*)		• All conventional oil and gas facilities require an EUB approval. Some also require approvals under ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT. (e.g. sour gas processing plants) or are covered by an ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT Code of Practice (e.g. compressor stations that emit more than 16 kg/hr of NO_x) • Most conventional oil and gas facilities in the region are not large sources of air emissions. The ones that are larger sources of emissions would have terms and conditions similar to the Oil Sands Insitu Sector Facilities.

2b. Development (wellsites/batteries, sour-gas processing/compressor stations) (Water)	• EUB Acts and Regulations (e.g. Oil Sands Conservation Act, Energy Resources Conservation Act) • Environmental Protection And Enhancement Act • Water Act	• Alberta Ambient Surface Water Quality Interim Guidelines • Canadian Water Quality Guidelines • Alberta Environmental Protection Industrial Effluent Limits Policy and Overview Document (Dec., 1995) • Alberta Environmental Protection Water Quality Based Effluent Limits Procedures Manual (1995)	• Conformance with the water quality guideline values stated in the Alberta Ambient Surface Water Quality Interim Guidelines • Maintain Adequate in stream flows of water		• All conventional oil and gas facilities require an EUB approval. Some also require approvals under ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT. (e.g. sour gas processing plants) or are covered by an ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT Code of Practice (e.g. compressor stations that emit more than 16 kg/hr of NO_x) • Presently, no discharge of process affected water (deepwell disposal may be used) • Design requirements may be stipulated to reduce the risk of contaminated water, such as secondary containment for storage tanks • Control of surface runoff water on a project specific basis • Limits may be stipulated on the net amount of water that may be used by the project, the sources of water supply, and timing of withdrawals.

2c Development (wellsites/batteries, sour-gas processing/compressor stations) (Terrestrial)	Environmental Protection And Enhancement Act	Approvals for Division 2, Part 8 Oil and Gas		• Ensure plant operation and waste generated does not adversely impact the receiving environment • Ensure design, construction and operation are conducted to minimize waste generation and substances released	ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT, Part II, Div. 2
	Forest and Prairie Protection Act Part II	Debris Disposal			Sec. 15,16, 21(1)a, 21(2)
	Mines and Minerals Act	Conventional Oil and Gas	Regulations Respecting Petroleum and Natural gas Agreements	• To ensure that disturbance land is satisfactorily reclaimed to an acceptable environmental standard	Part 5, Sec. 93
	Public Lands Act	License of Occupation Regulations Public Lands Pipeline Regulations			Sec. 19(c)/Letter of Authority/Schedule'A'
	Conservation and Reclamation Regulations	Conservation and Reclamation Plan		• Minimize negative impacts of development to the environment	Sec. 7, 16,17 Sec. 21,22, 23, 30 (Public Lands Pipeline Regulations)/Part II, Pipeline Installation Lease
	Municipal Government Act	Regional Land use Policies Development Permit			Mineral Surface Lease Regulations
	EUB Acts and Regulations	Drilling Waste Guidelines, plus many others	G-50 Guidelines, Drilling Waste Disposal.		
				• Protect soil and water table from excessive loading of contaminants • Ensure company drilling wastes meet ERCB G-50 guidelines	Information Letter 96-13

PEATLAND SECTOR

1. Facilities					
1a. Facilities (Air)		Air Monitoring Directive Alberta Stack Sampling Code			
1b. Facilities (Water)		Alberta User Guide for Waste Managers			
1c Facilities (Terrestrial)	Environmental Protection And Enhancement Act Public Lands Act Forest and Prairie Protection Act Part II, Land Surface Conservation and Reclamation Act. Municipal Government Act	Approvals for Division 2 Surface Materials Regulations License Occupation Regulations Miscellaneous Lease Regulations The Resource Handbook. Resource Road Planning Guidelines. Debris Disposal Conservation and Reclamation Plan Development Permit Alberta Native Plant Council – Guidelines for Rare Plant Surveys		• Ensure that the disturbed land is returned to an equivalent land capability • To ensure that substances released to the environment are within standards • Ensure development of facilities is on suitable lands	ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT, Part 2, Div.2 Sec. 19(c)/Letter of Authority/Schedule'A' Sec. 12
2. Field Operations					
2a. Field Operations (Air)					
2b. Field Operations (Water)					

2c Field Operations (Terrestrial)	Environmental Protection And Enhancement Act	Environmental Protection And Enhancement Act approval for a Peat operation if EIA required	For deep peat, (>40 cm) not required to salvage surface soils. For thin peat (<40 cm) The operator shall salvage min. of 15 cm	• Ensure that the disturbed land is returned to an equivalent land capability • To ensure that substances released to the environment are within standards	ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT, Part 2, Div. 2
	Public Lands Act	License of Occupation Regulation Surface Materials Regulations The Resource Handbook, Resource Road Planning Guidelines,	Rights and Duties of the Operator	• Ensure development of access is coordinated • Minimize environmental impacts of development and use • Minimize negative impacts of development to the environment	Sec. 19(c)/Letter of Authority/Schedule'A' Sec. 7,16,17(License of Occupation Reg.)
	Forest and Prairie Protection Act. Part II	Debris Disposal			
	Conservation and Reclamation Regulations	Conservation and Reclamation Plan		• Protect soil and water table from excessive loading of contaminants	Sec. 15,16
3. Transportation					
3a. Transportation (Air)					
3b. Transportation (Water)					

3c Transportation (Terrestrial)	Public Land Act/ Weed Control Act. Environmental Protection And Enhancement Act Forest and Prairie Protection Act Part II Motor Transport Act. Highway Vehicle Act.	License of Occupation Reg. Resource Road Building Guidelines. Integrated Resource Management Plans. Debris Disposal License of Occupation Roads		• Ensure development of access is coordinated • Minimize environmental impacts of development and use • Minimize negative impacts of development to the environment	Sec. 7,16,17(License of Occupation Reg.) Sec. 12, 12.1, 31 Environmental Protection And Enhancement Act, Part 2. Div. 2 Sec. 15, 16 Part II Sec. 10

GENERAL (APPLIES TO ALL SECTORS)

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline/Objective
A. Fisheries and Fisheries Habitat		Fisheries Habitat Protection Guidelines	Fisheries Management uses and distributes 15 Fisheries Habitat Protection Guidelines, each 3-15 pages in length, containing sections on Intent, Guidelines, Background, Implementation, and Legislative References. The subjects covered are: 1. Geophysical Operations 2. Wellsites (Oil and Gas Industry) 3. Pipeline Construction & Stream Crossings 4. Vehicular Access Across Watercourses 5. Extraction of Sand & Gravel From or Near Watercourses 6. Timing constraints on Construction In and Around Watercourses 7. Timber Harvesting and Fish Habitat 8. Salmonid Fishway Design Criteria 9. Gold Extraction and Fish Habitat 10. Water Intakes: Screening Requirements for Fisheries 11. Feedlots 12. Oil Spill Exercises 13. The Painting of Bridges Over Watercourses 14. Handling Oil Spills 15. Use of Explosives in Water
	Fisheries Act (Canada)		• Sec. 26. (1) "One third of the width of any river or stream … shall be always left open." • "No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat." • Sec. 35(1): Unless authorized as per sec. 35(2) (HADD) • Allows for the authorization by the minister, or under regulation of the alteration, disruption or destruction of fish habitat. • Sec. 36(3): Unless authorized as per sec. 36(4), "no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water." • Various sections of the Fisheries Act require protection of fish and fish habitat, or replacement of lost fish habitat through, for example, requirements for fishways, fish guards and screens, and protection from pollution.
		Fish and Wildlife Division Strategic Plan (April 1991)	Comprehensive document outlining the mission, goals, and values for fisheries and wildlife resources and their use, explicit objectives for each goal and activities to pursue each objective. (27pp. excluding figures and tables).
A. Fisheries and Fisheries Habitat (Cont.)		Fort McMurray-Athabasca Oil Sands: Subregional Integrated Resource Plan	***Note**: The Federal Fisheries Act and the federal Policy for the Management of Fish Habitat Are referenced in the SIRP advocating the protection of fish habitat and the Policy of "no net loss" of fish habitat. The Broad Fisheries Objectives of the SIRP are, for the most part, general in nature and I have listed only those which may be of some relevance to the CEA exercise:* To maintain and enhance existing aquatic habitat suitable to support productive fish populations. To maintain healthy fish populations and fishery production at least to their current levels, and to enhance them wherever possible.

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline/Objective
			To maintain and enhance the existing variety and distribution of fishing opportunities with emphasis on naturally producing populations. To develop new fishing opportunities, where possible, to meet increasing demand. Sec. 3.8. BG5 "Unrestricted legal public access to water bodies containing fishery resources will be maintained."
		Oil Sands Mining : End Land Use Committee	Pre-disturbance fish bearing capability will be reestablished.
		Management of Fish Habitat	Policy For the Management of Fish Habitat. A 28 page publication listing sections of the Fisheries Act that pertain to fish habitat protection and explaining.
		Aquatic Vegetation Cutting (2pp. + 21 maps)	Conditions & lake maps for in –water vegetation removal for swimming or boat access in front of cottage lots and community beaches.
		Fish & Wildlife Policy for Alberta (1982)	"…to ensure that fisheries populations are protected from severe decline and that viable populations are maintained." "The Division will prohibit the unauthorized release of fish, whether they be native or non-native species to Alberta, in order to protect provincial interests." • Arrangements for subsistence fishing by Indian people were included in treaties and affirmed in the Constitution Act, 1982. The sparrow decision (1990, Supreme Court of Canada, has affirmed the limits that can be applied to subsistence fishing rights.
		A Fish Conservation Strategy for Alberta, 1997-2005	1. Habitat maintenance goal: "Restore and maintain the productive capacity of fish habitat, and where possible and appropriate, increase the amount of productive fish habitat." Three objectives: a) Protection - " Maintain the productive capacity of habitats to support healthy and diverse fish resources" b) Rehabilitation – "Alleviate or reverse adverse impacts on the productive capacity of habitats and repair damaged habitats to restore productive capacity." c) Development - " Enhance fish habitats in areas where the production of fish resources can be increased and maintain the aesthetic qualities of these sites." 2. Fish Conservation Goal: " Restore and maintain the abundance, distribution and diversity of fish through natural reproduction." Three objectives: a) Production maintenance - " Maintain the abundance and diversity of fish at the carrying capacity of the habitat." b) Production restoration - " Restore diminished fish production to full production wherever possible." c) Production enhancement and development – " Enhance or develop new fish production wherever appropriate and possible" Guiding Principles: 1. "No net loss of the productive capacity of habitats" 3. "The biological diversity of the fish fauna is to be maintained, and the depletion or extirpation of species, populations, sub-populations or unique strains must be avoided." 7. "Public access should be provided and maintained to waters producing publicly-owned fish."

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline/Objective
	The Alberta Guide to sport Fishing Regulations		
	Alberta's Walleye Management and Recovery Plan		
	Alberta's Arctic Grayling Management and Recovery Plan		
Fisheries Act		DFO: Policy for the Management of Fish Habitat (1986)	2.1 "Increase the natural productive capacity of habitats for the nation's fisheries resources…" "…long-term policy objective is the achievement of an overall net gain of the productive capacity of fish habitats. …. This policy objective is applicable to all threats to the productive capacity of fish habitats, including water pollution, acid rain, biological agents, and any type of physical disruption." 2.2 "Maintain the current productive capacity of fish habitats supporting Canada's fisheries resources…" "The conservation goal will be implemented using the no net loss guiding principle…" 2.2.1 "Under [the no net loss principle], the Department [DFO] will strive to balance unavoidable habitat losses with habitat replacement on a project-by-project basis so that further reductions to Canada's fisheries resources due to habitat loss or damage may be prevented."
	Navigable Water Protection Act		

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline/Objective
B. Wildlife and Wildlife Habitat		Fish & Wildlife Policy for Alberta (1982)	"..to ensure that wildlife populations are protected from severe decline and that viable populations are maintained." "The Division will prohibit the unauthorized release of any wildlife, whether they be native or non-native species to Alberta, in order to protect provincial interests."
B. Wildlife and Wildlife Habitat (Cont.)		Fort McMurray-Athabasca Oil Sands: Subregional Integrated Resource Plan	*Broad Objectives - SIRP* To maintain, and, if possible, enhance the diversity, abundance and distribution of wildlife resources for Native subsistence, recreation and commercial benefits. Such resources include the following: 1. Black Bear – To maintain, within the current range of distribution, the current fall population of 300 black bears and encourage greater harvests to increase recreational benefits beyond the current level. 2. Ungulates – To maintain the current wintering population of 200 deer. To maintain habitat to support, throughout the current range of distribution, a wintering population of 2000 moose. 3. Bird Game – To maintain current average populations of bird game, recognizing that some of these populations are highly cyclical. 4. Furbearers – To maintain upland and aquatic habitats required to retain the current furbearer populations. 5. Rare and endangered species – To protect wildlife considered sensitive to disturbance or environmental change and to promote increased populations and distribution of species considered rare or endangered.
General (Cont.) B. Wildlife and Wildlife Habitat (Cont.)		Fort McMurray-Athabasca Oil Sands: Subregional Integrated Resource Plan (Cont.)	*RMA Specific Objectives* i) Athabasca-Clearwater RMA To maintain the limited waterfowl habitat found in this RMA. To maintain and enhance moose habitat to support at least 225 wintering moose, up from the current population of approximately 100. ii) Mildred-Kearl Lakes RMA To maintain moose habitat and to rebuild the wintering moose population to at least 430 animals from the present population of approximately 360. To maintain, or replace at another site(s) the waterfowl and fisheries habitat of Kearl Lake. iii) Stony-Birch RMA To maintain the limited number of waterfowl found in this RMA. To maintain the moose habitat and to rebuild the wintering moose population to at least 575, from the present population of approximately 280 moose. To maintain habitat that will continue to support the transient caribou that wander into the area from important caribou range nearby.
		Fish and Wildlife Division Strategic Plan (April 1991)	Comprehensive document outlining the mission, goals, and values for fisheries and wildlife resources and their use, explicit objectives for each goal and activities to pursue each objective. (27pp. excluding figures and tables).
		Oil Sands Mining : End Land Use Committee	1. Reclamation should ensure the evolution of productive natural ecosystems with the objective of reestablishing a diversity and abundance of wildlife habitat types and qualities consistent with pre-

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline/Objective
			disturbance levels. Oil Sands reclamation shall comply with the wildlife objectives of the Fort McMurray-Athabasca Oil Sands *Subregional Integrated Resource Plan.* Relevant objectives of the Plan, including wildlife habitat and population objectives for black bear, deer, moose, bird game and furbearers, shall be incorporated into all reclamation planning.
C. Transportation		Fish Habitat Protection Guidelines for Stream Crossings	This 41 page joint publication of Alberta Transportation and Utilities and Alberta Forestry, Lands and Wildlife (1992) provides planning and construction guidelines for AT&U and others so that fish habitat is protected and maintained when road crossings are constructed.
		Fort McMurray-Athabasca Oil Sands: Subregional Integrated Resource Plan	4.3 Gregoire Lake RMA 4.3. *Access and Infrastructure*, Guideline 1: "Except for direct water access, additional roads or other kinds of linear development will not be permitted within 100m of the established high-water mark of the lake, and will have a line-of -site limited to 200m."
		Habitat Management Standards for Rollback to Control Access	1p. of guidelines.
D. Water Usage		Freshwater Intake End-of-Pipe Fish Screen Guidelines	Freshwater Intake End-of-Pipe Fish Screen Guideline. A 27 page publication showing how to install screening that meets federal requirements that fish not be harmed by water intakes.
		Fort McMurray-Athabasca Oil Sands: Subregional Integrated Resource Plan	3.7. BG7 "Water quality and quantity monitoring programs will be maintained to ensure that data are available on which to base management decisions."
E. Wildlife	Wildlife Act *Alberta Regulation 143/97 Wildlife* Schedule 6: Endangered Species *Part 1: Endangered Animals*		Categorized as "Endangered" – whooping crane, peregrine falcon Categorized as "Threatened" – woodland caribou, northern leopard frog, and trumpeter swan. (of those wildlife species designated officially as endangered-threatened in Alberta, these are the five that may potentially be found in the Fort McMurray area)
		Status of Alberta Wildlife 1996 Based on AEP policy and one of its designated core businesses – "the conservation in perpetuity of Alberta's fish and wildlife resources." Also one of the AEP performance measures.	Status of Alberta Wildlife 1996 Based on AEP policy and one of its designated core businesses – "the conservation in perpetuity of Alberta's fish and wildlife resources." Also one of the AEP performance measures.
		Alberta's Woodland Caribou Conservation Strategy	The strategy development committee has sought to develop a strategy among its multi-stakeholder group that would result in "healthy caribou populations in perpetuity throughout Alberta's caribou range." *Broad Habitat and Population Goals:* Maintain 3.000 – 5,950 animals over 100,000 km^2 of suitable habitat in the boreal forest.

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline/Objective
		NERSC – Land Use Strategies for Industrial Activity in Key Caribou Areas of the Northeast Boreal Region	<u>General Guidelines</u> *Peat Harvesting:* encourage companies to locate outside key caribou areas. *Oil/Gas, Timber Harvesting: early* in and early out during winter operations, suspend activities between March 1 and June 15, access management to minimize habitat alteration and human disturbance. *Seismic Activity: use* of low impact seismic to retain wildlife values.
		Procedural Guide for Petroleum and Natural Gas Activity on Caribou Range (Attachment 1. to information letter 91-17)	"Petroleum and natural gas exploration and development activities can occur on caribou range, provided the integrity of the habitat is maintained to support its use by caribou"
		DRAFT Policy for Managing Alberta's Peatlands and Non-settled Area Wetlands	*General*: the intent of the policy with respect to peatlands is to 1. ensure representative rare and unique peatland ecosystems are set aside; 2. allow use of peatlands where social and economic benefits outweigh the loss of wetland values and functions; 3. minimize and mitigate the adverse effects of development on peatlands and their watersheds. Issues of concern include lack of current policy, demand for horticultural peat deposits, increasing activity of oil/gas, expansion in Oil Sands mining area, transportation/utility, and drainage for timber harvesting.
F. Protected Areas	Natural Heritage Act	Alberta Environmental Protection Guidelines	Protection of the ecological integrity, recreational resources, and scenic values of designated protected areas Policies for Protected areas and Recreational Resources
	Special Places 2000		To protect up to 12% of level one natural history themes in each of the natural regions of the province
		Ft. McMurray Athabasca Oil Sands Subregional Integrated Resource Plan - Ecological Resources - Recreation Resources	Ecological Resources: • To protect representative, significant and unique examples of the natural features, landscapes and ecosystems of the Boreal Mixed wood Ecoregion. • To provide for the recreational, scientific or educational use of ecological resources, yet ensure that features are maintained in a natural state. • To manage and protect areas with significant recreation and tourism capability. • To promote private sector development of wilderness recreation and tourism opportunities, with emphasis on wildland adventure experiences (e.g. hunting, fishing, river touring, trapline tours, photography and wildlife viewing). • To promote a range of appropriate extensive recreational and tourism opportunities focusing on the lakes and rivers, but within the biological and physical capability of the resources. • To maintain and expand, where appropriate, government or privately provided recreation and tourism-related facilities such as campsites, day-use sites, viewpoints and boat launches.
		Athabasca Clearwater Resource Management Area	1) Recreation Resources/ Mineral, Surface Material resources: a) Development activity permitted within or immediately adjacent to this RMA must not disturb or adversely affect La Salin Natural Area (N ½ 15 and E1/2 21, 22, Twp 93, Rge. 10, W4M). These lands are protected under an Order In Council as a conservation Natural Area. b) Development proposals will mitigate adverse impacts on the nationally or provincially significant

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline/Objective
		Athabasca Clearwater Resource Management Area (continued)	natural features identified in the following areas. The level of protection for each site will be determined through interagency review. 2) Nationally Significant: a) Athabasca River Tar Sands Reach (Twp. 95, Rge. 11, W4M) 3) Provincially Significant: a) McClelland Lake Patterened Fen (Twp. 97, Rge.9 and 10, W4M, and Twp. 98, Rge. 9, W4M) b) Eymundson Sinkholes on Pierre River (Twp. 98, Rge. 11, W4M) c) Ellis River – Oxbows and diverse vegetation (Twp. 95, Rge. 11 and 12, W4M) d) Firebag River – Landform Diversity (Twp. 98, Rge. 7, W4M) e) Clearwater River – Candidate Heritage River (Twp. 89, Rge. 9, W4M and Twp. 88, Rge. 7 and 8, W4M) These sites will be reviewed for their candidacy for formal designation. In the Clearwater River valleys, McClelland Lake wetland and the McKay tributary adjacent to Fort McKay, Oil Sands development using surface-mining techniques is not permitted. Within the remaining "tributaries" of the RMA, surface mining will be considered only where the proponent clearly demonstrates that efforts are being made toward applying mitigative measures and reclamation procedures that reflect the higher sensitivity of these areas.
Protected Areas		Athabasca Clearwater Resource Management Area	Experimental and commercial Oil Sands recovery, using in situ techniques, maybe considered on a site-by-site basis within the Athabasca and Clearwater river valleys, associated tributaries and the upland drainage basin of the McClelland Lake wetland. In situ development in the Clearwater River valley is not encouraged because of the area's potential for future recreation development. If it does occur, it should adhere to Access and Infrastructure guideline #4, in Subsection 4.2 ❖ Recreation and Tourism: ➢ visual and acoustic aesthetics. Minimize impacts of developments upon river users and recreationalists using the river as a travel corridor. ➢ characteristic valley horizon – maintain or restore ❖ Ecological: ➢ unique physical river valley characteristics (e.g. springs) ➢ rare flora and fauna ➢ critical ecological functions and processes
	Clearwater River	F&W guidelines for water resources referrals for the Water Management Division, NEB Region: pipelines, culverts, and bridges on flowing waters. To be replaced (in 1999) by (Draft) Codes of Practice under the soon to be proclaimed new Water Act	❖ Three (draft) Codes of Practice will stipulate the detailed requirements that must be followed under the new Water Act. These Codes contain many measures to protect fish and fish habitat and will replace permits presently issued under the Water Act. The Codes are: ➢ Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines. ➢ Code of Practice for the Placing, Constructing, Installing, Maintaining, Replacing or Removing a Watercourse Crossing. ➢ Code of Practice for Pipelines and Telecommunication Lines Crossing a Waterbody.
		Mildred Kearl Lake Resource management Area	Ecological Resources Recreation Resources: 1. To promote opportunities for recreation and tourism activities (e.g. services, facilities and interpretation) along provincial highways. 2. To maintain the recreation potential of the Fort Hills (located within Twp. 97, Rge. 10 and 11, W4M). Any activity adjacent to La Saline Natural Area (N1/2 of 15, E1/2 of 21 and 22, Twp. 93, Rge. 10, W4M) must

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline/Objective
			not disturb or adversely affect this provincial ecological resource.
	Natural Heritage Act	Ecological Resources	3.1 IRP, objectives
		The Boreal Natural Region of Alberta (1998)	
	Public Lands Act	Reservations	17(d). Protect sites for Special Purposes Examples: Disposition Reservations(DRS), Protective Notations(PNT), Consultative Notations (CNT)
G. Industrial Activities		Fort McMurray-Athabasca Oil Sands: Subregional Integrated Resource Plan	3.4. Broad Guidelines (BG).1 "…Wherever possible, linear development will not occur parallel to rivers within the valleys or within 100m of the top of the valley breaks…"
	Mines and Minerals Act 32/90	Energy Exploration	Part 10. Ensure exploration activities have minimal impact on the environment and provides a record of who uses the land
		Fort McMurray-Athabasca Oil Sands: Subregional Integrated Resource Plan Fort McMurray-Athabasca Oil Sands: Subregional Integrated Resource Plan (continued)	4.1 Fort McMurray Fringe RMA 4.1. *mineral and surface material resources*, Guidelines: "Commercial development of Oil Sands, using surface-mining techniques, is not permitted." "Impacts of mineral developments on aesthetic and wildlife values will be minimized by; limiting the line-of-site on access trails to 200m, retaining a vegetation buffer between the development site and public roads; and clearing the site in an irregular shape." 4.2 Athabasca-Clearwater RMA 4.2. *Mineral and surface material resources,* Guidelines*:* • "Seismic and other mineral exploration in the Athabasca and Clearwater river valleys and their tributaries shall maximize use of existing access or use portable equipment on hand cut lines not exceeding a width of 1.5m. Where this width is not sufficient to allow evaluation of the mineral resources or of geological structures, construction of new access, not exceeding a width of 3m, will be considered at the time of application. This guideline will apply except within areas approved for logging over the subsequent 5 years." • "…Instream gravel production is not permitted. Sand and gravel operations require a 50m buffer from the high-water mark of any river..." 4.3 Gregoire Lake RMA 4.3. *Mineral and surface material resources*, Guidelines: 2. "No surface mining or quarrying will be permitted in this area." • "No major facilities will be permitted in this area." 4. "A 400m, buffer shall be provided from the high water mark of Gregoire Lake for wellsites and infrastructure."
		F&W Surface Disposition (and operating condition) Guidelines.	Conditions (& explanations) to apply to routine applications for industrial land use activities. 6pp.

Resource Sector (Activity)	Acts/Regulations	Policy/Guidelines	Guideline/Objective
		Guidelines and Conditions for Exploration Approvals on Water covered Areas.	Describes which kinds (and locations) of bed and shore may have seismic drilling. 3pp. (Memo from Fregren Nov. 1/89)
		Oil Spill Exercise Criteria Requiring No Approvals	Criteria to be met for spill exercises to occur without approvals. 1 p. letter.
		AlPac Timber Harvest Planning and Operating Ground Rules (1993)	1. Wildlife Habitat Planning 1.1. Wildlife Zoning 1.1.1. The FMA will be stratified into wildlife habitat management zones which will be mapped and will have specific guidelines for harvest planning and operations (established for moose, caribou, valley habitat and other specialized habitats). 1.1.2. General Habitat Management The intent is to maintain viable populations of all indigenous wildlife species, with good geographic distribution throughout the FMA. *General Guidelines:* There are a number of general habitat guidelines that deal with retention of large diameter trees and snags; unmerchantable stands; cutblock size and configuration; lines of sight, restricting motorized access, thermal cover for ungulates; retention of mature and over-mature timber; wildlife movement corridors; retention of smaller stands (<5 ha) surrounded by riparian meadow or shrublands. 1.1.3. Moose Zone Management Objectives: 1.1.3.1. To optomize benefits from any habitat enhancement opportunities resulting from ogging. 1.1.3.2. to manage access in a more restricted fashion to control harvest of moose by hunters. 1.1.3.3. to retain thermal hiding cover adjacent to abundant browse supplies. *Guidelines:* Include reference to height of regenerating cutblocks before subsequent passes; cutblocks designed to limit line-of-sight adjacent to long-term roads; cutblock width and distance to thermal cover; scheduling of harvesting operations. 1.1.4. Caribou Zone: General Guidelines: Include maintaining bog and fen habitat in a contiguous pattern; protection of upland terrestrial lichen sites adjacent to bogs; access controls (January 15 – April 30) in known caribou range; removal of access after harvesting program. 1.1.5. Valley Habitat Zone *Management Objectives:* to maintain and/or enhance the habitat diversity, and the unique and seasonally important habitats commonly associated with watercourses and riparian areas. to provide wildlife species diversity, seasonal concentrations and critical period use often associated with these areas. 2. Road Planning 3.1 Roads will be planned to avoid key wildlife areas (e.g., riparian habitat areas, open meadows, etc.)

Others		Fort McMurray-Athabasca Oil Sands: Subregional Integrated Resource Plan	3.9. BG4 "Priority will be given to the management and protection of the habitats and populations of rare and endangered species." 4.1 Fort McMurray Fringe RMA 4.1. *Agriculture*, Guideline 1: "Future market gardening will be developed only on Canada Land Inventory Class 3 soils for individual leases not exceeding 8.1 ha; a 100m undisturbed buffer is to be maintained along the edge of a river." 4.2 Athabasca-Clearwater RMA 4.2. *Settlement*, Guideline 2: "The sale of public land is not permitted in the RMA." *4.2. Access and Infrastructure*, Guideline 1: "… All riverbank disturbances shall be mitigated through reclamation procedures and landscaping techniques to minimize erosion and negative visual effects." 4.2. *Agriculture,* Guideline 1: "Agricultural activity is not considered compatible with the intent of this RMA." 4.2. *Recreation and tourism*, Guideline 1: "Except for recreation purposes, no surface access leading to disposition , will be permitted within 200m of the river shoreline on lands identified for a proposed provincial recreation area within the Fort Hills (Twp. 97, Rge. 10-11, W4M)." 4.3 Gregoire Lake RMA 4.3. *Agriculture,* Guideline 1: "Agriculture activity is not allowed within this RMA."

APPENDIX 2D. PROVINCIAL REVIEW OF OIL SANDS APPROVAL PROCESSES

Exploration

(Shown in Figure 1.) The provincial approval process for oil sands mining has been streamlined with a new code of practice, which replaces the approvals previously required under the *Alberta Environmental Protection and Enhancement Act* (EPEA). However, surface access approval must still be obtained from the landowner or occupant under the *Public Lands Act.* (The code of practice cannot authorize access onto the land.) Under the code of practice, all programs require plans to be prepared and discussed with field inspectors.

Crown Mineral Disposition Review Committee (CMDRC)

(Shown in Figure 2.) The Crown Mineral Disposition Review Committee (CMDRC) is an interdepartmental committee that reviews all posting requests or applications for mineral rights dispositions. The CMDRC broadly assesses potential impacts of an activity on the environment, and recommends that mineral rights either be granted (with or without conditions) or refused. The environmental aspects considered at this stage include topographic and ground conditions, wildlife and fisheries resources, water resources, natural areas, parks or other protected areas, and historical resources. Restrictions related to land use, access or timing are included in the addendum of the mineral agreement. A contact person is also identified in the addendum to provide the applicant with details on any restrictions.

The CMDRC is the first step in the regulatory regime that addresses environmental impacts and protection. At the time of the review, the applicant submits only a request for the rights, not a project or development proposal.

Alberta Environment and the Alberta Energy and Utility Board Approval Process

(Shown in Figures 3 to 6.) The provincial environmental assessment process is guided by EPEA. A preliminary disclosure showing the concept of the proposed project is reviewed to determine whether the project is consistent with provincial policies and land use plans. Depending on the outcome, the proponent can plan, raise capital and continue to the detailed application stage. Preliminary disclosures are most valuable when land use policies for a particular region are unclear, or government policy with respect to an activity or its scale is unclear.

An environmental impact assessment report may be required to address all environmental issues and to provide government agencies with the information required to decide whether the project is in the public interest. The process provides extensive opportunities for public consultation. After this stage, the proponent can proceed to the subsequent detailed licensing stage.

Energy resource mining projects are subject to review by the Alberta Energy and Utilities Board (Oil Sands Permit Approval Process shown in Figure 6).

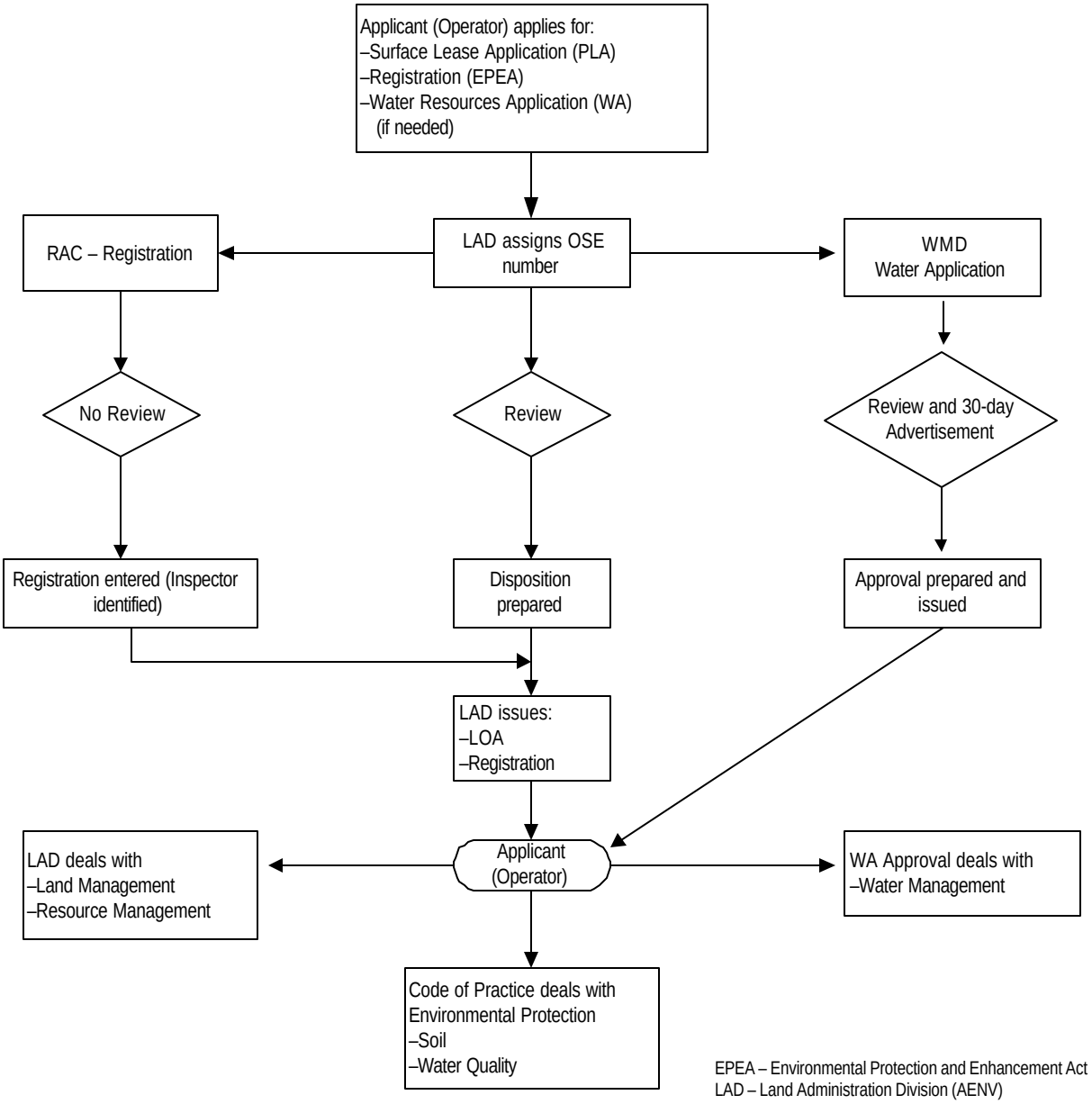
Reclamation Certificate

(Shown in Figure 7.) When a portion of the mine has been reclaimed, the operator may request a reclamation certificate for that part of the mine or the operator can apply after the entire mine site has been reclaimed. The Conservation & Reclamation Inspector (CRI) reviews the application. If it is complete, the CRI will hold an inquiry, which requires both the applicant and the CRI to be on site to review the reclaimed area. If the reclamation is unsatisfactory, the CRI will issue either a notice or an order to complete additional work. Once the area is reclaimed to the satisfaction of the CRI, a reclamation certificate will be issued for that area, and a portion or all of any security deposit may be refunded, depending on whether the site is partially or entirely reclaimed.

EXAMPLE OF THE CURRENT PROVINCIAL REGULATORY PROCESS

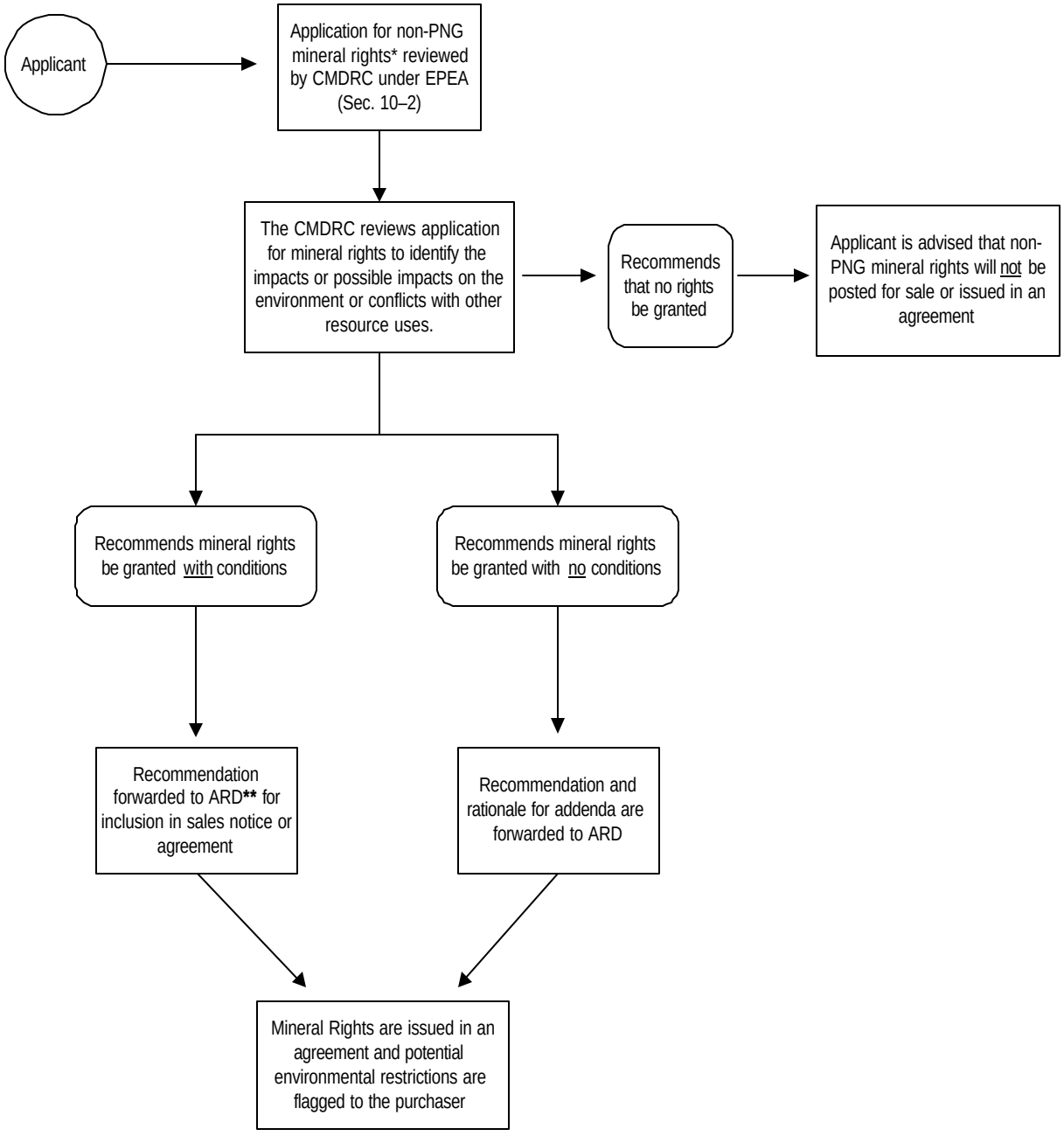
(Oil Sands Mining)

Figure 1. Oil Sands Exploration Referral Process



EPEA – Environmental Protection and Enhancement Act
LAD – Land Administration Division (AENV)
LOA – Letter of Authority
OSE – Oil Sands Exploration
PLA – Public Lands Act
RAC – Regulatory Approvals Centre
WA – Water Act
WMO – Water Management Division

Figure 2. Mineral Rights — Crown Mineral Disposition Review Committee (CMDRC)



*****For non-PNG mineral rights (e.g. coal, oil sands, quarriable minerals, ammonite shell, metallic minerals, salt, etc.) the lands are not normally posted for sale through a competitive bid. Applications are considered on an "as requested" basis.
******ARD – Alberta Resource Development

Figure 3. Development Process

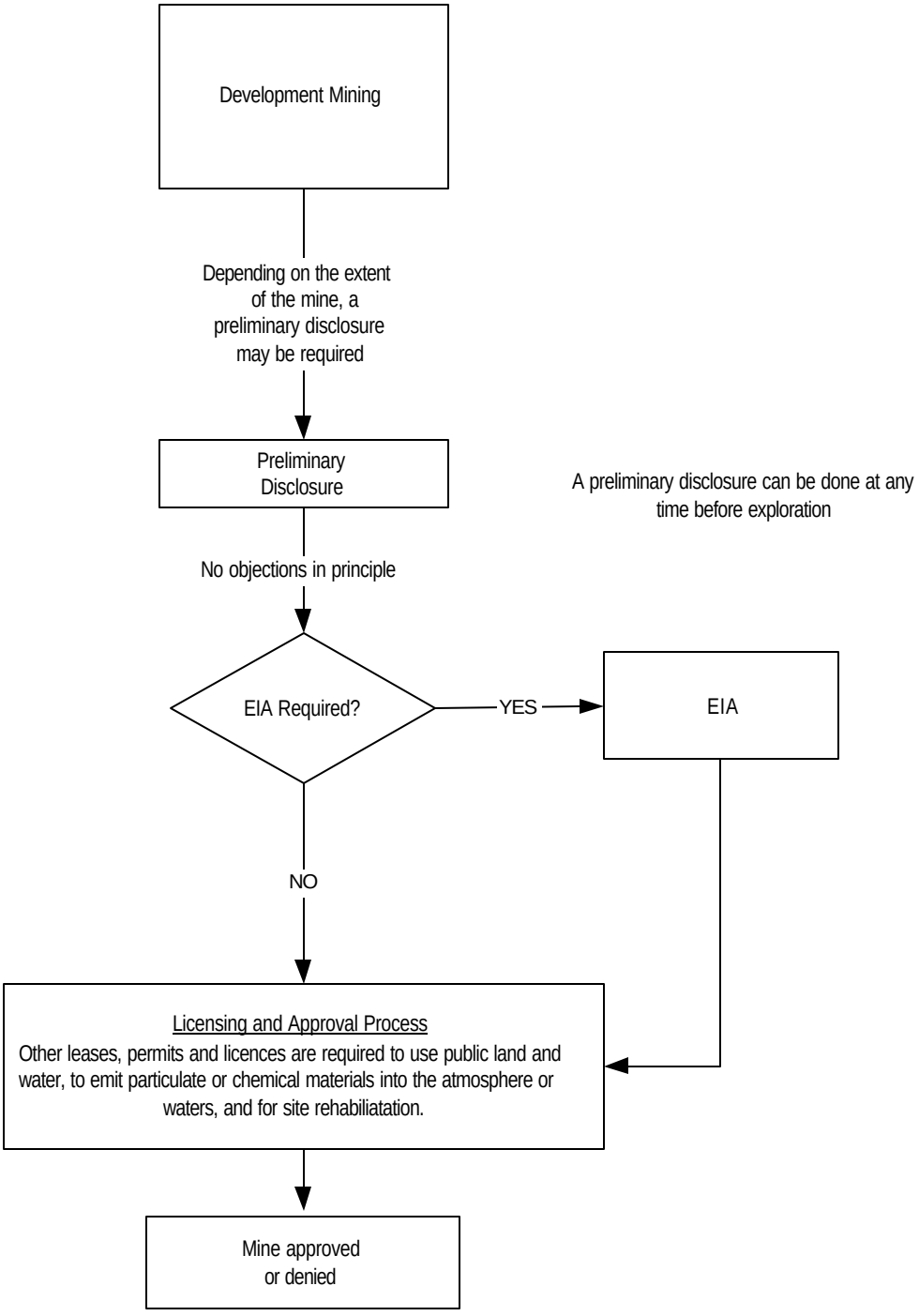


Figure 4. Preliminary Disclosure

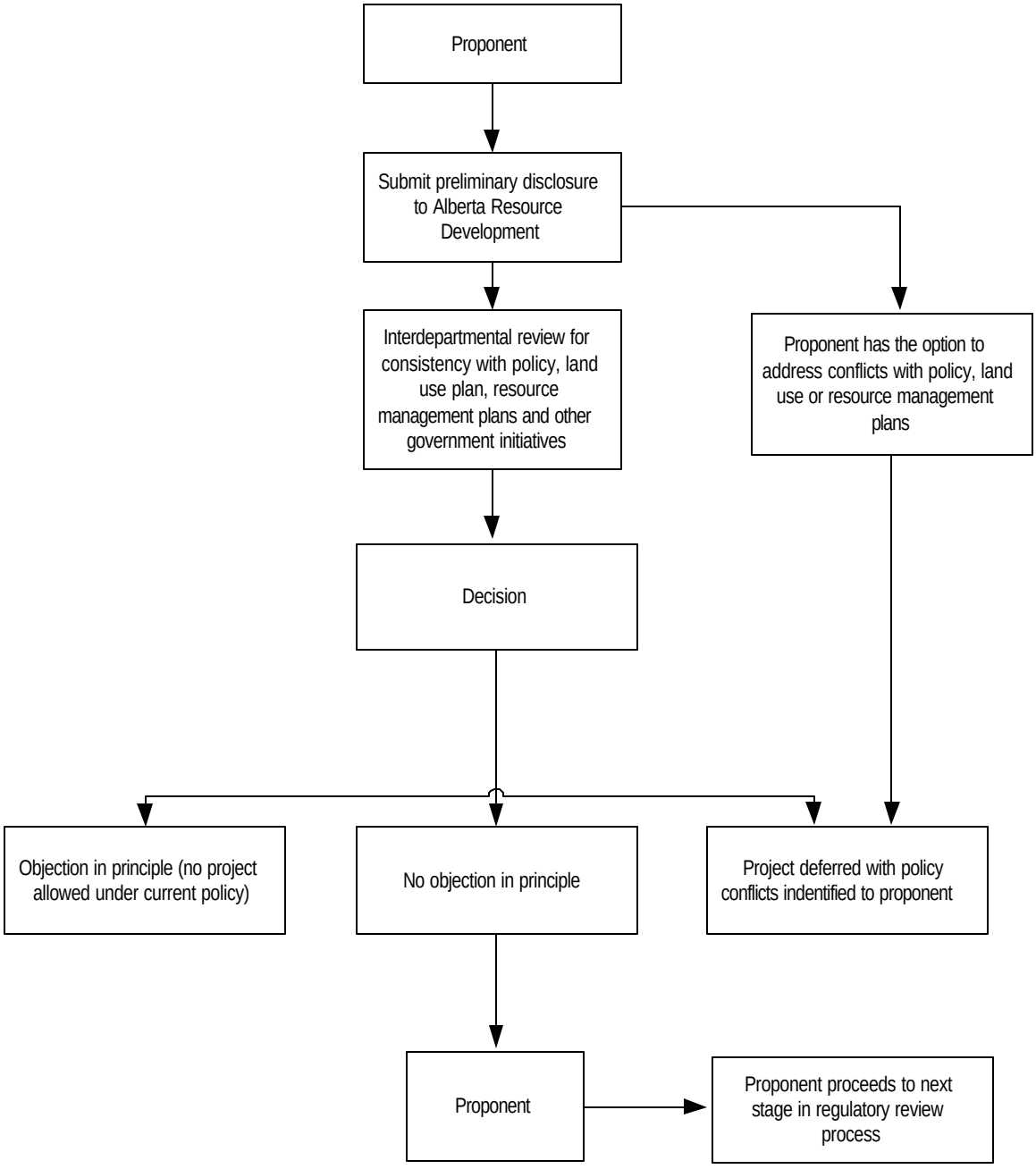


Figure 5. Environmental Impact Assessment (EIA) Process

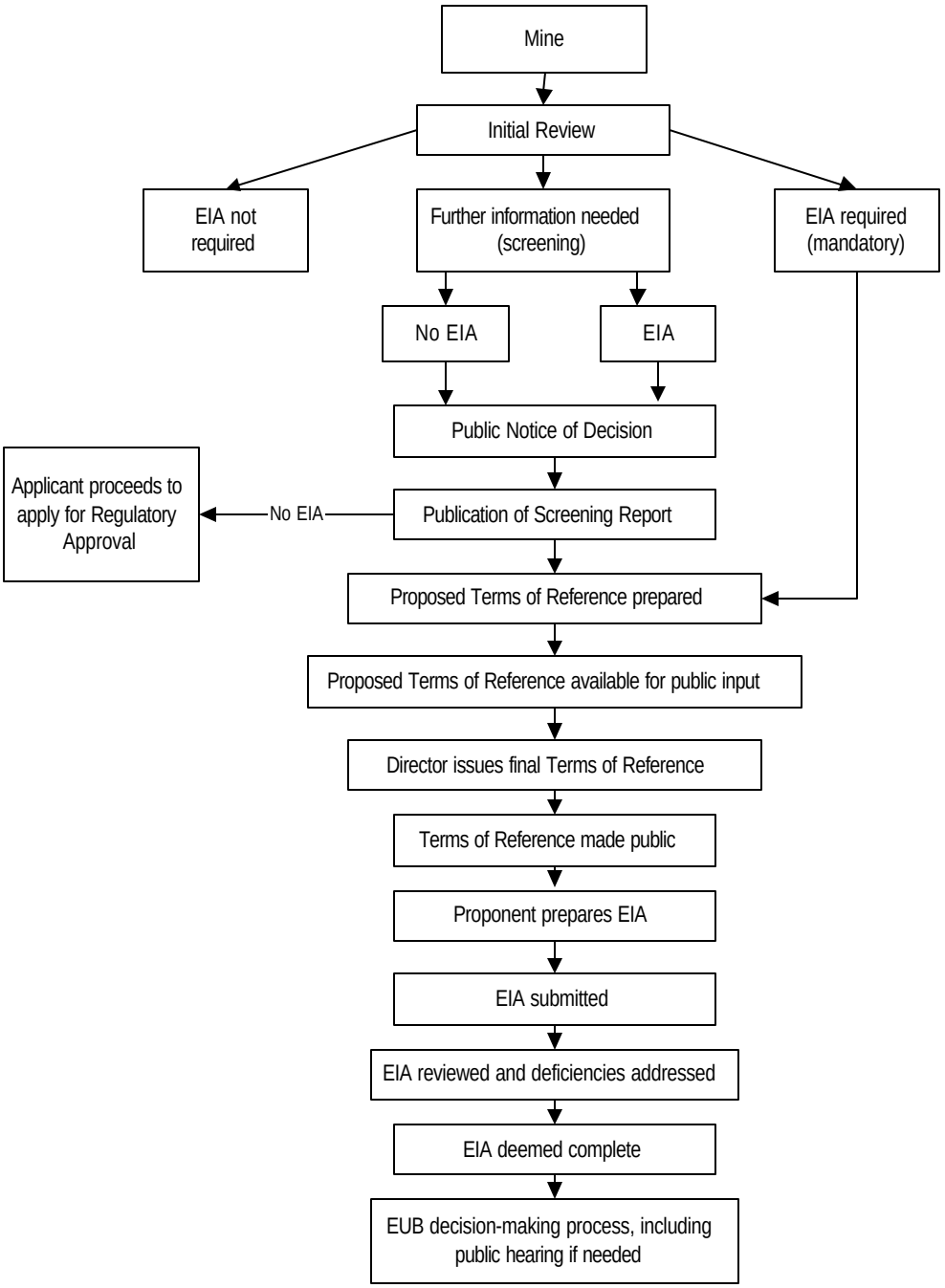


Figure 6. Oil Sands Approval Process

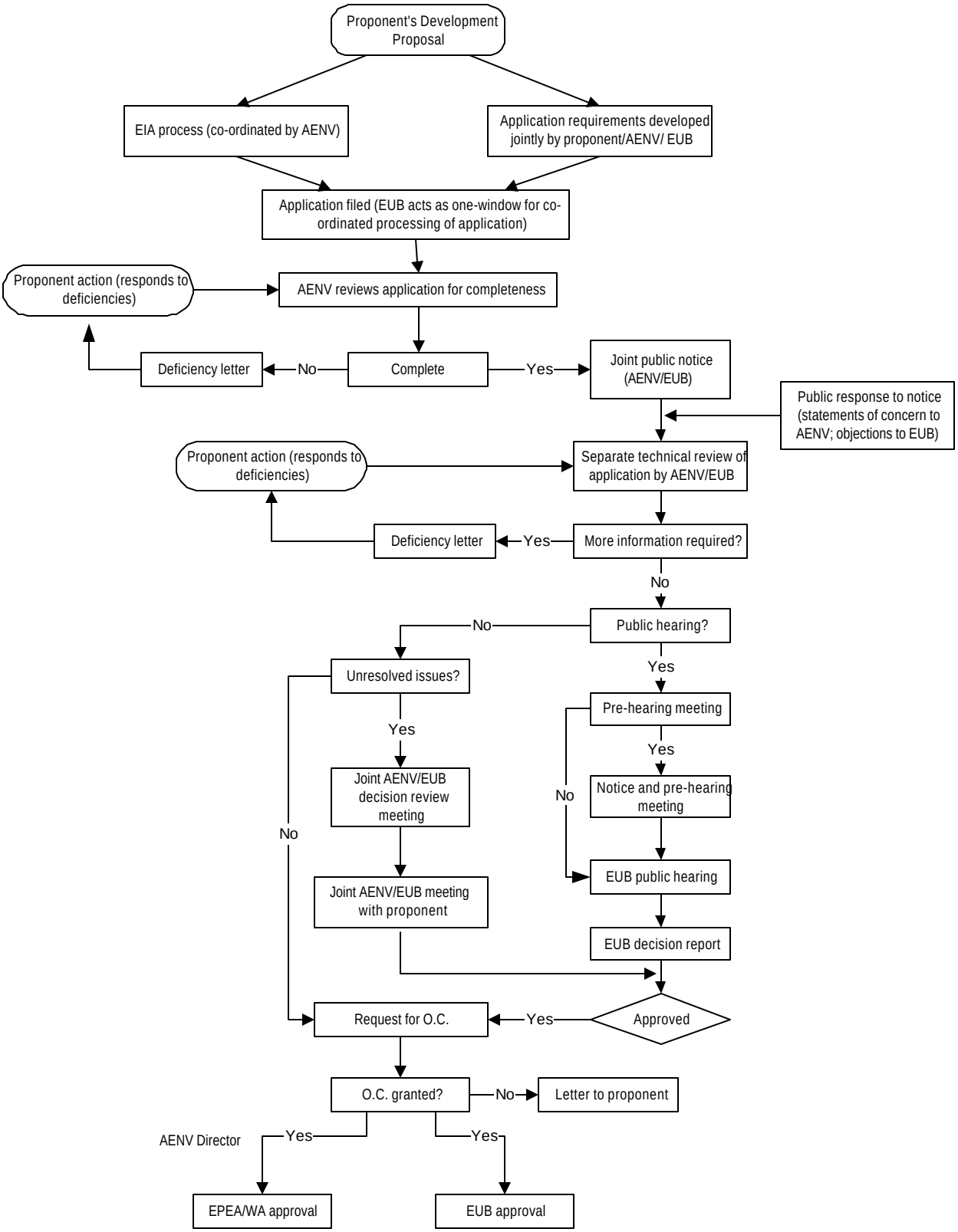
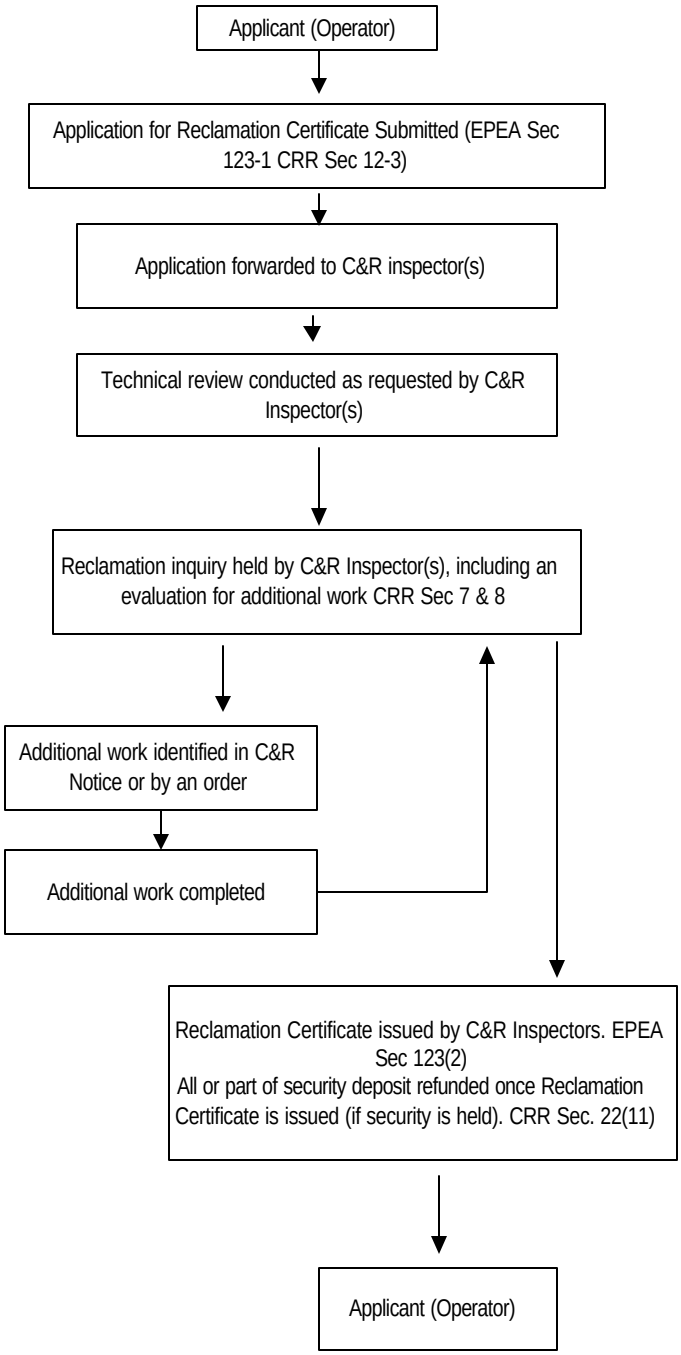


Figure 7. Reclamation Certificate



C&R – Conservatioion and Reclamation
CRR – Conservation and Reclamation Regulation
EPEA – Environmental Protection and Enhancement Act

APPENDIX 3

APPENDIX 3. INVENTORY OF PROGRAMS, COMMITTEES AND INITIATIVES IN THE OIL SANDS REGION

A large number of committees, programs and individuals are currently active in environmental research and management in the Athabasca oil sands area and surrounding region. This Inventory provides a summary description of 67 initiatives which are dealing with a broad range of topics from air and water quality to traditional resource use and reclamation.

The Inventory was conducted to provide an overview of research and monitoring activity in the region, as part of the Regional Sustainable Development Strategy (RSDS) development process. This document also includes committees involved in developing guidelines or recommendations which will affect future research direction. The majority of the information was gathered through a stakeholder survey, with some additional information collected from published documents and the Internet. Representatives from industry, provincial and federal governments, universities, aboriginal communities and non-governmental organisations were asked for their input, as all these groups are involved in conducting and funding activities in the region. The survey requested the following information about each program:

- Mandate and objectives
- When the program was formed
- Who is involved (chairperson, team members)
- Program structure and organisation
- Funding (source, amount)
- Current status of projects or program
- Links to other groups
- How results will be used
- How results are communicated

At this point, much valuable work is being carried out by the numerous committees and programs in the region; however, the linkages among the different groups are not always clear. In order to resolve a specific environmental or resource management issue, it will be necessary to review in greater depth the programs or committees which deal with that issue, including the status of current projects as well as previous results and reports. It will then be possible to identify potential gaps and overlaps among the different activities, and to provide strategic recommendations for improving the coordination and effectiveness of participants.

AIR QUALITY

Wood Buffalo Environmental Association (WBEA)

The Wood Buffalo Environmental Association's mandate is the collection and communication of credible air quality data. The group conducts air quality monitoring and has subcommittees which monitor terrestrial and aquatic ecosystems and work on modeling of ozone in the region. This committee was formerly known as the Regional Air Quality Coordinating Committee (RAQCC), formed in 1989 to address Fort McKay's concerns about air quality in their community. The WBEA name was adopted in January 1998 and the organization became a Clean Air Strategic Alliance (CASA) zone. Its mandate was broadened to provide a "one window' organization that would collect, coordinate, interpret and communicate regional environmental information. The committee includes members from industry, aboriginal communities including First Nations and Metis, municipal and provincial governments and

non-governmental organizations. Decision-making is by consensus and follows the general Clean Air Strategic Alliance of Alberta (CASA) zone design philosophies. Funding is primarily from the oil sands industry, however all members provide in-kind contributions. The 1999 budget is 1.963 million.

WBEA's Ambient Air Monitoring subcommittee operates eight continuous air quality monitoring stations and thirteen passive monitoring stations in the region. The network of stations is made up of 28 analyzers which continually examine such air quality, health and ecological factors as hydrogen sulphide (H_2S), sulphur dioxide (SO_2), oxides of nitrogen (NO_x), carbon monoxide (CO), ozone (O_3), total hydrocarbon (THC), 0 to 2.5 micron particulates ($PM_{2.5}$), acid deposition, wind speed, wind direction, relative humidity and temperature. Sampling is also done periodically for 0 to 10.0 micron particulates (PM_{10}), volatile organic compounds (VOC), polycyclic aromatics (PAHs) and metals deposition. WBEA also oversees the Terrestrial Environmental Effects Monitoring (TEEM) subcommittee which monitors terrestrial ecosystems, streams and traditional resources to detect any changes due to air emissions, as well as the Ozone Modelling Working Group which works to improve understanding of the ground-level ozone situation in the region. Results of all activities are reported through a web site, telephone hot line, presentations, technical papers, advertisements, radio talk shows, brochures, public forums, etc.

Terrestrial Environmental Effects Monitoring (TEEM)

The Terrestrial Environmental Effects Monitoring program conducts long-term monitoring of forest health, soil, stream and vegetation chemistry, and metal content of traditional resources, vegetation and small mammals. Several monitoring programs were established to determine whether air emissions (acid deposition, metals) from the oil sands industry are having an effect on the environment and traditional resource use. The program is managed and administered as a subcommittee of the Wood Buffalo Environmental Association (WBEA).

Membership on the TEEM committee reflects the membership of the WBEA, and includes representation from the oil sands industry, aboriginal communities, non-governmental organizations, and the provincial government. A Science Advisory Board (SAB) with 4-6 members provides the committee with advice on scientific issues reviews results. Funding for 1998 was approximately $360,000, which was provided by industry via the WBEA budget. Currently, TEEM runs five monitoring programs

1. Regional effects of acidifying emissions

This program gathers data on a range of parameters (tree health, tree growth, tree regeneration, soil chemistry, foliar chemistry, ground cover, lichen biodiversity) at 21 forest sites. There are 10 jack pine and 11 aspen sites, with high and low deposition sites selected for each forest type. An assessment of tree health is conducted every year, while the other parameters will be sampled every 5 years for the next 65 years. Passive monitors for acid deposition will be installed at a subset of the 20 sites to validate predicted models of deposition. Jack pine sites were sampled in 1998 and aspen sites will be sampled in 1999.

2. Spring acid pulse

The Steepbank, Muskeg and Firebag rivers are being sampled during spring snowmelt to detect and document episodes of acidification. A spring acid pulse has not been observed every year, and it is believed the phenomenon depends on weather conditions during fall freeze-up. Datasondes record hourly temperature, pH, conductivity and dissolved oxygen and weekly grab samples are also collected for analysis of major ions, etc. This program will continue annually until the frequency and magnitude of spring acid pulse events are understood. This is an AENV/WBEA initiative: program design, analysis and field work are conducted by AENV, helicopter funding is provided by WBEA. Total funding is $30,000.

3. Trace metals in soil, vegetation and small mammals

The trace metal content of soil, vegetation, lichens, voles and mice will be sampled every 5 years, with the next cycle planned for the year 2000. The samples are collected along a line beginning at the processing facilities and ending at distances about 70 km away.

4. Traditional resource use

This program may be designed to measure the trace metal content of plant and animal materials consumed by traditional resource users. The program is still under development. To date, a survey of traditional resource use by the Fort McKay community has been conducted, including the location and time of resource harvesting. From this information, a monitoring program will be designed.

Aerial infrared forest stress survey: This program uses aerial photography to measure infra-red reflectance of the forest overstory as an indicator of the extent and degree of forest stress. This information is verified by visual inspection at selected sites. Coverage is over a 100 km^2 area at a 1:10,000 scale. Surveys have been conducted every 5 or 6 years (1974, 1978, 1984, 1990, 1996, next planned for 2002).

The TEEM program will evolve as technology and understanding improve. As additional issues and concerns arise, new programs may be initiated. The data collected during monitoring surveys is held by industry (or by the consultants?). Summary reports are prepared for the TEEM committee. TEEM is linked to the provincial CASA Ecological Effects Monitoring program and the CFS Forest Health Survey and ARNEWS. As part of WBEA, TEEM is linked with the ambient air monitoring program and the Ozone Modelling Working Group.

Ozone Modelling Working Group (OMWG)

The Ozone Modelling Working Group was established in September 1998 to provide a better understanding of the ground-level ozone situation in the region, through modelling. OMWG is a working group sanctioned by and accountable to WBEA, and their results will contribute to the regional Cumulative Environmental Effects Management process. The committee includes members from industry, provincial and federal agencies, aboriginal communities and environmental organisations. Results are scheduled to be completed by June 30, 1999. The budget for 1999 is approximately $200,000, provided by Syncrude, Suncor and Shell.

The group's objectives are:

- To use modelling to develop a better understanding of ozone formation, transport and dispersion processes specific to the Wood Buffalo region;
- To enhance the capability and capacity for model based prediction of changes in ozone levels in the region in response to changes in emissions;
- To re-evaluate model selection, including model availability and performance;
- To validate the results of modelling by comparing model outputs with monitored data sets;
- To identify available anthropogenic and biogenic emissions data and data gaps;
- To achieve multi-party agreement and common understanding on model assumptions and scenarios;
- To evaluate model input data sets; and
- To fine-tune the model to support the environmental assessments of the projects

The modelling results will help determine the management strategy for ground-level ozone that should be implemented in the region. A report on the modelling results was released in December 1998. Subsequent sensitivity runs will also be released in a report.

NO_x/SO_2 Management Working Group (NSMWG)

In January 1999, the NO_x/SO_2 Management Working Group was formed by the CEEM Partnership with the mandate to design and implement a management system that establishes environmental capacity guidelines, environmental management objectives and an action plan to manage and control regional NO_x and SO_2 emissions associated with oil sands development. This group includes representatives from all stakeholder groups, including First Nations. Decision-making will follow the CASA consensus process and principles. The budget and funding sources have not yet been established.

The working group deliverables are expected to include recommendations on:

1. Science-based environmental capacities for NO_x and SO_2 emissions in the region affected by the oil sands industry;
2. Environmental management objectives that take into account science-based environmental capacities, the precautionary principle with respect to remaining uncertainties and economic impacts on industry and other stakeholders; and,
3. Programs or processes to implement the environmental management objectives including timelines, emissions allocation mechanisms (if necessary), enforcement approaches and stakeholder roles and responsibilities for implementation.

The Working Plan is currently being prepared and the committee's activities and time schedules should be available by April 1999. The first set of deliverables is expected by Dec. 31, 2000. Results will form the basis for regional emissions management, and if needed, for emissions allocation and emissions reduction requirements. Other initiatives in the region, such as WBEA's Ozone Modelling Working Group, and Shell's Expert's Forum on Ozone will be integrated with the Working Group. Much of the work of the CASA Target Loading Subgroup and its draft report will be directly usable by this working group.

Clean Air Strategic Alliance (CASA) Target Loading Subgroup (TLS)

The Clean Air Strategic Alliance is responsible for the strategic management of air quality in Alberta. CASA brings together diverse stakeholder groups to solve air quality problems on a consensus, rather than adversarial, basis. The Alliance includes representatives from government, industry and non-governmental organisations. A Board of Directors appoints Project Teams to address priority issues and develop solutions.

The CASA Target Loading Subgroup (TLS) has completed a framework for the management of acidifying emissions and deposition in Alberta. The framework is built upon the protection of sensitive receptors such as soil and water bodies. The maximum level of deposition, called the Critical Load, is that level of deposition that will not cause long-term adverse effects on the environment. The Critical Load varies from place to place due to differences in the chemistry of soils and water bodies across the Province.

The TLS has selected a Target Load as the management objective; the Target Load is approximately 90% of the Critical Load. Deposition will be maintained at levels below the Target Load – should deposition increase to above this level, management actions geared to the reduction of deposition through emissions management are specified by the TLS. Both the Critical and Target Loads are applied to grid cells; each grid cell measures 1° latitude x 1° longitude. The sensitivity of each grid cell is assigned on the basis of the sensitivity of the receptors (soil and water) within it. Because the estimation of deposition is based upon deposition model prediction, the TLS developed a mechanism to ensure that deposition monitoring and receptor sensitivity are understood before potentially costly emission management actions are implemented.

A Monitoring Load has been established at approximately 70% of the Critical Load. If deposition is estimated (by model prediction) to exceed the Monitoring Load, deposition monitoring and a detailed study of receptor sensitivity are to be conducted. In this way, any management actions will be based upon monitoring and research data, and not solely on the basis of deposition model prediction. The framework is presented and discussed in detail in *Application of Critical, Target and Monitoring Loads for the Evaluation and Management of Acid Deposition*. This document has been accepted by the CASA Board of Directors and by Alberta Environment, and is currently being finalised for printing and distribution.

Atmospheric Impact Research Technical Advisory Group (AIRTAG)

The Atmospheric Impact Research Technical Advisory Group was formed in February 1999 as an advisory group under the CONRAD Environmental Technical Planning Group (TPG). AIRTAG will focus on oil sands air emission research, with the role of establishing and carrying out a research program on behalf of the oil sands industry. The group was formed for three main reasons: 1) very little air emission research is being carried out, 2) no other organization is currently managing oil sands emission research and 3) stakeholder interest in air emissions is escalating. A committee directs activities and reports to the Environmental TPG, and will include members from industry, regulatory agencies and research agencies. The amount of funding has not been set yet but will be provided by industry and government.

The potential objectives of the committee will likely be to:

- Identify current air emission research initiatives concerning the measurement and effects of air emissions in the oil sands region conducted by industry or by existing committees or organisations;
- Review proposals on air emission and make recommendations to the CONRAD Environmental TPG.

Results will be used to improve plant operations, to reduce environmental impacts and to improve stakeholder confidence. AIRTAG will be linked with the other CONRAD advisory groups, TERRE and CEATAG. Affiliations with other groups (i.e. WBEA) have not yet been established. Stakeholder input and communication of results will occur through annual public workshops and reports.

Pond Emission Studies at Suncor

Suncor is conducting research to understand the mechanisms for VOC releases from tailings ponds, in particular their Pond 1. This project was formed after a series of routine pond VOC surveys showed inconsistent results. Funding for this internal Suncor program is variable, but typically around $50,000 to $100,000 per year. Research activities have included annual pond surface emissions studies, aquatic samples and theoretical studies. The results should provide a better understanding of the long term prognosis for tailings ponds.

Regional Air Pollutant Inventory Development System (RAPIDS) Pilot Project

An evaluation of this air emissions inventory software will determine if it is suitable for use in Alberta. The software was originally used in the Great Lakes region. The pilot project will examine how well electronic data transfer will work, how versatile the system is for storing and estimating criteria, toxic and greenhouse gas emissions, and whether modifications will be necessary. Industry and possibly NGO stakeholders would participate in the pilot project. Results of the project could be used to recommend changes to the air monitoring directive.

Acid Deposition Research Program (ADRP)

From 1983 to 1989, the Alberta Government/Acid Deposition Research Program worked to determine whether acid deposition was affecting Alberta's crops, forests, soils, streams and lakes. The ARDP consisted of three research components: 1) Biophysics Research; 2) Southern Alberta Medical Diagnostic Review; and 3) Occupational Health Feasibility Study. The two first research components functioned in cooperation with Science Advisory Boards, while a Public Advisory Board ensured involvement and communication with the public. The program was jointly sponsored by the public and private sectors of Alberta, who contributed approximately $10 million to fund the three research components.

No regional scale impacts were reported except potentially for the oil sands region; however, there was a warning that increased deposition could harm susceptible areas. Results of the study were communicated through reports, scientific publications, workshops, radio, TV and print media and meetings with interested communities. ADRP led to the formation of the Clean Air Strategic Alliance (CASA).

Fort McKay Air Quality Notification System

The community of Fort McKay has signed Bilateral Agreements with Shell and Suncor in order to address their concerns about air quality through a process of consultation. The program is still in the development stage and the companies are striving to gain a better understanding of air quality expectations in Fort McKay. Syncrude and AENV may participate in the program in the future. The results will be used to determine whether emissions at the source need to be modified. Companies may be required to report on exceedances of the notification level as a condition of their AENV approval. The intent is that this program will integrate into the current WBEA air quality monitoring and compliance response system, and as such should require minimal additional investments.

AQUATIC ECOSYSTEMS

Surface Water and Aquatic Resources

Regional Aquatics Monitoring Program (RAMP)

The Regional Aquatics Monitoring Program was established in 1997 by Suncor and Syncrude to monitor aquatic ecosystems in the oil sands region. The program's mandate is to determine, evaluate and communicate the state of the aquatic environment in the Athabasca Oil Sands Region. RAMP provides a means for industry to share costs and knowledge rather than having similar projects conducted by individual companies. The structure of the program has evolved to include participation by a wider group of stakeholders, including aboriginal communities.

A Steering Committee functions to prioritize projects within the program objectives, to review progress and results of projects and to communicate the results. A Program Review Committee evaluates the program for technical merit and for relevance to the needs of members, and facilitates communication and linkages with other regional initiatives. Funding for 1998 of approximately $400,000 was provided by Suncor, Syncrude, Shell and Mobil.

The objectives of RAMP are to:

1. Monitor aquatic environments in the oil sands area to detect and assess cumulative effects and regional trends.
2. Collect baseline and historical data to characterise variability of aquatic environments in the oil sands area.
3. Collect data against which predictions contained in EIAs can be verified.
4. Collect data that satisfies the monitoring required by regulatory approvals of oil sands developments.
5. Recognise and incorporate traditional knowledge into the monitoring and assessment activities.
6. Communicate monitoring and assessment activities, results and recommendations to communities in the Regional Municipality of Wood Buffalo, regulatory agencies, environmental committees/organisations and other interested parties.
7. Review and adjust the program to reflect monitoring results, technological advances and community concerns

RAMP is a long-term monitoring program with sampling frequencies ranging from seasonal to once every few years. Two years of sampling have been completed (1997-1998). The focus of monitoring has been on the Athabasca, Steepbank and Muskeg Rivers and wetlands occurring in the vicinity of the current and proposed oil sands developments. Sampling conducted to date includes surveys of water quality, sediment quality, benthic invertebrates, fish and wetlands vegetation. In addition, a radiotelemetry study of walleye and lake whitefish has been completed. An extension of the RAMP program initiated in 1999 will involve sampling of acid sensitive lakes (see next program). Oil sands companies are also conducting Climate and Hydrology surveys which will likely be merged into RAMP.

An annual report is produced and submitted to AENV and provided to other parties upon request. Results are used to modify operational and reclamation plans as required. Results will also be used to identify research requirements, with recommendations passed on to the appropriate initiative (ex: CEATAG). RAMP will be included within the regional environmental management framework, under the CEEM Partnership, and is indirectly linked to CEATAG and other groups through common membership on the executive committees. There is ongoing discussion about whether RAMP will become a sub-committee of WBEA. The Steering Committee meets quarterly in Fort McMurray and will attempt to hold one meeting per year in either Fort McKay or Fort Chipewyan. Annual reports are prepared, and the Program Review sub-committee will hold annual public workshops to review the previous year's results and describe plans for the next year. Golder Associates will archive and maintain a database of all monitoring data.

RAMP Acid Sensitive Lake Long-term Monitoring Program

The Acid Sensitive Lake Monitoring program was formed in 1999 to monitor acid sensitive lakes to detect changes caused by acidic deposition. As part of RAMP, the project will be a key part of a long-term oil sands monitoring program. Lake chemistry will be used as an early indicator of excessive deposition. A set of 32 lakes along a gradient of acidic deposition have been selected and will be sampled once in the summer of 1999 to confirm their chemistry and suitability for this project. In subsequent years, two samples per year are recommended. Depth profiles of temperature, pH, dissolved oxygen and conductivity will be measured for each lake, and a sample of water will be collected for chemical analysis. The work will be carried out by AENV with direction and funding of about $25,000 from RAMP. Sampling will be repeated every 4 to 6 years, and multiple-year trends will be reported.

Muskeg River Water Quality Survey

In view of the scale of development proposed and approved on the Muskeg River System, a survey was initiated in 1998 in order to obtain a more complete water quality data set for the river. Funding is from the Water Management Division and is approximately $40,000 for 1998/99. Parameters studied include oxygen, temperature, BOD, ammonia, nutrients, metals, and PAHs. Continuous recorders will operate at 4 sites, monthly grabs will be conducted at 6 sites and 2 synoptic surveys will be conducted at 12 sites. The program will operate during 1998-99 and will require partnerships for 1999-2000. This study is being coordinated with RAMP. Results will be used for a baseline description and interpretation of factors controlling water quality in the Muskeg River system; data will be shared with RAMP and other stakeholders. This study is pertinent to ongoing regulation and surveillance of mine drainage and water withdrawal applications and approvals.

Long term/Medium term River Networks for Water Quality Monitoring

Alberta Environment monitors water quality on major rivers to obtain data on baseline conditions, long term trends and potential impacts. On the Athabasca River, there is a long term site (Old Fort) which is sampled monthly and a medium term site (upstream of Fort McMurray) which is sampled 6 times per year. The funding of approximately $12,000 per year for the two sites is drawn from the Water Management Division Budget. A large number of water quality parameters are sampled, including trace organics. Data are in the public domain and are provided upon request. The data are used in technical and summary reports (e.g. 'Measuring up') as required. This data set is also used as background information by RAMP and by the oil sands industry for Environmental Impact Assessments.

Hydrometric Network and Meteorological Network

A provincial network of hydrometric and meterological stations collect and publish hydrometric data for rivers and lakes and some meteorological and water quality data. The monitoring network supports a variety of uses, such as flood forecasting, water management, water supply, project monitoring, and project design. The information also supports water quality initiatives and compliance assessment. The network is organised as a cost-sharing agreement between AENV and the Water Survey of Canada (WSC) (Environment Canada). Funding is approximately $2.4 million annually for the base hydrometric

network operated primarily by WSC. The network is supplemented with provincial-only stations operated by AENV.

The hydrometric network records data on streamflow, lake levels, and sediment data, while the meteorologic network collects climate data such as precipitation, temperature, wind speed and solar radiation. A list of all hydrometric and meteorologic stations and their locations is available for the Northeastern region of Alberta; the provincial network is extremely limited in this area of the province. The meteorologic data collected by Atmospheric and Environmental Services (Environment Canada) supports hydrology and forecasting functions. Other meteorologic data is collected as part of a provincial network (real-time data, snow surveys), sometimes in combination with streamflow data.

Regional Climatic and Hydrologic Monitoring Program

The climactic and hydrologic monitoring program began in 1995 when Syncrude installed five streamflow monitoring stations and a climate station in the Muskeg River Basin. Since 1998, Suncor, Syncrude, Shell and Mobil have jointly funded the program which has expanded to include monitoring of water levels and discharges on eleven streams and four lakes, as well as one rainfall gauge and one climate station. This program responds to a need for pre-development baseline information and monitoring requirements to be included in EIAs.

Monitoring conducted to date includes snow surveys, measurement of water levels, stream discharges and total suspended sediment concentration. Climate parameters measured include rain and snowfall, temperature, wind speed and direction, relative humidity and solar radiation. The four industry partners contribute approximately $150,000 in total to this monitoring program. The results are presented in an annual report, including a compact disc with a database of local and regional hydrologic and climactic data. This program is linked with, but not part of RAMP.

Northern Lakes Inventory Program

The Northern Lakes Inventory Program is run by the AENV Fisheries Branch NEB Region and the Alberta Conservation Association. The program monitors fisheries in the lakes in the Richardson Lake Back Country (north of the Firebag River and south of Lake Athabasca) to determine what species of sport fish are present in these lakes and whether the populations are stable, vulnerable or collapsed. As part of the provincial pike and walleye Monitoring Program, this project fulfils regional obligations to Fisheries Management and receives funding through the Alberta Conservation Association.

Sampling is conducted in lakes located between Township 103 and Township 107 and between Range 01-W4 and Range 08-W4. Length, weight, and aging structures are taken from all sport fish to determine their age of maturity, as well as length and weight frequency distributions. Sampling for each lake consists of test angling and gill netting over a three to five day period. Due to the large number of lakes in this area sampling currently only occurs once. Once the data base for this area is complete the intent is to monitor a few representative lakes once every five years to determine the effectiveness of the fisheries regulations imposed on these lakes. Summary reports are written at the end of each field season and the information will be used to maintain and/or improve fish populations in these lakes. Recommendations generally entail changes to the Sport Fishing Regulations; these changes are discussed with interest groups and other Government staff.

Walleye Monitoring Program

The AENV Fisheries Branch NEB Region and the Alberta Conservation Association monitor the pike and walleye populations in Gregoire Lake as part of the provincial pike and walleye monitoring program. The information will be used to maintain and/or improve the fish populations in the lakes. A creel census was set up to gather information on age of maturity, as well as length and weight frequency distributions. Sampling occurred during the summer of 1996. This study will be repeated every five years to determine the effectiveness of the fisheries regulations, and results will be discussed with interest groups and other Government staff. The information will be used to adjust Sport Fishing Regulations, if necessary.

CONRAD Environmental Aquatics Technical Advisory Group (CEATAG)

The CONRAD Environmental Aquatics Technical Advisory Group was formed in 1995 as a focus group for the aquatic component of oil sands environmental research. As an advisory group under the CONRAD Environmental Technical Planning Group, the group aims to improve coordination, communication and integration among aquatic research activities in the region. An executive committee coordinates the review of research proposals.

General membership in CEATAG includes about 80 representatives from industry, consultant firms, universities and government, who participate in research activities or attend the annual workshop. CEATAG does not directly fund research projects, rather, funding is primarily from oil sands companies, as well as external funding obtained by the researchers (e.g., NSERC, PERD, ESTAC) and in-kind contributions from members Total funding for the 29 projects listed under CEATAG in 1998 was $4.9 million for the 1996-2001 period.

CEATAG aims to accomplish the following:

1. Facilitate, coordinate and integrate the activities of numerous groups and individuals conducting research related to oil sands environmental aquatic issues.
2. Communicate research results to stakeholders such as corporate management; local, provincial and federal governments; non-governmental organisations; the scientific community; and the public at large.
3. Provide a forum for the discussion of new projects and project results.
4. Document, review, assess and archive research results.
5. Provide advice to the CONRAD Environmental Technical Planning Group on matters dealing with aquatic issues.

CEATAG coordinates a total of 29 separate projects (1998). Each project is described on a one-page form. Several projects deal with the effects of potentially toxic substances (CT, tailings water, naphthenic acids, etc.) on different ecosystem components (plants, invertebrates, fish, breeding birds, total ecosystem health, etc.). Several projects are sub-components of a PERD Task 5 project entitled "Assessment of Natural and Anthropogenic Impacts of Oil Sands Contaminants within the Northern River Basins", a set of follow-up studies to the NRBS initiative. There is also a Fish Health and Tainting Study conducted by an industry consortium which involves taste tests, chemical tests and fish health.

Results from aquatic research are used to modify operational and reclamation plans as required. CEATAG is indirectly linked to RAMP through common membership on both committees, and linkages also exist with the numerous partner research agencies. Results of research projects are documented in reports that are submitted to the CONRAD secretariat. CEATAG also holds regular workshops to overview project work and results; the last workshop was held in Calgary in November 1998.

Program of Energy Research and Development (PERD)

The Program of Energy Research and Development is a federal agency which funds research on the non-nuclear energy sector and its economic and environmental impacts. The projects funded under PERD are organised into the following 5 Tasks:

- Task 1 Energy Efficiency
- Task 2 Energy and Climate Change
- Task 3 Transportation
- Task 4 Renewable Energy Sources
- Task 5 Hydrocarbons

Under PERD Task 5, there is an Oil Sands and Heavy Oil Program, which includes a project entitled "Assessment of Natural and Anthropogenic Impacts of Oil Sands Contaminants within the Northern River Basins". The project addresses the NRBS recommendations to the Ministers regarding oil sands contaminant fate, distribution and impacts in the northern basins area. Nine sub-components of this project are listed as environmental projects under CEATAG and are described on one-page forms which present each project's scope and objectives.

Northern River Basins Study (NRBS)

The Northern River Basins Study (NRBS) was a very large, multidisciplinary study which addressed the environmental and socio-economic effects of industrial, municipal, agricultural and other development in the Peace, Athabasca and Slave river basins. The program was launched in response to concerns expressed by northern residents following the 1991 approval of the Alberta Pacific Pulp Mill in Athabasca. This large, 4 ½ year study (1991-1996) was a partnership between the governments of Canada, Alberta and the Northwest Territories who contributed total funding of $12 million. The NRBS was managed by a 25-member Study Board which included representatives from funding governments, municipal governments, First Nations, industry, education, agriculture, health, environmental groups and the affected public. The results were overseen by a 7-member Science Advisory Committee.

During the 4 ½ years of the study, approximately 150 individual studies were completed. These projects were classified into 8 main components: contaminants, drinking water, nutrients, hydrology/hydraulics, food chain, synthesis and modelling, traditional knowledge, and other river uses. Results were reported in 148 technical reports and summarised by 13 synthesis reports prepared by the leaders of the component groups. The Study Board reviewed the findings, as well as public input, and developed a series of recommendations which were presented in a final report: "Northern River Basins Study: Report to the Ministers", June 1996. Follow-up actions are being addressed by the Northern River Ecosystem Initiative (NREI) and by related initiatives supported by PERD and Environment Canada.

Northern Rivers Ecosystem Initiative (NREI)

The Northern Rivers Ecosystem Initiative (NREI) is a follow-up program which will implement the recommendations presented by the NRBS in 1996. The NREI was formed in August 1998 and is directed by a 10-member Steering Committee with representatives from the governments of Canada, Alberta and the Northwest Territories. Agencies involved in the NREI will work with industry, Aboriginal peoples, academia and communities. Scientific research will be conducted to address the new questions raised following the completion of NRBS, and policy issues such as pollution prevention will also be addressed. Environment Canada has committed $2.9 million over five years to the NREI, in addition to in-kind resources. Alberta and the Northwest Territories will also contribute current staff and resources.

Approximately 20 projects or proposals are currently proceeding under NREI. These projects address issues such as nutrients, contaminants, endocrine disruption, long-range transport of atmospheric pollutants, hydrology, pollution prevention, cumulative environmental effects and the impacts of land use on water quality. The results of the NREI will be used to make informed management decisions for the northern river basins. Linkages will be developed between government agencies and various other organizations such as RAMP, the University of Alberta, Ducks Unlimited, ARC, etc. Results of NREI studies will be communicated to the public through newsletters, a web site and information meetings.

Lake Acid Sensitivity Inventory

The sensitivity of lakes throughout Alberta to acidic deposition is being assembled in a database. A map depicting sensitive lakes is continuously updated to provide an overview of aquatic sensitivity on a provincial scale. Data collected through a variety of programs are used to update the data base and sensitivity maps. This inventory is primarily an AENV initiative; however, in 1998 data were collected from approximately 150 northern lakes in a joint effort between AENV and ALPAC. A subset of these lakes will be selected for long-term monitoring. Sensitivity to acidic deposition is primarily based on

alkalinity but pH, calcium, and total dissolved solids are also mapped if available. A report containing sensitivity maps was published in 1996.

GROUNDWATER

Groundwater Observation Well Network

Alberta Environment manages a Groundwater Observation Well Network which focuses on the use and protection of subsurface water resources. A province-wide network of observation wells monitor water levels and water quality in aquifers that have a potential to be used for water supply purposes. In total, the network consists of 340 observation wells and 200 piezometers (small diameter wells). In addition, groundwater is monitored in the vicinity of reservoirs, rivers, lakes, dams and oil sands developments to detect any impacts on local groundwater systems. The network is managed by the Hydrogeology Section of the Water Sciences Branch. Results are communicated through reports and workshops and the data can also be provided electronically and mechanically.

Suncor Groundwater Monitoring Program

Suncor initiated a Groundwater Monitoring Program in 1993 to monitor groundwater quality and trends over time on their leases. The program was formed in response to an AENV Regulatory Requirement, and also provides required data for EIAs and reclamation planning and design. This is an internal Suncor program; however, a Fort McKay representative will be involved in 1999. Funding from the Suncor budget is approximately $50,000. Sampling is carried out 1-2 times per year. Suncor submits an annual report to AENV and the results are also available for RAMP.

TERRESTRIAL ECOSYSTEMS

Wildlife, Biodiversity and Forested Ecosystems

Colonial Nesting Bird Survey

The colonial nesting bird survey is an ongoing AENV program which monitors colonial nesting bird species to determine population status and trends and to track outbreaks of contagious diseases. This program is part of the regional work plan for wildlife management, and is conducted by NRS Wildlife Management staff. All heron, cormorant, grebe and pelican species are monitored regularly (cormorants are monitored annually while the other species are done in a 1 in 3 year rotation). Any outbreaks of avian cholera or Newcastle Disease are reported to the public. According to the results, bird carcass removal may be required to avoid contamination of livestock. Population trend data is entered into the Biodiversity/Species Observation Database (BSOD) and is available from the regional office.

May Waterfowl Breeding Population Survey

The May Waterfowl Breeding Population Survey monitors trends in waterfowl breeding populations and pond numbers in Alberta. The survey is a cooperative effort between the US Fish and Wildlife Service (planes and pilots), Canadian Wildlife Service (ground surveys) and AENV (assist with ground surveys). The survey is a combination of air and ground surveys, with the ground survey portions used to provide a visibility correction for the more comprehensive aerial portion. The survey provides annual estimates of breeding populations of various duck species. In southern and central Alberta, the survey is conducted with both aerial and ground portions while the northern Alberta survey consists only of the aerial portion without any ground surveys. The data can be obtained through the Natural Resources Service.

Furbearer Monitoring Program

The furbearer monitoring program is an ongoing AENV program which tracks the harvest of 18 furbearing species in the province to ensure that provincial population levels are not being negatively affected by trapping. The senior holder of a trapline provides an annual harvest report or affidavit. These

records have been collected since the 1950s and are used to track cyclic population trends. There are also buyer's records which contain the number and source of purchased furs.

For the last 5 or 6 years, a registration system has been in place to track four sensitive species: lynx, otter, wolverine and fisher. The registration forms record data on numbers, location, date of kill, sex and age. There is also a maximum quota established for these species. Fisher carcasses are bought directly from trappers to determine sex and age, which cannot be determined from the pelt alone. Sex and age ratios are monitored and quotas are adjusted accordingly.

As part of the provincial furbearer management plan, the program forms part of the regional obligation to wildlife management and is conducted by staff of the AENV Wildlife Branch, NEB Region. Results are used to formulate annual harvest quotas and to determine the range and density of furbearers within the region and province. The information is discussed with the Alberta Trappers Association and within the government to determine the best adjustment to the quota regime. Annual reports are produced and the data is submitted to Statistics Canada for national reporting.

Ungulate Monitoring

An annual AENV ungulate monitoring program surveys ungulate populations (deer/moose) in order to formulate wildlife management strategies, allocation limits etc. The survey is conducted by NRS staff in the Northeast Boreal Region. Public participation is common and is based on a need for observers. Of the 21 Wildlife Management Units in the region, four are inventoried annually. Population trend information is used to set season limits, to determine the relative health of the population and to establish allocation limits for commercial outfitters. Results are provided to District offices, local Fish & Game chapters and are housed in the regional filing system. This program is part of the provincial ungulate monitoring program and White Area ungulate management program.

Biodiversity Assessment and Conservation in the Athabasca Oil Sands

A research project entitled *Biodiversity Assessment and Conservation in the Athabasca Oil Sands* has been initiated to produce baseline information on the diversity of amphibians, songbirds and plants in natural and reclaimed areas, particularly wetlands. There is a strong focus on wetlands because these habitats are important for many species and will experience the largest areal declines of all habitat types in the oil sands region. The budget of approximately $40,000 will be contributed by Environment Canada, AENV and oil sands companies.

Sampling will take place during the summer of 1999; site locations and protocols are currently being established. The results may be used to further understanding of cumulative effects on habitats, to assist future EIA reviews, to improve planning and reclamation guidelines in the region, and to assist the development of a regional, long-term biodiversity monitoring plan for the region. Results will be reported through CEATAG for the aquatic components as well as through other government reports. The project may also be linked to RAMP, WWG and the Alberta Amphibian Monitoring Program.

Boreal Caribou Committee (BCC)

The Boreal Caribou Committee (BCC) conducts research and other activities with the objective of integrating caribou conservation and resource development. BCC was formed through the amalgamation of the Northeast and Northwest Regional Standing Committees on Woodland Caribou (NERSC and NWRSCC) which were founded in 1991 and 1994, respectively. Each committee included a research sub-committee, which were merged in 1996 to establish the Boreal Caribou Research Program (BCRP). Data collection and analysis is generally conducted by university researchers.

The Funding and Communications sub-committees were amalgamated in 1997 and 1998, respectively. Membership in the BCC includes representatives from government, universities and industry, including forestry, petroleum-based and peat companies. Aboriginal communities have participated or acted as observers from time to time. Funding is procured from a variety of sources, including industry, Alberta

Government, non-governmental organisations, Alberta Conservation Association and federal/provincial research funding agencies.

The committee's efforts have focused on research to learn more about the caribou so that practical and effective management and land use guidelines can be developed. Recommendations for guideline development will be made to the regional board of directors. The main research subjects include population size and population dynamics, predator-prey dynamics, habitat use, and effects of industrial development and increased access on caribou movement and survival.

Presently, caribou populations appear to be stable to slightly declining. The area of concern covers most of northern Alberta (north of approximately Cold Lake, Athabasca, Fairview). Currently, research projects are underway in the Cold Lake Air Weapons Range, Wabasca, Red Earth, Caribou Mountains and south-west of Fort McMurray. Results are communicated through newsletters, published scientific journal articles, conference presentations, videos, pamphlets, web site, group presentations, informal contacts with aboriginal communities, sportsman shows, etc.

Sustainable Development: Managing Total Effects of Regional Activities

This initiative will focus on managing the levels and impacts of habitat fragmentation in the Athabasca Oil Sands region. The proposal was developed in response to concerns about the rapid expansion of industrial activities in the Northeast Boreal Region, and the potential impacts of large-scale habitat fragmentation on species of concern in the boreal forest (e.g., woodland caribou). This is a cooperative venture between AENV and the Western Economic Partnership Agreement (WEPA). Participants may also include Environment Canada, oil sands companies, oil and gas industry, forest products industry, universities, etc. The proposal was accepted for funding in 1999; funding over 3 years will be $450,000, shared equally by AENV and WEPA.

The proposed project should include three elements: 1) Link an inventory done at the landscape level (coarse filter) with field data collected on associated individual species (fine filter) through a statistical model at a regional scale. 2) Create a habitat fragmentation model that considers the impact of linear and other disturbances, as well as natural processes such as vegetation community succession and fire ecology. 3) Link these two models to create a powerful predictive tool for strategic decision-making in the region, and potentially for other regions in the province.

This initiative will support the Alberta Government's integrated goal of sustainable development by providing decision-makers with more comprehensive information in a tool that allows for scenario development. The project will help the province in assessing impacts on a longer time scale, and across broader spatial boundaries. This tool can be used to measure impacts to wildlife species of concern and biodiversity on a large scale, and manage accordingly. It will also enable government and industry to find better solutions that reduce conflicts between sectors and impacts on landscapes. There will be links to the Boreal Caribou Research Program, the Alberta Forest Biodiversity Monitoring Program, and other terrestrial cumulative effects initiatives in the oil sands region. Results will be communicated through reports and workshops with participants and other interested parties.

EIA Biodiversity Working Group

Alberta Environment formed an internal EIA Biodiversity Working Group at the end of 1998 to determine what level of baseline surveys and methods are appropriate for vegetation, wildlife and rare plants for Environmental Impact Assessments and the resulting decision-making process. Alberta is a signatory to the Canadian Biodiversity Strategy, which includes a specific direction for the biodiversity issue to be incorporated within the EIA process. AENV needs to develop a position for proponents on what are appropriate methods and intensity of surveys for determining baseline data needs, to assess and reclaim for wildlife, vegetation and rare plants.

The committee meets to discuss these issues and decision-making is by consensus. The results will be used to complete baseline information for the Shell Muskeg Mine and the Suncor Millennium Mines.

Future applications for major industrial development will use the protocol determined as the standard for their Environmental Impact Assessment development. Oil Sand Mine Applicants have been involved with the protocol development to date, and will be advised when the decisions have been finalised. Communications of the direction for new EIAs will be determined as part of this project.

Wildlife and Biodiversity Studies

Alberta Environment has expressed concern over the baseline information and methods used within recent EIAs to assess impacts of development on wildlife and biodiversity. In response to these concerns, industry and AENV are forming a committee or working group which will address potential improvements to the assessment process. The vision is that this group will become a long-term, multi-stakeholder committee. Initial issues that will be examined include: 1) Increasing the baseline information on special eco-elements (rare plants and wildlife); 2) Biodiversity benchmarking for reclamation; and 3) Habitat suitability modelling for impact verification. The results of this work could be used to enhance regional resource management systems (i.e. adaptive management concept). The group would link with the CEEM Partnership and the RSDS, as well as the Reclamation Advisory Committee and other provincial programs dealing with biodiversity issues.

Alberta Forest Biodiversity Monitoring Program (AFBMP)

The Alberta Forest Biodiversity Monitoring Program will monitor biodiversity in the forested regions of the province to determine whether changes are occurring due to human activities, particularly forestry, fire management and petroleum development. The project is currently in the design and development phase. Once established, the full-scale program will produce a publicly-available, long-term and large-scale data base of consistently collected, statistically sound information on a broad variety of biotic and landscape elements. It is hoped that this approach will be the most efficient and cost-effective way to provide high quality data.

The project is coordinated through the Foothills Model Forest and involves many participants and partners from the forestry industry, provincial and federal government agencies and universities. A Steering Committee directs development of the program at the strategic level, while a Technical Committee develops the sampling program. These committees were formed in 1998 and will complete their present mandate by January, 2000. Funding for the project in 1998/1999 is approximately $224,700 provided by several partners.

The objectives of the current committees are to:

- Develop a list of aquatic and terrestrial attributes to be sampled
- Develop a sampling plan, including sample locations, frequency and methodology
- Develop a plan for periodic reporting of landscape composition and pattern of forested areas using remote sensing technology
- Complete an analysis of program effectiveness (statistical power) for a range of investment scenarios
- Plan the required coordination, administration and funding
- Conduct a test implementation and evaluation of the program (pilot sampling project)

Once all of these planning, testing and evaluation steps are complete, a full-scale, long-term monitoring program will be implemented. The program has a web site: www.fmf.ab.ca/bm.html

Sustainable Forest Management Network (SFMN)

The Sustainable Forest Management Network (SFMN) is a large network of researchers and partners who are working to ensure the sustainability of Canada's boreal forests. Research is aimed at preserving ecological functions and biodiversity, as well as improving forest-based economic opportunities by developing new technologies, new knowledge and new strategies for management and conservation of the resource.

Established in 1995, the SFMN is one of Canada's 17 Networks of Centres of Excellence. These Networks are funded through a combined effort of the three major Canadian research granting councils (NSERC, SSHRC, MRC) and Industry Canada. Funding for the SFMN is approximately $5 million per year, currently granted for 1995-2001. There are 21 universities, 13 industry partners and 5 government departments/agencies participating in the network. The program includes a Board of Directors, Research Planning Committee and Research Administration Committee. The administrative centre for the program is at the University of Alberta.

At the outset, research activities were grouped into 4 themes:

- Ecological Basis of Sustainable Forestry
- Minimal Impact Technologies for Forest Materials Processing
- Planning and Practices for Sustainable Forest Management
- Socio-Economic Sustainability

To improve integration, research activities were reorganised in 1998 into 3 research legacies:

- Understanding Disturbance
- Strategies and Institutions for Sustainable Forest Management
- Life Cycle Analysis and Technology Development

This project will position Canada as a leader in environmentally responsible forest management policies. Long-term benefits of the program will include the training of highly qualified personnel (graduate students, postdoctoral fellows, technicians, summer assistants, etc.) and the development of partnerships between researchers, industries, governments, First Nations and other communities. Progress and results are communicated by means of a web site, technology transfer group, Boreal Gazette publication, peer-reviewed scientific publications, and workshops with partners and researchers. ALPAC has been a major communicator for the NE Region. The SFMN web site is at www.biology.ualberta.ca/sfm.hp/sfm.web/english.web/main_e.html

Terrestrial and Riparian Organisms, Lakes, and Streams (TROLS)

The goal of the Terrestrial Riparian Organisms, Lakes and Streams (TROLS) study is to evaluate the role of riparian buffer strips in mitigating potential effects of logging on lakes and streams. The program will assess how buffer strips affect animal and plant communities in upland and riparian areas. Researchers are experimentally examining three different widths of buffer strips for lakes, and one width of buffer strip for streams, with control settings for both.

Now in its fourth year, this 6 year project, based at the University of Alberta, includes 13 principal investigators from 4 institutions across Canada. Partners include several forestry companies, Syncrude and the provincial and federal governments. In cooperation with the project, forestry companies will be harvesting wood according to different patterns and buffer strip widths around the study lakes. Researchers will be able to compare pre- and post-cut conditions for a wide range of ecological elements. Results will be used to determine how wide riparian buffer strips should be in order to protect aquatic ecosystems and retain viable wildlife populations. TROLS will support the integrated management of wildlife populations and aquatic resources, and will help to validate current forestry guidelines for widths of riparian buffer strips in the aspen-dominated boreal forests of northern Alberta.

Alberta Forest Research Advisory Council (AFRAC)

The Alberta Forest Research Advisory Council provides guidance for the development of a comprehensive research program for the forest industry. Investment in research will support the economic, community and ecological sustainability of Alberta, as well as the expansion of the forest sector. The goal is to expand the province's wood products industry from $3.5 billion in shipment values in 1997 to $6.5 billion in 2005 to $10 billion in 2010.

AFRAC was formed in 1996 and includes members from forest products companies, government agencies and research organisations. The Council provides advice and recommendations to the Minister and is supported by a secretariat within AENV. Funding is currently under review; the council has the potential to influence the allocation of dollars through the SFMN ($5 million/yr); the Foothills Model Forest ($2.5 Million/year), the Forest Resource Improvement Association ($12 million/yr), CFS ($5 million/yr), Alberta Environment ($2.25 million) and the Alberta Research Council.

The Council has produced two reports:

- Research Directions for Alberta's Forest Sector. 1998. This document identifies 7 research directions and a number of research priorities, and is up for review by the Minister.
- Research Plan of Alberta's Forest Sector. (In progress.)

AFRAC is linked to the Alberta Science and Research Authority, the Research Needs and Priorities Committee and the Land and Forest Service Executive. The "Alberta Forest Legacy" report provides a vision and direction for the forestry sector. Results are communicated through the AENV web site, Forest Edge magazine and to wood products companies.

RECLAMATION AND REMEDIATION

Terrestrial Reclamation Research on Challenging Materials (TERRE)

The Terrestrial Reclamation Research on Challenging Materials (TERRE) group was formed in the spring of 1998 as a technical advisory group under the CONRAD Environmental TPG. The group's mandate is to coordinate oil sands industry terrestrial reclamation research to promote the development of effective techniques and to ensure focus, cooperation and cost-sharing within reclamation research activities. Committee members are from industry, universities and AENV. The group operates by consensus and makes recommendations regarding research. The group itself does not dispense funds for research; individual companies determine whether they want to conduct the research themselves or in partnership with others. Industry funds the administrative costs.

Activities in 1998 have included developing the database of projects and the group's organisational structure. Projects underway include work on draft reclamation criteria and protocols, performance assessment, overburden reclamation materials, tailings sand reclamation materials, and CT reclamation materials. The focus for 1999 will be to develop a plan to address the high priority issues identified in 1998 and secure funding to support projects. There are linkages to CEATAG through the Environmental TPG. Results are communicated through reports, CONRAD meetings and public workshops.

Research Project: Creating a Soil-like Profile

The Alberta Research Council (ARC) is conducting research to develop a soil-like aggregate from tailings which will support a sustainable plant community. Begun in 1995, the project will help the oil sands industry develop cost-effective procedures to establish self-sustaining ecosystems on disturbed land. The project is led ARC and Syncrude is also involved. Funding for 1999 is $40,000.

This research has the following objectives: 1) Develop a procedure to create stable aggregates from the fine tails and tailing sand using organic amendments; 2) Study the capability of the created profile to support a sustainable plant community; and 3) Develop a model/system that describes the evolution of soil-plant ecosystem over time on the created profile. A field site was established in 1997 where soil and plant performance are being monitored. Results are presented through annual reports, presentations to company staff and conferences.

Suncor CT Reclamation Demonstration

Suncor has developed a demonstration site to demonstrate the viability of wetland and terrestrial reclamation of CT deposits. This internal Suncor program was initiated in 1996 and receives $350,000 of funding per year. The results will be used to improve the design of commercial scale reclamation activities and are publicised through reports, public announcements and workshops.

Bi-annual Tailings Research and Development Seminar

Every 18 to 24 months, Syncrude and Suncor organise one-day seminars on tailings management and technology development, as a regulatory requirement from EUB approvals. The seminars serve to communicate challenges and advances and to obtain input to oil sands research programs. Results are an increased awareness by regulatory agencies and stakeholders, regulatory evaluation of oil sands applications and modifications of oil sands research programs. The meeting location alternates between Edmonton and Fort McMurray. Typical involvement includes Syncrude, Suncor, AENV, EUB, public stakeholders, Fort McKay First Nation, Athabasca Chipewyan First Nation, Mobil, Shell. The most recent seminar was held in March 1999 in Fort McMurray.

Athabasca Oil Sands Reclamation Advisory Committee (RAC)

The Reclamation Advisory Committee (RAC) will make recommendations regarding reclamation and appropriate end land use. RAC was formed in February 1999 as a result of the recommendations made by the Oil Sands Mining End Land Use (ELU) Committee in January 1998. Building upon those recommendations, the new committee will make integrated and regionally sound recommendations to AENV and the oil sands industry regarding reclamation, which are informed by community and stakeholder values, traditional knowledge, scientific information, fiscal reality and provincial policy. The committee will operate by consensus and include members from the oil sands and forestry industries, aboriginal communities, environmental groups and municipal, provincial and federal government agencies. Members are self-funded; the oils sands industry and the provincial government will cover incidental costs. RAC will serve as a steering committee for working groups which are developing operational guidelines for reclamation activities (Wetlands Working Group, Oil Sands Vegetation Reclamation Committee, soils, traditional land uses). The committee will also facilitate opportunities for stakeholders to participate in reclamation decisions, and recommend research related to reclamation and land use.

Oil Sands Mining End Land Use Committee (ELU)

As the predecessor to RAC, the Oil Sands Mining End Land Use Committee (ELU) developed recommendations on desirable and achievable end land uses on reclaimed land. Established in 1997, the committee included representatives from the oil sands Industry, AENV, the AEUB, the Municipality of Wood Buffalo, aboriginal groups, recreational groups, and environmental organisations. Their recommendations were presented in a report in 1998 and the committee was disbanded. (Report: *Oil Sands Mining End Land Use Committee Report and Recommendations*, July 1998, 150 pp.)

Oil Sands Vegetation Reclamation Committee (OSVRC)

The Oil Sands Vegetation Reclamation Committee was formed in 1996 with a mandate to prepare guidelines for establishing forest ecosystems on reclaimed land. The committee focused on starter vegetation and design criteria for ecosystems that would 1) support commercial forests, and 2) provide wildlife habitat. The guidelines will be used by industry and government to plan, conduct and assess reclamation activities. The committee included members from industry, consultants and the provincial government and development of the guideline was based on consensus decisions, scientific studies and government legislation or policies. Funding was provided by industry.

The objectives of the committee were to identify:

1. Approaches to oil sands lease reclamation that will meet regulatory guidelines and revegetation requirements;

2. The forest ecosystems that can be established on oil sands leases;
3. The existing reclamation methods available to develop these ecosystems;
4. The principles of landscape and ecosystem design to meet the land use objectives of commercial forest and wildlife habitat;
5. The biodiversity objectives that should be considered;
6. How the success of reclamation should be monitored; and
7. The additional research required to address present information gaps and future improvements in reclamation research.

The Oil Sands Vegetation Reclamation Committees submitted its recommendations to the Reclamation Advisory Committee. In October 1998, the *Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region* were released. The Guideline also identifies research which is needed to validate the predictions and uncertainties in current knowledge and to maintain the credibility of these recommendations.

As research and monitoring continue in the region, new data will be used to update and refine the suggested approaches and techniques every five years. The guideline is linked with the Land Capability Classification System, since soils are an integral part of vegetation requirements. At this point, the extent to which the manual is used is voluntary.

Soils Working Group

Formed in 1995, the Soils Working Group developed a land classification system to evaluate pre-and post-disturbance land capability for forest production. The group was originally called the Tailings Sand Reclamation Practices Working Group; however, its scope was later broadened to cover all oil sand reclamation materials. The classification system was designed as an aid in planning soil handling procedures and measuring land capability. The group included members from industry and government. The working group met five times and conducted a workshop in February 1996 to present the initial *Land Capability Classification for Forest Ecosystems in the Oil Sands Region* to stakeholders.

The working group revised the system thorough 1996 and 1997 and released an updated version of the system in 1998. The group meets annually to evaluate the experience gained during the year and to consider the need for any updates or modifications. During the working group's active period, funding of $230,000 was provided by Suncor and Syncrude. Future funding will be allocated should further substantive revisions be required to the classification system.

The classification system provides a method to classify land into one of 5 classes based on its capacity for forest production. The system supports the regulatory objective of the return of equivalent land capability on lands disturbed by oil sands mining thereby ensuring that a productive land base is maintained in the oil sands region. It also ensures similarity in reclamation techniques among different companies, making it easier to evaluate the success of reclamation. The classification system has been published as a report (*Land Capability Classification System for Forest Ecosystems in the Oil Sands Region, Revised Edition*, 1998) and is currently being used by industry and government in completing and reviewing EIAs and reclamation plans. This initiative is linked to the Oil Sands Vegetation Reclamation Committee and to TERRE (CONRAD Terrestrial Advisory Group).

Oil Sands Wetlands Working Group (WWG)

The Wetlands Working Group is developing a framework manual for the establishment of wetlands on reclaimed land. This committee was formed in January 1998 and operates as a technical working group under the Reclamation Advisory Committee (RAC). The group is co-chaired by industry and government, and includes representatives from universities, aboriginal communities, consultants and non-governmental organisations (Ducks Unlimited). Decision-making is consensus based. The 1998 budget of approximately $160,000 for administration, consultants and participation of aboriginal communities was

funded by industry, while AENV provides in-kind contributions through participation on the group, editing and preparation of the guideline.

Through the development of the guideline, the working group will produce the following deliverables:

- Review the purpose of wetlands in the reclaimed landscape and the types of wetlands that can be created through reclamation.
- Review the factors that need to be considered in the construction of wetlands.
- Develop guidelines to describe the desirable characteristics of wetlands.
- Identify methods and procedures for the construction of wetlands at oil sands mines

The WWG is finalising a draft document (*Draft Guideline for Wetland Establishment on Reclaimed Oil Sands Leases*, Jan. 1999) which will be forwarded to the RAC. The guideline will be used by industry to plan wetlands, by government to review applications for the establishment of wetlands, and by the pubic to understand the government's expectations for the establishment of wetlands. The manual addressed 5 types of wetlands: altered, opportunistic and constructed wetlands, vegetated channels that connect wetlands, and the littoral zone of end pit lakes. The report will also provide recommendations regarding information and research needs that can be considered by groups such as CEATAG. A public workshop to obtain comments on the manual from groups or individuals outside the Working Group is scheduled for May, 1999.

End Pit Lake Group

When oil sands extraction is completed, a certain number of mine pits will be filled with water to form End Pit Lakes, which will become a permanent feature of the final landscape. The End Pit Lake Group was formed to develop and manage a program of research and monitoring that will address uncertainties in End Pit Lake conditions and design, to ensure that the lakes will be environmentally acceptable.

Formed in March 1999, the committee is still under development but will include members from Syncrude, Suncor, Shell and Mobil at a minimum. The group will develop and oversee the program committed to by recent proponents regarding end pit lakes. To achieve its objectives, the group will require significant input from CT research programs and end land use stakeholders. Results will be used to ensure end pit lake design and conditions are acceptable to AENV and stakeholders.

Native Plant Working Group

The Native Plant Working Group was formed in October 1997 to develop a manual providing guidelines for the use of native plant materials in Alberta. Over the last few years, there has been some concern about the requirement to use native plants in revegetation projects on public land. To date, there have been several approaches taken that vary from allowing agronomic species on most sites to allowing only the use of native species. It became apparent that a more consistent policy needed to be developed. As a result, the guidelines are intended to provide a clear, consistent and integrated direction about revegetation using native plant materials where the goal is to re-establish a native plant community. The manual will provide information on existing legislation and guidelines to promote the use of native plants for reclamation.

The steering committee was formed with representatives from both the Land and Forest Service of Alberta Environment and the Public Lands Branch of Agriculture, Food and Rural Development (AFRD). In turn this committee established the Native Plant Working Group with members from AFRD, AENV, industry and other affected groups (e.g., Alberta Native Plant Council). The working group will develop the documents and provide recommendations to the steering committee for approval. The steering committee collected input from stakeholders during guideline development.

A draft guideline is to be developed by the end of April 1999 and is to be used on a trial basis for 1999. Following this trial, the working group and steering committee will prepare a final version which will be forwarded to the executive of AENV and AFRD for approval and release in 2000. A draft version of the guideline can be viewed on the web site (*Draft Native Plant Revegetation Guidelines for Alberta*. H. S.

Gerling (ed.), 1998). The objectives of the guidelines are to promote the use of native species in the revegetation of disturbed sites; encourage the eventual establishment of native plant communities and acknowledge the site specific role of non-native species to meet short term revegetation goals.

The project was provincial in scope, but results will be relevant for reclamation activities by oil sands operators. Managing authorities will determine the degree of use of native plants for reclamation based on a number of influencing factors. The Land and Forest Service will require the use of native plant species rather than agronomics for all new mines.

Syncrude Forest Reclamation Network (SFRN)

Syncrude formed a Forest Reclamation Network (SFRN) in March, 1999 to coordinate their forest reclamation activities. The network was formed for three reasons: 1) The forest industry has valuable experience and skills not available at Syncrude, 2) Syncrude is interested in accelerating its forest reclamation program, and 3) there is a need to capture more opportunities for short term forest research. The network will include members from Syncrude, forestry companies, (as well as probably AENV and Fort McKay First Nations – did not attend first meeting). The network will meet as required with an informal structure and decision-making will be by consensus. Funding will come out of the SCL internal reclamation budget.

Network scope will include: 1) detailed planning of reclamation over the next 5 years, 2) identifying seedling sources, 3) identifying field demonstration opportunities, 4) evaluating alternate forest reclamation strategies. Results will directly impact reclamation operations at SCL. Results could also influence the activities of the Athabasca Oil Sands Reclamation Advisory Committee and the Forest Vegetation Working Group. No specific communication strategy outside of the network is planned. Ad hoc communication may occur through numerous other organisations with common membership.

Syncrude Reclamation Certification Working Group

The Syncrude Reclamation Certification Working Group meets occasionally to evaluate Syncrude's S4 overburden disposal site, negotiate any necessary rework, and establish plans for obtaining reclamation certification. Formed in 1998, the group includes members from Syncrude and AENV. The working group will develop a strategy for completion of reclamation work and for application for certification. The results will be of significance to the Athabasca Oil Sands Reclamation Advisory Committee (RAC).

Fort McKay Industry Relations Corporation (IRC) End Land Use Committee

The Fort McKay Industry Relations Corporation End Land Use Committee is an informal group with members from Fort McKay and Syncrude. The committee was formed so that Fort McKay could be included in End Land Use planning Funding is through the Fort McKay IRC. Specific decisions or results will be incorporated into industry's Conservation and Reclamation Plans.

Suncor Reclamation Monitoring Program

In 1976, Suncor initiated a Reclamation Monitoring Program to monitor the development of soils and vegetation on reclaimed sites compared to natural forest systems in the region. This program was set up in response to an AENV requirement, and receives $40,000-60,000 of funding per year. As part of a continuous improvement process, the results will indicate successful reclamation techniques and where changes are required. Results are communicated through an annual report, presentations at conferences and seminars, EIA submissions and Environmental Applications. The program is linked to the Reclamation Advisory Committee, the Soils Working Group and the Oil Sands Vegetation Reclamation Committee.

Syncrude/Fort McKay Bison Project

The Bison Project is a joint initiative of Syncrude and the Fort McKay First Nations to conduct research and training activities with the intent of establishing a bison herd on reclaimed land. Project plans, progress and results are reviewed by the Syncrude/Fort Mckay Bison Liaison Committee. The project was started in 1993 and is funded by Syncrude.

For the first five years, the research program examined the biophysical feasibility of raising bison on reclaimed land. Research focused on forage productivity on oil sands reclamation sites, selection of suitable forage varieties, bison health and productivity, soil development under a grazing regime, and potential contamination of edible bison tissue by industrial emissions. A report on the 1993-1997 research activities is nearly complete.

The project now has a socio-economic focus, namely to grow the herd to a size where it can be operated profitably as a business enterprise by the Fort McKay First Nations and to train members of the Fort McKay First Nations in the necessary range, animal, and business management skills. The results are being used in support of including bison ranching as an end land use in a Conservation and Reclamation plan currently under consideration by AENV. More generally, the results point to an alternative to the current objective of reclaiming to forested landscapes similar to those existing before disturbance . This alternative land use may have greater regional socio-economic value than reclamation to exclusively forested landscapes. The results indicate that oil sands mining creates an opportunity for large scale development of a sustainable regional bison ranching industry that would otherwise be prohibitively expensive.

Lynton Siding Decommissioning Project

The Lynton Siding Decommissioning Project coordinates the decommissioning of a contaminated sulphur handling facility and the remediation of surrounding forest affected by sulphur deposition. Sulphur emissions from a sulphur handling facility at Lynton Siding near Fort McMurray damaged the surrounding area. The facility owners abandoned the facility without remediating the damage caused by their activities. Owners of the sulphur (oil companies), the landowner (AENV) and leaseholder (CN) undertook the project to cooperatively fund the remediation.

The project operated in 1992-1993 and was re-established in 1997. The overall budget will be approximately $400,000 over 4 years, funded 1/4 by AENV, 1/4 by CN Rail and the remaining 1/2 allocated among the oil companies on the basis of the amount of sulphur shipped through Lynton Siding. Baseline monitoring studies of sulphur, pH, and electrical conductivity have been completed to delineate the affected area. The latter part of the project involves monitoring of sulphur and pH levels in surrounding forest over the next 4 years to evaluate the effectiveness of an aerial liming program. Monitoring of remediation effectiveness will begin this summer and results will be used to evaluate the effectiveness of the remediation program and fine tune it as necessary.

Enersul operates a sulphur handling facility on the same site. They are required to carry out a similar monitoring program annually under the terms of their Approval to operate; in addition they have been carrying out a similar but less extensive remediation program related to their own activities. Reporting of results is by reports and letters internally. The project manager (Amoco) has also given public notice prior to commencing the project and discussed the remediation program with members of the local Indian Reserve. (The reserve is not within the remediation area but the members have expressed concern about effects on their traditional use area.)

HUMAN HEALTH

Athabasca Oil Sands Community Exposure and Health Effects Assessment Program (AOSCEHEAP)

The Athabasca Oil Sands Community Exposure and Health Effects Assessment Program (AOSCEHEAP) was initiated to examine the links between human health and environmental exposure to chemicals. The study combines two broad components: 1) measurement of human exposure to air contaminants; and 2) measurement of the health of local communities in the oil sands area. The program was started in 1994 following the EUB review of Syncrude's Mildred Lake Development Project. AOSCEHEAP is directed by a Management Committee with one representative each from the Northern Lights Regional Health Authority (NLRHA), Syncrude, Suncor, aboriginal communities, non-governmental organisations, the

public and Alberta Health. The Management Committee appoints a Program Manager, Operations Committee, Science Advisory Committee, Study Coordinator and Science Directors. Secretariat services and logistical support are provided by Alberta Health and NLRHA.

The three main objectives of the program are to: 1) describe the exposure of individuals and of the population to airborne chemicals and particulates; 2) quantify the relative contribution of various exposure sources and pathways to airborne chemicals (ex: indoor vs. outdoor air); and 3) describe the associations between exposure to airborne chemicals and human health effects. To measure exposure, passive monitors were worn by members of the Fort McMurray community for 24-hr monitoring periods. The monitors measure exposure to volatile organic compounds (VOCs), ozone, NO_2 and SO_2, while inhalable particulate levels are monitored by active samplers.

The health of individuals and the community will be assessed based on information from questionnaires, physical measurements, physician visits, hospitalisation data and health status data. A pilot study which tested equipment and field methodology was completed in 1997. The main study (baseline phase) collected data until the fall of 1998, and these data are currently being analysed and evaluated by Alberta Health.

Fort McKay Health Project (no official name yet)

A similar project to the Athabasca Oil Sands Community Exposure and Health Effects Assessment Program (AOSCEHEAP) is in the planning stages. The study will examine the effect of air quality on the community of Fort McKay and on levels of personal exposure to selected air pollutants. The project will likely include representatives of Fort McKay, oils sands companies, NLRHA, Alberta Health and the University of Alberta. The project was initiated at the request of the community of Fort McKay in relation to concerns about increased oil sands activities. The community has expressed an desire to play a leadership role in conducting the study.

Alberta Council for Research on Air and Health (ACRAH)

The Alberta Council for Research on Air and Health (ACRAH) is developing a strategy to fund research on issues of air quality and health. Formed in 1997-98, the Council is chaired by a representative of the Alberta Lung Association.

MULTIDISCIPLINARY INITIATIVES

Cumulative Environmental Effects Management Partnership (CEEMP)

The Cumulative Environmental Effects Management Partnership was formed to address important concerns about the cumulative effects of all human activities in the oil sands area on the environment and human health. This initiative was preceded by a Cumulative Effects Assessment (CEA) Committee who released a framework manual in March 1999 that documented the approach for preparing cumulative effects assessments in the Athabasca Oil Sands Region.

The vision of the CEEM Partnership is that the environment of the region including the land, forest, air, water, wildlife and biodiversity will be protected and sustained over the long term and that the collective activity in the region will not cause any lasting harm to the environment or cause adverse effects to the health of humans. The group is co-chaired by industry and an NGO and includes representatives from a large number of stakeholder groups who make decisions by consensus.

The CEEM Partnership will form Working Groups to address specific environmental issues, including the currently active NOx/SO2 Management Working Group. Funding has been provided by Syncrude, Suncor, Shell, Mobil , Petro-Canada and Gulf. The budget for late 1997 and 1998 was about $200,000. The core budget for 1999 is now being determined and each working group will likely have its own budget.

The purposes of the CEEM Partnership are to: 1) provide a forum for regional stakeholders to facilitate discussion and make consensus-based decisions forming the basis for action by members, and recommendations to the RSDS as appropriate, on managing the region's cumulative environmental effects, thereby forming the core of a proactive regional environmental management system that addresses cumulative impacts of regional developments; and 2) develop and apply environmental management tools, thresholds, guidelines and objectives. The results will form the basis of recommendations on cumulative effects in the region to be sent to RSDS and to industry, as well as to the Wood Buffalo Environmental Association (WBEA) and Canadian Oilsands Network for Research and Development (CONRAD).

Athabasca Tribal Council / Industry Working Group (ATC/IWG)

Members of the Athabasca Tribal Council (ATC) and industry have formed a working group (ATC/IWG) to resolve First Nations issues and develop community capacity so that the ATC can achieve their Mission Statement (Resource Development Strategy). Formed in May 1998, the objectives of the working group are to expedite the identification and resolution of issues, to work to establish each party's satisfaction with decisions and outcomes, and to ensure cooperation and communication among parties. Direction is provided by a Steering Committee and a Working Group Committee. The Steering Committee includes ATC Chiefs representing the five First Nations and industry Vice-Presidents representing the main resource developers (9 companies).

Subcommittees have been established for the following five key work areas:

- Environmental/Consultation Capacity
- Employment and Training Initiatives
- Human Infrastructure
- Physical Infrastructure
- Long Term Benefits

Each of the sub-committees is co-chaired by an ATC and an industry representative. Some of the issues addressed by the sub-committees include: effective participation in the regional environmental management systems (ex: CEEM Partnership, WBEA), improving education and training, increased First Nations employment, identifying infrastructure issues and needs and community development. The sub-committees report back to and are monitored at the Working Group level, with semi-annual review of progress at the Steering Group level.

Integrated Management Strategy Treaty Caucus (IMS)

The Integrated Management Strategy Treaty Caucus (IMS) is documenting environmental management practices on reserve lands. The First Nations of Canada and the Department of Indian and Northern Affairs Canada (INAC) are exploring the mutual opportunities to improve the practical management of reserve lands. The committee will include all Treaty Areas of Alberta, INAC and the Arctic Institute of North America.

The group will research current First Nations environmental programs, evaluate and identify and gaps and linkages, integrate the programs into an overall environmental strategy and provide a comprehensive report. The result will be an improved environmental management regime integrating the various environmental programs available. The final report will be written for and distributed to the First Nations of Alberta.

Alberta Oil Sands Environmental Research Program (AOSERP)

This research program consisted of a large number of projects which collected baseline environmental information in the oil sands region. The program operated from the mid-1970s to 1985. Individual research projects addressed a wide variety of issues, including air, water, terrestrial, wildlife, reclamation, socio-economic, archaeology, geology and climate. The study area can be approximately defined as the oil sands lease areas of 1975. About 160 reports were produced.

Canadian Oil Sands Network for Research and Development (CONRAD) - Environmental Technical Planning Group (TPG)

The Canadian Oil Sands Network for Research and Development was founded by industry in 1993, with the objective of coordinating and integrating research performed by the private sector, government and academics. Through CONRAD, the different research initiatives will share expertise and resources, and coordinate shared research to improve effectiveness. CONRAD has formed five technical planning groups (TPGs): Mining, Extraction, Upgrading, Environmental and In-situ recovery.

The CONRAD Environmental TPG operates on a consensus basis and makes recommendations to industry and government regarding environmental research priorities in the oil sands region. The TPG does not dispense funds for research. It approves and coordinates research projects through the various technical advisory groups (TAGs) and promotes effective use of research dollars by individual companies and through partnerships. Individual companies decide whether they want to conduct the research themselves or in partnership with others. Administrative costs are shared by government and industry.

Research results are achieved through the TAGs established under the CONRAD Environmental TPG: CEATAG for aquatic research and TERRE (Terrestrial Advisory Group) for terrestrial research. An End Pit Lake Advisory Group and an air issues advisory group (AIRTAG) are currently being formed. The TAGs initiate and complete projects, participate in funding solicitation and allocation, manage peer review and report to CONRAD on projects. Research coordinated through the CONRAD Environmental TPG and its advisory groups links to other oil sands activities being conducted under the CEEM Partnership and WBEA. Results are communicated through the reports and workshops of the technical advisory groups.

Saskatchewan Environment and Resource Management Tar Sands Working Group

This group was formed in January 1999 and is an internal initiative of the Saskatchewan Environment and Resource Management (SERM) department. The working group will coordinate Saskatchewan's Environment and Resource Management communication, monitoring and involvement in Alberta's Tar Sand developments, to ensure that Saskatchewan's environment is not negatively impacted as a result of emissions from Alberta's Tar Sand developments. The group will gather information and develop strategies on possible impacts on Saskatchewan's environment from.

Currently, a literature review of past monitoring initiatives is being conducted, which may lead to a short term regional lake monitoring program. The group will ensure internal integration among the Shield and West Boreal EcoRegions, Environmental Protection Branch, Environmental Assessment Branch and Forest Ecosystem Branch. Information will be shared with Alberta Environment, the Alberta Energy Utility Board, and industry.

Dams and the Environment Committee

This committee was formed in 1998 by the Canadian Dam Association (CDA) to investigate, advise and represent CDA on matters related to environmental impacts of dams, reservoirs and tailings ponds. The focus is to improve the environmental performance of dams and tailings dams. Tailings ponds are regionally important since the surface mines rely on them. The committee will include a variety of members with different skills and points of view, from government, industry, consulting firms, from all over the country. The committee will conduct the following activities:

- Prepare a registry and bibliography of case histories.
- Create a network of experts.
- Coordinate with committees with similar objectives.
- Research legislation on dams and the environment.
- Propose guidelines or criteria to integrate environmental concerns into planning, design, construction, maintenance and operation of dams.
- Communicate on environmental impacts and encourage dam owners to communicate.

At present, web site communications and the registry and bibliography are in progress; formation of the network is well underway. Results will be communicated through newsletters and the web site.

Accelerated Reduction/Elimination of Toxics (ARET)

Accelerated Reduction/Elimination of Toxics is a voluntary, non-regulatory program that targets 117 toxic substances, including 30 that persist in the environment and may accumulate in living organisms. ARET participants voluntarily commit to reduce their emissions of toxic substances to the environment. Their action plans, which outline how they will achieve their commitments, are publicly available. Each year, participants monitor their emissions and report their results.

In the long term, ARET aims to achieve virtual elimination of emission of 30 persistent, bioaccumulative and toxic substances and reduction of another 87 toxic substances to levels insufficient to cause harm. ARET's short-term goal for the year 2000 is to reduce persistent, bioaccumulative and toxic substance emissions by 90 percent, and all other toxic substance emissions by 50 percent. Results to date show that ARET participants have made significant progress toward the goals committed to in their action plans. Together, 303 facilities have reduced toxic substance emissions to the environment by 24,090 tonnes - a decrease of 64% from base year levels to December 1997. Participants also commit to further reduce their emissions of toxic substances by another 5,172 tonnes from 1998 to 2000.

APPENDIX 4

APPENDIX 4. THEME SPREADSHEETS

Theme 1 (Category A): Sustainable Ecosystems and Land Use:

Environmental Component		Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
49		End Land Use	*Continuity of landform, watershed and vegetation communities across oilsands mine closure landscapes is necessary for the development of sustainable landscapes and a diverse ecosystem including a diversity of landforms, indigenous vegetation, near-natural water patterns, and wetlands, and a natural appearance.	-Subregional IRP -Requirement for reclamation -Forest Landscape Mgmt Strategy for Alberta -ELU Committee Recommendation -EPEA Approvals -Public Lands Act	- RAC - OSVRC - WWG - Syncrude Forest Reclamation Network - EUB-Industry Boundary Group - Sustainable Development: Managing Total Effects of Regional Activities	- Suncor Reclamation Monitoring Program - Corporate	- SFMN - TERRE - Corporate - Suncor CT Reclamation Demonstration
50	Terrestrial	End Land Use	*Landscape design to create landforms of mine structures that have a natural appearance is possible only if it is planned into the development from project inception.(i.e., part of the approval process.)		- RAC	- Corporate	- TERRE - Corporate
51	Terrestrial	End Land Use	Re-establishing a diverse ecosystem including a diversity of landforms, indigenous vegetation, near-natural water patterns, and wetlands, in the reclaimed landscape.		- RAC - OSVRC - WWG - Syncrude Forest Reclamation Network	- Suncor Reclamation Monitoring Program - Corporate	- TERRE - Corporate
52	Terrestrial	End Land Use	*The reclaimed landscape will be used for recreational purposes, with the potential for intensive recreational activities including fishing and hunting pressures because of increased access. The capability to support and/or the land to recover after use from these types of activities have to be incorporated into the closure planning. Public information about the government policy with respect to assurances that the cost of end land use will not be passed along to the public and information about how industry will finance end land use over the long term.	-Sub-Regional IRP -Forest Landscape Mgmt Strategy for Alberta -ELU Committee Recommendations -EPEA Approvals -Public Lands Act -Forest Act -Forest Land Use Zones	- RAC		

Theme 1 (Category A): Sustainable Ecosystems and Land Use:

53	Terrestrial	End Land Use	Rapid establishment of functional riparian areas similar to those present in the pre-development landscape following closure and ensuring that watershed structures do not require periodic long-term maintenance.	-Sub-Regional IRP -Forest Landscape Mgmt Strategy for Alberta -ELU Committee Recommendations -Draft guideline for Wetland Establishment on Reclaimed Oil Sands Leases -EPEA Approvals	- RAC - WWG - Corporate	- Corporate	- Corporate - TROLS
54	Terrestrial	End Land Use	Utilization of native species and traditional plant species in reclamation in the closure planning design.	-Sub-Regional IRP -Forest Landscape Mgmt Strategy for Alberta -Canada Forest Accord -Alberta Forest Legacy	- RAC - WWG - Native plant working group - Corporate	- Corporate	Corporate
55	Terrestrial	Traditional Use Values and Mitigation	*What vegetation species existed in the predisturbance landscape and what species will be established in the reclaimed landscapes, and when.	-ELU Committee Recommendations -Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region -EPEA Approvals	- RAC - WWG - Native plant working group - Corporate	- Corporate	Corporate
56	Human Health	Traditional Use Values and Mitigation	*Impact of development on medicinal plants. Are the plants going to be available in reasonable distance during development, are the plants etc. going to be available on the reclaimed landscape and, in either case, are they going to be safe to consume?	-Public Lands Act -Forest Mgmt Plan	- RAC - WWG - Corporate	- TEEM - Corporate	
69	Terrestrial	End Land Use	Mitigation of cumulative environmental effects through regional development planning and integrated mine plans of oil sands developments.		- RAC - OSVRC - WWG - Syncrude Forest Reclamation Network - EUB-Industry Boundary Group - Sustainable Development: Managing Total Effects of Regional Activities		- SFMN - Forestry Research
70	Surface Water	Tailings	Reduction and mitigation of surface disturbances of oil sands developments through the examination and use of alternate tailings technologies and management.				- TERRE - Research project: creating a soil-like profile - Bi-annual tailings R & D seminar
72	Terrestrial	Forest Values	Cumulative impact of development on annual allowable cut and other forest values.				

Theme 2 (Category A): Cumulative Impacts on Wildlife Populations (includes access management issue)

Environmental Component		Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
2	Air	Traditional Resource Use	*Effect of air pollution on bird flyways. (The issue was not well understood by the workshop group therefore defined as "effects of air pollution on waterfowl".)				
63	Terrestrial	Cumulative Impacts on Wildlife - Habitat Changes	*The uncertainty about cumulative impact of individual and multiple oil sands developments on wildlife as a result of the habitat loss, and larger scale (regional) fragmentation of the ecosystem, has major implications to regional wildlife populations. This is particularly important for wildlife species of concern in Alberta such as the Red, Blue, and Yellow listed species. -Changes in habitat availability, connectivity and diversity -Preservation of habitat for threatened animals -Increased mortality risks due to industrial activity and increased traffic flow	-Sub-Regional IRP -Forest Landscape Mgmt Strategy for Alberta -Fish & Wildlife Policy for Alberta -End Land Use Committee -FMAOSSIRP -Boreal Caribou Research Program -EPEA Approvals -Hunting Licenses -Trap Line Permits	- Sustainable Development: Managing Total Effects of Regional Activities - EIA Biodiversity Working Group - BCC	- AFBMP - Ungulate monitoring - Furbearer monitoring - Colonial nesting bird survey - May waterfowl breeding population survey	- BCC - Biodiversity Assessment & Conservation in the Athabasca Oil Sands - SFMN - TROLS - AOSERP - Corporate
64	Wildlife	Traditional Use Values and Mitigation	*Impact of development on wildlife of high traditional value; moose, rabbits, aquatic furbearers, grouse, waterfowl, and squirrels.		- Sustainable Development: Managing Total Effects of Regional Activities	- AFBMP - Ungulate monitoring - Furbearer monitoring - May waterfowl breeding population survey	- SFMN - TROLS - AOSERP - Corporate
65	Terrestrial	End Land Use	*Uncertainty about the type of wildlife that the reclaimed land will sustain and if the wildlife (moose, rabbits, aquatic furbearers, grouse, waterfowl, and squirrels) that will be sustained is congruent with traditional needs.	-Sub-Regional IRP -Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands -ELU Committee Recommendation -EPEA Approvals -Hunting Licenses -Trap Line Permits -Public Lands Act	- RAC - Sustainable Development: Managing Total Effects of Regional Activities - EIA Biodiversity Working Group	- AFBMP - TEEM	- TERRE - CEATAG
66	Wildlife	Traditional Use Values and Mitigation	Concern that increased activity in the region has and will result in increased 'unregulated' tourism which might occur on traditional trap lines. What protection do the holders of these trap lines have regarding tourism development on their lines?	-Sub-Regional IRP -Forest Landscape Mgmt Strategy for Alberta -Boreal Caribou Research Program -Wildlife Act -EPEA Approvals	- ATC/IWG	- Furbearer monitoring	
67	Wildlife	Hunting	*Over-hunting pressures from increased access and restrictions of hunting access within the development areas and bag limits within the region. The potential for increased access and increased human populations to impact wildlife populations.	-Hunting Licenses -Trap Line Permits -Public Lands Act -Forest Land Use Regulations -LOC Regulations -Access Mgmt Policy -Trappers Compensation Program -ATRL Process -Commercial Trail Riding Policy -Trapper Cabin Policy -Miscellaneous lease regulations		- Ungulate monitoring - Furbearer monitoring - May waterfowl breeding population survey	- TROLS - Corporate

Theme 3 (Category A): Soils and Plant Species Diversity

	Environmental Component	Topic	Issue	Mangement Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
48	Terrestrial	Wetland Assessment and Impacts	*The undetermined impact on wetland vegetation communities due to basal aquifer and surface aquifer drawdown and the uncertainty of lateral distance of impact. This surface drawdown may cause the drying of wetlands over a significant area, depending on the volume of water removal required to dry a wetland.	-Sub-Regional IRP -Draft Wetlands Policy for Alberta -EPEA Approvals -Water Act -Public Lands Act	- WWG	- RAMP - Groundwater Observation Well Network - Corporate	
58	Terrestrial	Biodiversity Assessment	*The Canadian Biodiversity Strategy recommends addressing the impacts to biodiversity for environmental impact assessments. There is uncertainty as to the acceptable level of detail and scope of assessments and expectations for restoration. Impacts to Biodiversity includes changes in landscape and community levels, changes in species and genetic levels, and impacts to rare species like rare plants. - Soils, plants and wildlife tend to be treated separately rather than in an integrated fashion, as an ecosystem.	-Sub-Regional IRP -Canadian Biodiversity Strategy -Candian Forest Strategy -Alberta Forest Legacy -Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands -ELU Committee Recommendations -EPEA Approvals -Public Lands Act -Forest Act	- EIA Biodiversity Working Group	- AFBMP	- Biodiversity Assessment and Conservation in the Athabasca Oil Sands - SFMN
59	Terrestrial	Biodiversity Conservation	Protection of areas in the lease that are not underlain by economic oil sands and are not specifically needed for mine as biodiversity in-situ conservation areas.	-Sub-Regional IRP -Canadian Biodiversity Strategy -Candian Forest Strategy -Alberta Forest Legacy -EPEA Approvals -Public Lands Act			
60	Terrestrial	Diversity of Soil Types to Promote Potential for Vegetation Diversity	The re-creation of a single type (homogenous) topsoil across the reclaimed landscape may not provide an “equivalent capability” for the return of a diversity of native vegetation communities. Research is required to understand the soils and technology necessary to re-establish a diversity of vegetation types, in a reasonable period of time. The requirement to salvage all the presently existing mineral soils maybe necessary to prevent the permanent loss of the capability to re-establish and sustain equivalent vegetation and other biological diversity.	-Sub-Regional IRP -Forest Landscape Mgmt Strategy for Alberta -ELU Committee Recommendations -EPEA Approvals	- RAC - Soils Working Group - OSVRC - WWG - Corporate	- Suncor Reclamation Monitoring Program	- TERRE
61	Terrestrial	Diversity of Soil Types to Promote Potential for Vegetation Diversity	*Reclamation soil depths and types should be based on end-land use needs. The soil depth may be adjusted for different vegetation types in different locations so as to maximise the speed and likely success of initial reclamation efforts.		- RAC - Soils Working Group - OSVRC - WWG - Corporate	- Suncor Reclamation Monitoring Program	- TERRE
62	Terrestrial	Diversity of Soil Types to Promote Potential for Vegetation Diversity	The productivity of soils used to support commercial forest are based on the use of a soil rating procedure called the, “Land Capability Classification for Forest Ecosystems in the Oil Sands Region (LCCS)”. The rating system is new and requires monitoring to determine the factors that influence productivity and the long-term sustainability of the forests established and the establishment and viability of other uses.		- RAC - Soils Working Group - OSVRC - WWG - Corporate	- Suncor Reclamation Monitoring Program	- TERRE

Theme 4 (Category A): Effects of all Air Emissions on Human Health, Wildlife and Vegetation.

Environmental Component		Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
7	Air	Air Pollutant Interactions	*Cumulative impacts of concentration and deposition of air pollutants on human health, wildlife, and vegetation in the region (individual emissions and their interactions, including synergistic effects of ozone).	-CASA SO2 Mgmt in Alberta -Air Toxics Mgmt program in Alberta -NOx/VOC Mgmt Program -Index of the Quality of The Air -Pollution minimization by CCME Guidelines for Air Emissions Sources -BACT for Air Toxics -EPEA Approvals	- NSMWG	- WBEA - TEEM - AOSCEHEAP and F. McKay Health Study - Corporate	- OMWG - AOSCEHEAP - AIRTAG - RAPIDS Pilot Project
8	Air	Air Quality Notification	*Establishing community air quality notification levels, incorporating both human health and aesthetic needs.	-EPEA Approvals -Ambient Air Quality Guidelines	- Fort McKay Air Quality Notification System	- WBEA	
9	Air	Air Toxics	*Cumulative impact of concentration and deposition of air pollutants (Air Toxics, Priority Substances List 1/2) on human health and wildlife (especially amphibians) due to air emissions.	-Air Toxics Mgmt Program in Alberta -Pollution minimization by CCME Guidelines for Air Emissions Sources -BACT for Carcinogenic Air Toxics -BADT for Non-carcinogenic Air Toxics -EPEA Approvals	- ARET	- WBEA - AOSCEHEAP - Corporate	- AIRTAG - Corporate
10	Air	Ambient Air Quality Guidelines	*Meeting ambient air quality guidelines for criteria emissions, e.g. SO2 and NOX (Recognizing that some guidelines are in the process of being updated and that others may need updating, e.g. SO2 and NOX).	-Ambient Air Quality Guidelines -Modelling done in support of approvals -VOC, PM, ozone under review	- NSMWG	- WBEA - Corporate	- AIRTAG
11	Air	Lack of Ambient Air Quality Guidelines	Several air emissions lack air quality guidelines (e.g., reduced sulphur, individual VOCs, PM 2.5)	-CASA -OSEC MOU			
13	Air	Ground Level Ozone	*Impact of Ground Level Ozone on human health and vegetation. (Ground-level ozone is a secondary pollutant formed from NOX and VOC emissions).	-Guideline for Ozone -Emissions of Ozone precursors (VOC & NOx) managed through approval limits & reference to CCME Codes of Practice in approvals	- NSMWG	- WBEA - AOSCEHEAP	- OMWG - AIRTAG
15	Air	Inhalable Particulate Matter (PM10 and PM2.5)	*Impact of inhalable particulate matter on human health and wildlife.	-Air Toxics Mgmt Program in Alberta -Canada Wide Standards process to establish ambient guidelines for PM10 -Pollution minimization of particular matter emissions -Ambient Guideline for TSP -CCME Guidelines for NOx sources -EPEA Approvals		- WBEA - AOSCEHEAP	- AIRTAG
18	Air	Odours	Cumulative impact of odour levels in residential settlements and odours from individual projects.	-CASA SO2 Mgmt in Alberta -Air Toxics Mgmt Program in Alberta -EUB-EPEA legislation -Alberta Ambient Air Quality Guidelines for H2S and SO2 -Sulphur recovery guidelines -CCME Guidelines -Non-Criteria Pollutant Guideline for CS2 -Draft EUB flaring guide -EUB-EPEA Approvals		- Corporate	

Theme 4 (Category A): Effects of all Air Emissions on Human Health, Wildlife and Vegetation.

25	Air	VOCs	Impact of VOC concentrations on human health, vegetation and wildlife. Volatile Organic Compounds (VOC) is a group of compound with relatively few ambient air quality guidelines that have been stipulated. VOCs are from industrial and natural sources and are a major contributor to odour and ozone formation. Issues here are odour, health and perception of a problem	-Air Toxics Mgmt Program in Alberta -CCME Guidelines -Non-Criteria Pollutant Guidelines for CS2 -EPEA Approvals	- ARET	- WBEA - AOSCEHEAP - Corporate	- AIRTAG - Corporate

Theme 5 (Category A): Effects of Heavy Metal Deposition - Consumption and Bio-accumulation

Environmental Component		Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
1	Air	Traditional Resource Use	Effects of deposition of heavy metals and acidifying compounds on traditional plants used by First Nations and Metis residents in and around the Oil Sands Developments.	-CASA SO2 Mgmt in Alberta -Air Toxics Mgmt Program in Alberta -Alberta Ambient Air Quality Guidelines for NO2 & SO2 -Interim Critical Load for Acid Deposition -BACT for Heavy Metals sources -Sulphur Recovery Guidelines -EPEA Approvals	- NSMWG (acid dep.)	- TEEM - RAMP - Corporate	
14	Air	Heavy Metals Deposition	*Impacts of increasing levels of heavy metal deposition on soil and vegetation, fish, wildlife and/or human health.	-Air Toxics Mgmt Program in Alberta -Pollution Minimization by BACT for Carcinogenic Air Toxics -BADT for Non-Carcinogenic Air Toxics -EPEA Approvals		- TEEM - RAMP - Corporate	
56	Human Health	Traditional Use Values and Mitigation	*Impact of development on medicinal plants. Are the plants going to be available in reasonable distance during development, are the plants etc. going to be available on the reclaimed landscape and, in either case, are they going to be safe to consume?		- RAC - WWG - Corporate	- TEEM - Corporate	

Theme 6 (Category B): Access Management

Environmental Component		Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
66	Wildlife	Traditional Use Values and Mitigation	Concern that increased activity in the region has and will result in increased 'unregulated' tourism which might occur on traditional trap lines. What protection do the holders of these trap lines have regarding tourism development on their lines?	-Sub-Regional IRP -Forest Landscape Mgmt Strategy for Alberta -EPEA Approvals -Hunting Licenses -Trap Line Permits -Public Lands Act -Forest Land Use Regulations -LOC Regulations -Access Mgmt Policy -Trappers Compensation Program -ATRL Process -Commercial Trail Riding Policy -Trapper Cabin Policy -Miscellaneous lease regulations		- Furbearer monitoring (AENV)	
71	Terrestrial	Traditional Use Values and Mitigation	Space to carry out cultural/spiritual actifities without disturbance.				

Theme 7 (Category B): Cumulative Impacts on Fish Habitat and Populations

	Environmental Component	Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
26	Fisheries	Fishing	*Over-fishing pressures from increased access. The potential for increased access and increased human populations to impact fish populations.	-FHPG -Fish & Wildlife Policy for Alberta -FCSA -DFO Policy for Mgmt of Fish Habitat -Walleye Mgmt Plan -Pike Mgmt Plan -Arctic Grayling Mgmt Plan -Fishing licenses/regulation -Forest Land Use Zone		- Northern Lakes Inventory Program - Walleye Monitoring Program	
27	Fisheries	Fish Conservation	*Activities in the region will result in changes in flow (volume) which in turn will alter fish habitat.	-Water Act -FHPG -Fish & Wildlife Policy for Alberta -DFO Policy for Mgmt of Fish Habitat -FCSA -Sub-Regional IRP -DFO Approvals -Fisheries Act -EPEA Approvals		- Regional Climate and Hydrology Monitoring Prog. - Hydrometric Network (WSC and AENV) - RAMP	
36	Surface Water	Surface Water	Changes in flows, sediment concentrations and channel regime in receiving streams in local basins and their impacts on fish habitat.	-Water Act -FHPG -Fish & Wildlife Policy for Alberta -FCSA -Fisheries Act -DFO Policy for Mgmt of Fish Habitat -Draft Guidelines for Wetlands Establishment -AAWQG -CWQG -DFO Approvals -EPEA Approvals	- Corporate	- Corporate - RAMP - Hydrometric Network	
37	Surface Water	Drainage Regime	*Restructuring of drainage regimes may contribute to increased erosion and result in impacts to wetlands and change flow rates in tributaries, increase sediment concentration, and have an impact on fish habitat.		- Corporate	- Corporate - RAMP - Hydrometric Network	
46	Surface Water	Water Quality	*Effects of industrial effluents on fish health - disease, deformities and fish tainting.	-FCSA -Fisheries Act -DFO Policy for Mgmt of Fish Habitat -Sub-Regional IRP -AAWQG -CWQG -DFO Approvals -EPEA Approvals -Water Act Authorization		- RAMP	- CEATAG - NRBS/NREI

Theme 8 (Category B): Effects of Emissions from Tailings Ponds

	Environmental Component	Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
18	Air	Odours	Cumulative impact of odour levels in residential settlements and odours from individual projects.	-CASA SO2 Mgmt in Alberta -Air Toxics Mgmt Program in Alberta -EUB-EPEA approvals -Alberta Ambient Air Quality Guidelines for H2S and SO2 -Sulphur recovery guidelines -CCME Guidelines -Non-Criteria Pollutant Guideline for CS2 -Draft EUB flaring guide	- Corporate - Fort McKay Air Quality Notification System	- WBEA	
21	Air	Tailings Pond Emissions	Emissions of Volatile Organic Compounds (VOC) and Total Reduced Sulphur (TRS) compounds from the tailings pond is a concern to nearby residents. Tailings pond issues revolve around the uncertainty respecting emissions and mitigation strategies for odours and VOC concentration.	-Alberta Toxics Guideline -Ambient Guideline for H2S -Flaring Guideline -EPEA Approvals -EUB Approval re: recovery of diluent	- Corporate	- WBEA - AOSCEHEAP - Corporate	- Corporate - AIRTAG
24	Air	VOC Emissions	Minimising the loss of solvent diluents with the long-term objective of eliminating the release of untreated froth treatment tailings solvents.	-EPEA Approvals -EUB Approval re: solvent recovery & reporting of solvent losses	- Corporate	- Corporate	- Corporate
25	Air	VOCs	Impact of VOC concentrations on human health, vegetation and wildlife. Volatile Organic Compounds (VOC) is a group of compound with relatively few ambient air quality guidelines that have been stipulated. VOCs are from industrial and natural sources and are a major contributor to odour and ozone formation. Issues here are odour, health and perception of a problem.	-Air Toxics Mgmt Program in Alberta -CCME Guidelines -Non-Criteria Pollutant Guideline for CS2 -EPEA Approvals	- Corporate - ARET	- WBEA - AOSCEHEAP - Corporate	- Corporate - AIRTAG

Theme 9 (Category B): Effects of Acid Deposition on Sensitive Receptors

Environmental Component		Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
1	Air	Traditional Resource Use	Effects of deposition of heavy metals and acidifying compounds on traditional plants used by First Nations and Metis residents in and around the Oil Sands Developments.	-CASA SO2 Mgmt in Alberta -Air Toxics Mgmt Program in Alberta -Alberta Ambient Air Quality Guidelines for NO2 & SO2 -Interim Critical Load for Acid Deposition -BACT for Heavy Metals sources -Sulphur Recovery Guidelines -EPEA Approvals	-NSMWG	- TEEM - RAMP - WBEA	- AIRTAG
3	Air	Acid Deposition - Soils	*Impacts on productivity and vegetation composition of local and regional acid sensitive soils.	-CASA SO2 Mgmt in Alberta -Target Load Subgroup Draft '99 -Alberta Ambient Air Quality Guidelines for NO2 and SO2 -Interim Critical Load for Acid Deposition -Sulphur Recovery Guidelines -CCME Guidelines on Air Emission Sources -EPEA Approvals	- NSMWG	- TEEM - RAMP	- Corporate - ADRP
4	Air	Acid Deposition - Surface Water	*Impacts on buffering capacity, biological productivity and species composition of acid sensitive rivers and lakes.	-CASA SO2 Mgmt in Alberta -Target Load Subgroup Draft '99 -Alberta Ambient Air Quality Guidelines for NO2 and SO2 -Interim Critical Load for Acid Deposition -Sulphur Recovery Guidelines -CCME Guidelines on NOx Emission Sources -EPEA Approvals	- NSMWG - WRUG	- TEEM - RAMP - RAMP Acid Sensitive Lake Monitoring Program	- Lake Acid Sensitivity Inventory
5	Air	Acid Deposition - Vegetation	*Impacts on biological productivity of acid sensitive vegetation; and changes in species composition and diversity, including impacts on the success and sensitivity of revegetation on reclaimed areas.	-CASA SO2 Mgmt in Alberta -Target Load Subgroup Draft '99 -Alberta Ambient Air Quality Guidelines for NO2 and SO2 -Interim Critical Load for Acid Deposition -Sulphur Recovery Guidelines -CCME Guidelines on NOx Emission Sources -EPEA Approvals	- NSMWG	- TEEM - Corporate	- ADRP - Corporate
6	Air	Acid Deposition - Wetlands	*Acidification of wetlands may impact mosses and lichens, and cause sphagnum moss invasion in poor fens, and result in changes to wetlands composition/diversity.	-CASA SO2 Mgmt in Alberta -Target Load Subgroup Draft '99 -Alberta Ambient Air Quality Guidelines for NO2 and SO2 -Interim Critical Load for Acid Deposition -Sulphur Recovery Guidelines -CCME Guidelines on NOx Emission Sources -EPEA Approvals	- NSMWG - WRUG		- U of A
16	Air	Long-range Transport	Monitoring and assessment of long-range transport of air emissions including acidifying emissions.	-CASA SO2 Mgmt in Alberta -Alberta Ambient Air Quality Guidelines for NO2 and SO2 -Interim Critical Load for Acid Deposition -EPEA Approvals	- SERM	- TEEM	- NREI - ADRP - Lake Acid Sensitivity Inventory

Theme 9 (Category B): Effects of Acid Deposition on Sensitive Receptors

19	Air	Oxides of Nitrogen	*Cumulative impact of increasing NOX emissions. These emissions can contribute to the increase of ambient NOx concentrations, formation of ground level ozone, acidification, vegetation effects and human health effects. High temperature combustion processes produce oxides of nitrogen (NOX) emissions.	-Alberta Ambient Air Quality Guidelines for NO2 -Interim Critical Load for Acid Deposition -CCME Guidelines on NOx Emissions Sources -EPEA Approvals	- NSMWG	- WBEA - RAMP - TEEM - AOSCEHEAP	- OMWG
20	Air	Sulphur Dioxide (SO2)	*Impact of increasing SO2 concentrations on human health, vegetation and wildlife. SO2 is a compound for which ambient air quality guidelines have been stipulated, and it is also a major contributor to acidic deposition.	-CASA SO2 Mgmt in Alberta -Target Load Subgroup Draft '99 -Alberta Ambient Air Quality Guidelines for SO2 -Interim Critical Load for Acid Deposition -Sulphur Recovery Guidelines -Flaring Directive -EPEA Approvals	- NSMWG	- WBEA - RAMP - TEEM - AOSCEHEAP	
56	Human Health	Traditional Use Values and Mitigation	*Impact of development on medicinal plants. Are the plants going to be available in reasonable distance during development, are the plants etc. going to be available on the reclaimed landscape and, in either case, are they going to be safe to consume?		- RAC - WWG - Corporate	- TEEM - Corporate	
57	Terrestrial	Monitoring of Acidification of Terrestrial and Wetland Ecosystems	The cumulative effects of acid deposition by industry, plant and vehicle emissions on terrestrial and wetland ecosystems is unknown so it must be monitored to understand future impacts. The potential impacts and degradation to vegetation, and wildlife could affect the future sustainability of wetland vegetation complexes, associated wildlife species, Caribou, and other sensitive species in northeastern Alberta.	-CASA SO2 Mgmt in Alberta -Alberta Ambient Air Quality Guidelines for NO2 and SO2 -Interim Critical Load for Acid Deposition -Sulphur Recovery Guidelines -CCME Guidelines on NOx Emission Sources -EPEA Approvals	- NSMWG	- Corporate	- AIRTAG

Theme 10 (Category B): Cumulative Impacts on Surface Water Quality

	Environmental Component	Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
34	Surface Water	CT Reclamation	The potential toxicity of CT release water and its duration on the landscape.	-Sub-Regional IRP -Industrial Effluents Policy -Alberta Ambient Surface Water Quality Guidelines -Canadian Water Quality Guidelines -Groundwater Guideline -Wetlands Guideline -EPEA Approvals	- Corporate - RAC	- RAMP - Suncor Reclamation Monitoring Program - Corporate	- TERRE - CEATAG - ARC - Suncor CT Reclamation Demonstration - Corporate - Bi-annual Tailings R & D Seminar
35	Surface Water	Water Quality	*Effects of runoff from Coke and Sulphur piles on water quality.			- RAMP	
40	Surface Water	Water Quality	Should we use chemical specific guidelines for toxic elements of water discharges instead of "Toxic Units", e.g., from end-pit lakes.	-FCSA -Fisheries Act -DFO Policy for Mgmt of Fish Habitat -Sub-Regional IRP -AAWQG -CWQG -Industrial Effluents Policy -AEP Water quality -EPEA Approvals			- CEATAG - Corporate (CT research)
41	Surface Water	Water Quality	*Changes in water quality of streams, rivers, and lakes due to an individual project and multiple projects, and monitoring and assessment of effects of water pollutants in the downstream region. (Athabasca and PAD)	-Water Act -FCSA -Fisheries Act -DFO Policy for Mgmt of Fish Habitat -Pipeline Act -Forestry Legislation Policy -Sub-Regional IRP -AAWQG -CWQG -Industrial Effluents Policy -EPEA Approvals -Water Act Authorization		- RAMP - Muskeg River Water Quality Survey - Long term/Medium term River Networks Sites	- NRBS/NREI/PERD - Forestry research projects - CT research
42	Surface Water	Water Quality	*Changes in Athabasca River water quality and the quality of tributaries.			- RAMP - Muskeg River Water Quality Survey - Long term/Medium term River Networks Sites	- NRBS/NREI/PERD - Forestry research projects - CT research
43	Surface Water	Water Quality	Monitoring and assessment of effects of water pollutants in the downstream region (the effects need to include water quality, sediment quality, benthos and fish).			- RAMP - Muskeg River Water Quality Survey - Long term/Medium term River Networks Sites	- NRBS/NREI/PERD - Forestry research projects - CT research
44	Surface Water	Water Quality	*Untreated drinking water aesthetics - smell and taste.	-Water Act -Sub-Regional IRP -Groundwater Guideline -Guidelines for Canadian Drinking Water -EPEA Approvals		- Municipalities	- NREI - U of A
68	Surface Water	Sustainability	Impacts of multiple developments on long-term hydrological and biological integrity of water sheds such as Muskeg Rivers and Kearl Lake.			- RAMP - Hydrometric Network (AENV and WSC) - Regional Climate and Hydrology Monitoring Prog. - Long term/Medium term River Networks Sites	- SFMN - TROLS

App. 4-13

Theme 11 (Category C): Cumulative Impacts on Surface Water Quantity

	Environmental Component	Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
34	Surface Water	CT Reclamation	The potential toxicity of CT release water and its duration on the landscape.	-Sub-Regional IRP -Industrial Effluents Policy -Alberta Ambient Surface Water Quality Guidelines -CWQG -Groundwater Guidelines -Wetlands Guidelines -EPEA Approvals	- Corporate - RAC	- RAMP - Suncor Reclamation Monitoring Program - Corporate	- TERRE - CEATAG - ARC - Suncor CT Reclamation Demonstration - Corporate - Bi-annual Tailings R & D Seminar
38	Surface Water	End Pit Lake (EPL) Water Quality	*Impact of EPL water quality on habitat conditions for biota in the lake itself, and for the River/Creek, to which it will discharge. Uncertain water quality in the EPL, which is a final landscape feature. This results from the proposal to put tailings in the lake and cap it with water; and the quality of water that will be in these lakes from local runoff.	-Water Act authorization -Fisheries Act -RAC -Wetlands Guideline -Environment Quality Guideline -EPEA Approvals	- EPL Group - Corporate	- RAMP - Corporate	- TERRE - CEATAG

App. 4-14

Theme 12 (Category C): Cumulative Impacts on Surface Water Quantity

	Environmental Component	Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
39	Surface Water	Surface Water	*Changes in open water areas, including lakes and streams. This is an overall issue of watershed management and cumulative changes in flow regimes due to development.	-Water Act -FHPG -Fish & Wildlife Policy for Alberta -FCSA -Fisheries Act -DFO Policy for Mgmt of Fish Habitat -Sub-Regional IRP -DFO Approvals -Water Act Authorization -EPEA Approvals		- RAMP - Regional Climate and Hydrology Monitoring Prog. - Hydrometric Network	
47	Surface Water	Water Quantity	*In-stream flow needs in the Athabasca River and developed tributaries.	-Water Act -Fish Conservation Strategy -Instream Flow Needs -Water Mgmt Planning & Guidelines -Water Conservation Guideline -Water Act Authorization		- Hydrometric Network - Corporate	
68	Surface Water	Sustainability	Impacts of multiple developments on long-term hydrological and biological integrity of water sheds such as Muskeg Rivers and Kearl Lake.			- RAMP - Hydrometric Network (AENV and WSC) - Regional Climate and Hydrology Monitoring Prog. - Long term/Medium term River Networks Sites	- SFMN - TROLS

App. 4-15

Theme 13 (Category C): Cumulative Impacts on Groundwater Quantity

	Environmental Component	Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
29	Groundwater	Water Quantity	*Changes in groundwater quantity associated with withdrawal due to water supply. *(In-Situ)*	-Water Act -Sub-Regional IRP -Water Act Authorization	- Corporate	- Corporate - Groundwater Observation Well Network	
30	Groundwater	Water Quantity	Changes in groundwater quantity associated with mines (other than Basal Aquifer depressurization).	-Water Act -Sub-Regional IRP -EUB -Wetlands Guidelines -Water Act Authorization	- Corporate	- Corporate - Groundwater Observation Well Network	

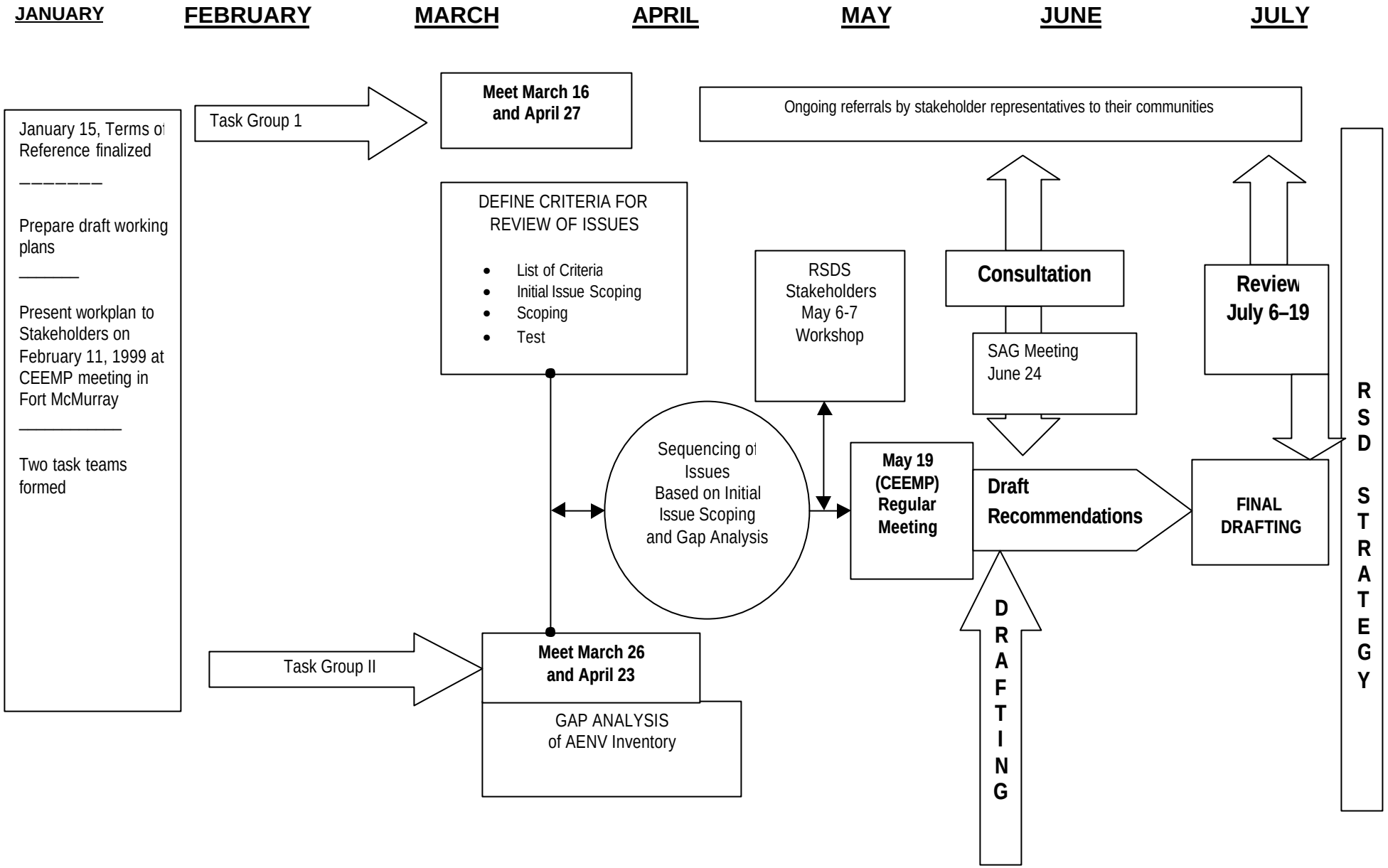
App. 4-16

Theme 14 (Category C): Cumulative Impacts on Groundwater Quality

	Environmental Component	Topic	Issue	Management Tools	Management Plan / Organization	Monitoring Program / Organization	Research Program / Organization
28	Groundwater	Water Quality	*Potential effects of improper deep-well disposal of process waste-water. *(In-Situ)*	-Sub-Regional IRP -Water Act -Deep Well Disposal (EUB) -Penalties -EPEA Approvals -EUB License	- Corporate	- Corporate - Groundwater Observation Well Network	
31	Groundwater	Water Quality	Effects of seepage water from reclaimed landforms and tailings ponds.	-ELU Committee -Sub-Regional IRP -Water Act -EPEA Approvals	- Corporate	- Corporate - Groundwater Observation Well Network	- CT research - TERRE
32	Groundwater	Water Quality	Effects of produced water on groundwater quality. *(In-Situ)*		- Corporate	- Corporate - Groundwater Observation Well Network	
33	Human Health	Tailings Pond	Effects of seepage from existing tailings ponds.		- Corporate	- Corporate	

APPENDIX 5

APPENDIX 5A. RSDS CONSULTATION PROCESS JANUARY TO JULY 1999



Consultation Chart July 1999
Chart A-2

APPENDIX 5A: RSDS - STAKEHOLDERS TASK TEAMS (CEEMPP) & AENV CO-ORDINATION TEAM

MARCH 99 BEGIN

(CEEMP) STAKEHOLDER TASK GROUPS

Task I

Don Klym , Chairperson

Group Met March 16 & April 27

Task II

Judy Smith, Chairperson

Group Met March 26 & April 23

AENV/RSDS COORDINATION TEAM

Science

Ken Foster, Team Leader

Baseline Inventory

SURVEY,Mar. 30

Management

Randall Barrett, Team Leader

Baseline Inventory

Process Review Modelling, Mar. 30

Inventory Mar.31/99

DEFINE CRITERIA FOR REVIEW OF ISSUE

- List of Criteria
- Initial Issue Scoping

GAP Analysis of AENV Inventory

- Evaluation AENV List
- Review/Test

ISSUES

ISSUES

INTEGRATE 2 TASK GROUPS

Joint Meeting April 13/14
GAP ANALYSIS
SEQUENCE
RECOMMEND

SEQUENCING OF ISSUES Adjust

Analysis April 30/99

MAY 6/7 WORKSHOP

MAY 6/7 WORKSHOP

May 19 (CEEMPP) Meeting RECOMMEND

AENV Begins to Draft RSDS

Preliminary Draft Referral to Advisory Group

July 6 send out to stakeholders

July 30 Final Draft to Deputy Minister AENV

Regional Regulators Linkages
Group reviews
May 20
June 24 and 30
Copy July 6 - 19

May 31/99

June 30/99

July 30/99

June 24 Stakeholders Advisory Group Meets

July 6 – 19 Draft to all Stakeholders

RSDS July 30, 1999

APPENDIX 5B. PROCESS FOR COMPILING SCIENCE INVENTORY

In order to gather information on the committees, projects and programs involved in environmental research and resource management in the Northeast Boreal Region, the questionnaire found in this appendix was sent to all stakeholders. The form asks for information on program objectives, participants, funding sources, activities and results. Several respondents provided additional information such as reports, Terms of Reference documents, and program summaries. Results were compiled into an inventory, found in Appendix 3, which describes the activities and progress of each initiative. Examples are provided of the blank form and one completed for the provincial furbearer monitoring program.

BLANK QUESTIONNAIRE ON COMMITTEES, PROJECTS AND PROGRAMS:

ACRONYM: **Committee/Project Name:**	
Last update of form: (date)	
Contact Information and Organizational Structure (phone numbers, email addresses)	
Chairperson:	
AEP contact:	
Committee members and affiliations:	
Date formed:	
Structure (organization, decision-making, involvement of native communities, etc.):	
Funding (source, size of budget):	
Mission	
Please mark an "x" beside all issues in which this committee or project is involved:	
☐ **Air**	☐ **Terrestrial/Vegetation**
☐ **Water**	☐ **Aquatic Resources**
☐ **Traditional Resources**	☐ **Wildlife**
☐ **Reclamation**	☐ **Health**
☐ **Other:** (describe)	
Project/committee focus and objectives:	
Why was this project or committee formed?	
How are the results expected to be used? What are the links to regional management?	
Completed or Current Programs and Initiatives	
Program Name:	**Description (parameters under study, sampling frequency, program duration, regional study boundaries, contacts, etc.):**
Integration	
Links to other groups/programs:	
How are results communicated? (reports, public announcements, workshops with local communities, etc.)	

EXAMPLE QUESTIONNAIRE ON COMMITTEES, PROJECTS AND PROGRAMS:

ACRONYM:	
Committee/Project Name: Furbearer monitoring program	
Last update of form: Feb. 24, 1999	
Contact Information and Organizational Structure (phone numbers, email addresses)	
Chairperson:	
AEP contact:	Floyd Kunnas
Committee members and affiliations:	AEP Wildlife Branch NEB Region
Date formed:	On-going
Structure (organization, decision-making, involvement of native communities, etc.):	
Funding (source, size of budget): Part of the regional obligations to wildlife management – no specific budget allocation.	
Mission	
Please mark an "x" beside all issues in which this committee or project is involved:	

	Air		**Terrestrial/Vegetation**
	Water		**Aquatic Resources**
	Traditional Resources	X	**Wildlife**
	Reclamation		**Health**
	Other: (describe)		

Project/committee focus and objectives:
Monitor the status of four sensitive furbearers species with the use of registration forms and direct carcass analysis.

Why was this project or committee formed?
To ensure that the harvest of the four sensitive species of furbearers was not negatively affecting the status of the population provincially.

How are the results expected to be used? What are the links to regional management?
The information is used to formulate annual harvest quotas and to determine the range and density of furbearers within the region and province.

Completed or Current Programs and Initiatives

Program Name:	**Description (parameters under study, sampling frequency, program duration, regional study boundaries, contacts, etc.):**
	Fisher carcasses are collected annually to determine age/sex ratios in a trapped population. Registration records for the remaining 3 species are analyzed annually in order to modify quotas as needed.

Integration

Links to other groups/programs:
This is part of the provincial furbearer management program.

How are results communicated? (reports, public announcements, workshops with local communities, etc.)
Information is discussed with the Alberta Trappers Assoc. and within govt. to determine the best adjustment to the quota regime.

APPENDIX 5C. WORKSHEET USED AT DEPARTMENTAL WORKSHOP

On April 13 and 14, 1999, AENV held an internal workshop to review existing scientific information and management tools relevant to each of the 72 issues. Participants at the workshop included AENV specialists on air, water and terrestrial issues, as well as representatives from Alberta Health and Wellness and the Energy and Utilities Board. Four work groups (Air, Water, Terrestrial and Broad-level Issues) each reviewed a subset of the issues, and provided information on baseline data, work in progress, current management tools and recommended improvements to the system or information base. This appendix provides an example of the blank form used at the workshop and one filled out for Issue #57, "Monitoring of acidification of terrestrial and wetland ecosystems".

BLANK WORKSHEET (USED AT APRIL 13/14 DEPARTMENTAL WORKSHOP)

REGIONAL SUSTAINABLE DEVELOPMENT STRATEGY

Issue: (insert issue number and description)

Scope of Issue	**Please Choose One or More Where Appropriate**			
Spatial Scale	Foot Print / Lease / Off-Lease			
Timing of Stress	Short / Medium / Long			
Stressor Source	Mine / Linear / Forestry / Traditional / Other			
Stress Type	Land Disturbance / Substance Release / Resource Consumption / Other			
Jurisdiction	AEP / EUB / NRCB / Federal / Municipal / Treaty or Agreement / Other			
Gap Analysis Criteria	**Comments**	**Status**		
Information: **Baseline Information** Resource Inventory, Classification, Mapping/Database, Monitoring	**Gap Rating: A =** Adequate **U =** Under Development **I =** Inadequate	A	U	I
Information: **Stressors (Mine, Linear, Forestry, Traditional, Other)** Knowledge of Stressor, Environmental Interactions, Evaluation and Reporting Methods		A	U	I
Information: **Mitigation Tools**		N/A		
Existing Research Programs: **Completeness**	**List Programs and Completeness** (**Y** = Yes, **N** = No, **P** = Partial)	Y	N	P
Research: **Recommendations** Are research programs complementary, overlapping, inadequate, etc.		N/A		

Management Tools: **Policy**	**Gap Rating: A =** Adequate **U =** Under Development **I =** Inadequate	A	U	I
Management Tools: **Objective/Guideline**		A	U	I
Management Tools: **Approvals/Permits/ Licenses**		A	U	I
Management Tools: **Voluntary/Other**		N/A		
Management Tools: **Recommendations**		N/A		

APPENDIX 5D. SUMMARY OF PROCESS FOR IDENTIFYING AND SEQUENCING REGIONAL ENVIRONMENTAL ISSUES

The 72 issues being addressed by the RSDS were identified from the ones described in the *Athabasca Oil Sands Cumulative Effects Assessment Framework Report* [1], and from a list of issues raised during recent EUB hearings on oil sands mines and in situ projects. The list was refined during multi-stakeholder meetings for the RSDS, which involved industry, First Nations and Aboriginal Communities, environmental groups, and various municipal, provincial and federal government agencies.

Two CEEM-Partnership Task Groups were formed to do the preliminary analysis of the issues so they could be sequenced (sequencing analysis) according to the degree of urgency and information gaps. The specific criteria used for this coarse screen analysis are given below.

Urgency — based on the combination of timing, risk, and uncertainty for each issue.

- Environmental impact consequence and risk (What is the stakeholder's degree of concern at each level. If no further action is taken, what is the risk?)
- Timing of impact (When will the stress occur and how long will it last. Is it happening now? Is the effect of the stress immediate or does it show up later? Is the effect over a threshold level and is it reversible?)
- State of management system (What is being done now to reduce uncertainty; i.e., science. What are the current management initiatives to reduce or control the impact related to the issue?)

Gaps — based on identifying the information and systems needed to manage each issue.

- Scientific and traditional information (baseline information on the resource being affected. Information on stress factors [stressors] affecting the resource. Information on the availability of processes for mitigation).
- Measurable management objective (policy, objectives, approvals).

Each environmental component (air, water, land and human health) was rated separately by experts in that field. The resulting list of issues was then reviewed by AENV and the CEEM Partnership. By identifying the gaps, some common threads or themes were found in several of the issues. The issues were grouped according to similarities in their gaps, and a list of 14 "issue themes" was created. These issue themes were then organized into the order that stakeholders want to see them addressed.

[1] *Athabasca Oil Sands Cumulative Effects Assessment Framework Report* Prepared for the Cumulative Environmental Effects Management Initiative; February 1999. Golder Associates Ltd.

LEGEND FOR
RSDS ISSUES RATING TABLE

ISSUES

The issues contained in the RSDS Issues Rating table are a compilation of Stakeholder and Government issues. Original wording has been maintained as much as possible Comments from various groups have been added in the issue box (bolded italicised letters). Those issues preceded by an asterisk (*) are taken from the Cumulative Environmental Effects Management Partnership (CEEMP) Checklist for Gap Analysis.

The issues have been ordered in the Issues Rating Table first according to sequencing ratings, and then by gaps ratings. Sequencing ratings have been assigned so that issues needing immediate attention, and those for which the effects are not reversible, are given highest priority. For issues sequenced identically, the gaps rating provides a further scaling so that if items are of equal urgency those with the largest gaps will be addressed first.

ISSUE LINKAGES / THEME CATEGORY:

For each issue in the list, related issues (those with common themes) are listed here. The category assigned to each issue is also given.

SEQUENCING CRITERIA:

With the exception of risk (determined using a separate risk assessment process), sequencing criteria ratings given (shadings of each cell) are based on results of the AENV Workshop (April 13/14, 1999). Each environmental component (air, water, terrestrial, and human health) was rated separately by experts in that field. CEEMP members reviewed the results during a May 27 1999 meeting with AENV. Ratings apply as follows:

Criteria	Rating	Definition	Numerical Rating	Shading
†Timing of Stress	Short	< 2 years	6	Dark
	Medium	2-25 years	3	Grey
	Long	> 25 years	1	None
Duration of Stress	Short	< 2 years	1	None
	Medium	2-25 years	2	Grey
	Long	> 25 years	3	Dark
†Reversibility	Yes	N/A	1	None
	No	N/A	5	Dark
Magnitude of Risk Level	High	N/A	3	Dark
	Medium	N/A	2	Grey
	Low	N/A	1	None
	Uncertain	N/A	NR	None
Maximum Score			**17**	

†Criteria considered most indicative of urgency hence the broader scope of ratings.

GAPS RELATED TO SEQUENCING

The first two portions of the gaps analysis, "Timing of Effect" and "Spatial Scale of Effect" are used for description not rating. Three choices are provided for each topic. Headings that apply to a particular issue are marked with an "X" (according to input from the April 13/14, 1999 AENV Workshop).

The next two columns "Scientific and Traditional Information" and "Measurable Management Objective" contain ratings that are a combination of results from the AENV Workshop and the CEEMP April 23, 1999 meeting. CEEMP provided the ratings indicated by shading. These ratings were used with the following exceptions:

- In cases where the AENV Workshop rated an issue higher for certain criteria than CEEMP, the AENV Workshop rating (large, centred, bolded number) is indicated over the CEEMP shading. An example of this is issue 51, under "Baseline" where cross-hatching indicates a medium rating from CEEMP, while a high gap rating has been assigned from the AENV Workshop according to the large centred '3'.
- AENV Workshop ratings have also been used in cases where CEEMP deemed criteria not applicable or in need of further clarification. An example of this is issue 52 where there is no shading applied (indicating CEEMP has not indicated any gaps) while the AENV Workshop ratings do indicate a gap.

For cases in which CEEMP rated an issue higher than the AENV Workshop the CEEMP rating and shading have been left untouched. Ratings have been applied as follows:

Criteria	Gap Rating	Definition	Numerical Rating	Shading
Baseline Information, Stresses Information	High	Inadequate	3	Dark
	Medium	Underway	2	Grey
	Low	Adequate	1	None
†Mitigation	High	Inadequate	3	Dark
	Medium	Underway	2	Grey
	Low	Adequate	1	None
Management Policy, Management Objectives, Approvals	High	Inadequate	3	Dark
	Medium	Underway	2	Grey
	Low	Adequate	1	None
Maximum Score			**18**	

†Mitigation numerical ratings indicated only when provided by CEEMP because AENV had inconsistent interpretations of mitigation between workshop groups

APPENDIX 5e. RSDS ISSUES RATINGS TABLE - DRAFT 10 - last revision July 14/99

	Environmental Component	Topic	Issue	Issue Linkage / Theme Category	SEQUENCING CRITERIA					GAPS RELATED TO SEQUENCING												
					Timing			Magnitude - Risk Level (NR = Not Rated)	Sequencing Rating	Timing of Effect			Spatial Scale of Effect			Scientific & Traditional Information			Measurable Management Objective			Gap Rating
					Timing of Stress	Duration of Stress	Reversibility (Yes or No)			Short (<2 Yr)	Medium (2-25 Yr)	Long (>25 Yr)	Foot Print	Lease	Off Lease	Baseline	Stresses	Mitigation	Policy	Objectives	Approval	
51	Terrestrial	End Land Use	Re-establishing a diverse ecosystem including a diversity of landforms, indigenous vegetation, near-natural water patterns, and wetlands, in the reclaimed landscape.	49-50, 52-56 Cat A					100%			X	X	X		**3**						94%
56	Human Health	Traditional Use Values and Mitigation	*Impact of development on medicinal plants. Are the plants going to be available in reasonable distance during development, are the plants etc. going to be available on the reclaimed landscape and, in either case, are they going to be safe to consume?	1, 14, 49-56, 58-60, 62, 63 Cat A				**NR**	100%			X	X	X								72%
60	Terrestrial	Diversity of Soil Types to Promote Potential for Vegetation Diversity	The re-creation of a single type (homogenous) topsoil across the reclaimed landscape may not provide an "equivalent capability" for the return of a diversity of native vegetation communities. Research is required to understand the soils and technology necessary to re-establish a diversity of vegetation types, in a reasonable period of time. The requirement to salvage all the presently existing mineral soils maybe necessary to prevent the permanent loss of the capability to re-establish and sustain equivalent vegetation and other biological diversity. ***CEEMP rated issues 60, 61, and 62 as one issue.***	49, 55, 56, 58-59, 61-66 Cat A					100%			X	X									72%
61	Terrestrial	Diversity of Soil Types to Promote Potential for Vegetation Diversity	*Reclamation soil depths and types should be based on end-land use needs. The soil depth may be adjusted for different vegetation types in different locations so as to maximise the speed and likely success of initial reclamation efforts. ***CEEMP rated issues 60, 61, and 62 as one issue.***	58-60, 62 Cat A				**NR**	100%			X	X									72%
62	Terrestrial	Diversity of Soil Types to Promote Potential for Vegetation Diversity	The productivity of soils used to support commercial forest are based on the use of a soil rating procedure called the, "Land Capability Classification for Forest Ecosystems in the Oil Sands Region (LCCS)". The rating system is new and requires monitoring to determine the factors that influence productivity and the long-term sustainability of the forests established and the establishment and viability of other uses. ***CEEMP rated issues 60, 61, and 62 as one issue.***	58-63 Cat A				**NR**	100%			X	X									72%
49	Terrestrial	End Land Use	*Continuity of landform, watershed and vegetation communities across oilsands mine closure landscapes is necessary for the development of sustainable landscapes and a diverse ecosystem including a diversity of landforms, indigenous vegetation, near-natural water patterns, and wetlands, and a natural appearance.	50-56, 58, 59, 60, 62, 63 Cat A					100%			X	X	X		3						67%
50	Terrestrial	End Land Use	*Landscape design to create landforms of mine structures that have a natural appearance is possible only if it is planned into the development from project inception.(i.e., part of the approval process.)	49, 51-56 Cat A				**NR**	100%			X	X	X		3						67%

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52	Terrestrial	End Land Use	*The reclaimed landscape will be used for recreational purposes, with the potential for intensive recreational activities including fishing and hunting pressures because of increased access. The capability to support and/or the land to recover after use from these types of activities have to be incorporated into the closure planning. Public information about the government policy with respect to assurances that the cost of end land use will not be passed along to the public and information about how industry will finance end land use over the long term. ***Issue not rated by CEEMP as they felt that further issue definition was required.***	49-51, 53-56 65 Cat A				**NR**	100%			X	X	X		**2**	**3**		**1**	**3**	**1**	67%
53	Terrestrial	End Land Use	Rapid establishment of functional riparian areas similar to those present in the pre-development landscape following closure and ensuring that watershed structures do not require periodic long-term maintenance. ***Baseline and Stresses Information portions of the gaps analysis not rated by CEEMP as they felt it was not applicable.***	49-52, 54-56, 65 Cat A				**NR**	100%			X	X	X		**2**	**1**					61%
55	Terrestrial	Traditional Use Values and Mitigation	*What vegetation species existed in the predisturbance landscape and what species will be established in the reclaimed landscapes, and when.	49-54, 56, 58, 59, 60, 62, 63 Cat A					100%			X	X	X								61%
40	Surface Water	Water Quality	Should we use chemical specific guidelines for toxic elements of water discharges instead of "Toxic Units", e.g., from end-pit lakes. ***Scientific information was not rated by CEEMP as it was considered to be solely a management issue.***	Cat D	N/A	N/A	N/A		100%			X			X	**3**	**3**					56%
27	Fisheries	Fish Conservation	*Activities in the region will result in changes in flow (volume) which in turn will alter fish habitat.	36, 37, 39, 27 Cat B					100%			X			X							33%
72	Terrestrial	Forest Values	Cumulative impact of development on annual allowable cut and other forest values. ***Issue added at the May 6/7 Workshop with Stakeholders.***	Cat A	**ISSUE NOT RATED**				100%	**ISSUE NOT RATED**												0%
63	Terrestrial	Cumulative Impacts on Wildlife - Habitat Changes	*The uncertainty about cumulative impact of individual and multiple oil sands developments on wildlife as a result of the habitat loss, and larger scale (regional) fragmentation of the ecosystem, has major implications to regional wildlife populations. This is particularly important for wildlife species of concern in Alberta such as the Red, Blue, and Yellow listed species. -Changes in habitat availability, connectivity and diversity -Preservation of habitat for threatened animals -Increased mortality risks due to industrial activity and increased traffic flow	49, 51, 55, 56, 58-60, 62, 64-65, 67 Cat A					88%			X			X		3					100%
58	Terrestrial	Biodiversity Assessment	*The Canadian Biodiversity Strategy recommends addressing the impacts to biodiversity for environmental impact assessments. There is uncertainty as to the acceptable level of detail and scope of assessments and expectations for restoration. Impacts to Biodiversity includes changes in landscape and community levels, changes in species and genetic levels, and impacts to rare species like rare plants. - Soils, plants and wildlife tend to be treated separately rather than in an integrated fashion, as an ecosystem. ***CEEMP felt this issue very closely resembled issue 51.***	49, 51, 55, 56, 58-63, Cat A					88%			X	X	X	X	**3**						94%

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59	Terrestrial	Biodiversity Conservation	Protection of areas in the lease that are not underlain by economic oil sands and are not specifically needed for mine as biodiversity in-situ conservation areas.	49, 51, 55, 56, 58, 60-63 Cat A					88%			X	X	X		**3**						94%
65	Terrestrial	End Land Use	*Uncertainty about the type of wildlife that the reclaimed land will sustain and if the wildlife (moose, rabbits, aquatic furbearers, grouse, waterfowl, and squirrels) that will be sustained is congruent with traditional needs.	50, 52-54, 63-65 Cat A					88%			X	X	X	X				**3**			78%
54	Terrestrial	End Land Use	Utilization of native species and traditional plant species in reclamation in the closure planning design.	49-53, 55-56 Cat A					88%			X	X	X								67%
64	Wildlife	Traditional Use Values and Mitigation	*Impact of development on wildlife of high traditional value; moose, rabbits, aquatic furbearers, grouse, waterfowl, and squirrels.	63, 65, 67 Cat A					82%			X			X							94%
38	Surface Water	End Pit Lake (EPL) Water Quality	*Impact of EPL water quality on habitat conditions for biota in the lake itself, and for the River/Creek, to which it will discharge. Uncertain water quality in the EPL, which is a final landscape feature. This results from the proposal to put tailings in the lake and cap it with water; and the quality of water that will be in these lakes from local runoff.	Cat C				**NR**	79%			X		X	X							72%
57	Terrestrial	Monitoring of Acidification of Terrestrial and Wetland Ecosystems	The cumulative effects of acid deposition by industry, plant and vehicle emissions on terrestrial and wetland ecosystems is unknown so it must be monitored to understand future impacts. The potential impacts and degradation to vegetation, and wildlife could affect the future sustainability of wetland vegetation complexes, associated wildlife species, Caribou, and other sensitive species in northeastern Alberta. ***CEEMP did not rate the Scientific Information portion of the Gaps Rating as they felt it was a management issue only.***	1,3, 4-6, 16 Cat B					76%			X		X	X	**2**	**2**					67%
1	Air	Traditional Resource Use	Effects of deposition of heavy metals and acidifying compounds on traditional plants used by First Nations and Metis residents in and around the Oil Sands Developments.	14, 56 Cat A					71%		X	X			X	**3**	**3**					100%
4	Air	Acid Deposition - Surface Water	*Impacts on buffering capacity, biological productivity and species composition of acid sensitive rivers and lakes.	3, 5, 6, 16, 57 Cat B					71%		X	X			X	**3**	**3**		**3**	**3**	**3**	89%
6	Air	Acid Deposition - Wetlands	*Acidification of wetlands may impact mosses and lichens, and cause sphagnum moss invasion in poor fens, and result in changes to wetlands composition/diversity.	3, 4, 5, 16 Cat B					71%		X	X			X				**3**	**3**	**3**	89%
66	Wildlife	Traditional Use Values and Mitigation	Concern that increased activity in the region has and will result in increased 'unregulated' tourism which might occur on traditional trap lines. What protection do the holders of these trap lines have regarding tourism development on their lines?	67 Cat A & B					71%			X			X							89%
67	Wildlife	Hunting	*Over-hunting pressures from increased access and restrictions of hunting access within the development areas and bag limits within the region. The potential for increased access and increased human populations to impact wildlife populations.	63-66 Cat A					71%			X			X							89%

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26	Fisheries	Impacts of Access on Fishing	*Over-fishing pressures from increased access. The potential for increased access and increased human populations to impact fish populations.	Cat B					71%			X			X							83%
48	Terrestrial	Wetland Assessment and Impacts	*The undetermined impact on wetland vegetation communities due to basal aquifer and surface aquifer drawdown and the uncertainty of lateral distance of impact. This surface drawdown may cause the drying of wetlands over a significant area, depending on the volume of water removal required to dry a wetland.	Cat A					71%		X	X		X	X							83%
3	Air	Acid Deposition - Soils	*Impacts on productivity and vegetation composition of local and regional acid sensitive soils. ***CEEMP felt this issue was very similar to issue 3.***	4, 5, 6, 16, 57 Cat B					71%			X	X	X	X							78%
5	Air	Acid Deposition - Vegetation	*Impacts on biological productivity of acid sensitive vegetation; and changes in species composition and diversity, including impacts on the success and sensitivity of revegetation on reclaimed areas. ***CEEMP felt this issue was very similar to issue 3.***	3, 4, 6, 16, 57 Cat B					71%		X	X	X	X	X							78%
31	Groundwater	Water Quality	Effects of seepage water from reclaimed landforms and tailings ponds.	32, 33 Cat C				**NR**	71%			X		X	X							67%
14	Air	Heavy Metals Deposition	*Impacts of increasing levels of heavy metal deposition on soil and vegetation, fish, wildlife and/or human health.	1, 56 Cat A					71%		X	X			X							67%
41	Surface Water	Water Quality	*Changes in water quality of streams, rivers, and lakes due to an individual project and multiple projects, and monitoring and assessment of effects of water pollutants in the downstream region. (Athabasca and PAD)	39, 42, 43, 47, 68 Cat B				**NR**	71%	X	X	X			X							50%
46	Surface Water	Water Quality	*Effects of industrial effluents on fish health - disease, deformities and fish tainting.	Cat B				**NR**	71%	X	X	X			X							50%
28	Groundwater	Water Quality	*Potential effects of improper deep-well disposal of process waste-water. ***(In-Situ)***	Cat C					71%			X		X	X							33%
33	Human Health	Tailings Pond	Effects of seepage from existing tailings ponds. ***Not filled out at April 13/14 workshop***	31, 32 Cat C	**ISSUE NOT RATED**				67%													39%
69	Terrestrial	End Land Use	Mitigation of cumulative environmental effects through regional development planning and integrated mine plans of oil sands developments. ***Issue added at CEEMP meeting, April 27, 1999.***	Cat A	**ISSUE NOT RATED**				67%	**ISSUE NOT RATED**												0%
70	Surface Water	Tailings	Reduction and mitigation of surface disturbances of oil sands developments through the examination and use of alternate tailings technologies and management. ***Issue added at CEEM Task Group I meeting, April 27, 1999.***	Cat A	**ISSUE NOT RATED**				67%	**ISSUE NOT RATED**												0%
71	Terrestrial	Traditional Use Values and Mitigation	Space to carry out cultural/spiritual actifities without disturbance. ***Issue added at the May 6/7 Workshop with Stakeholders.***	Cat B	**ISSUE NOT RATED**				67%	**ISSUE NOT RATED**												0%
32	Groundwater	Water Quality	Effects of produced water on groundwater quality. ***(In-Situ)***	31, 33 Cat C					65%			X		X	X							67%
44	Surface Water	Water Quality	*Untreated drinking water aesthetics - smell and taste.	Cat B					65%	X	X	X			X							67%

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68	Surface Water	Sustainability	Impacts of multiple developments on long-term hydrological and biological integrity of water sheds such as Muskeg Rivers and Kearl Lake. ***Issue added at the April 23/99 CEEMP Meeting.***	39, 41, 42, 43, 47 Cat B					65%													67%
20	Air	Sulphur Dioxide (SO2)	*Impact of increasing SO2 concentrations on human health, vegetation and wildlife. SO2 is a compound for which ambient air quality guidelines have been stipulated, and it is also a major contributor to acidic deposition.	7,8,9,10, 11, 13, 15, 19, 21, 25 Cat B					65%	X	X	X		X	X							61%
11	Air	Lack of Ambient Air Quality Guidelines	Several air emissions lack air quality guidelines (e.g., reduced sulphur, individual VOCs, PM 2.5)	7, 8,9,10, 13, 15, 19, 20, 21, 25 Cat A					65%	X				X	X							50%
43	Surface Water	Water Quality	Monitoring and assessment of effects of water pollutants in the downstream region (the effects need to include water quality, sediment quality, benthos and fish).	39, 41, 42, 47, 68 Cat B					65%	X	X	X			X	**2**						50%
45	Surface Water	Water Quality	*Silt and other contaminants increase from logging and development. ***Issue not rated by CEEMP as they felt the expertise needed was not present to give a rating.***	Cat E					65%	X	X	X			X	**2**	**2**		**1**	**1**	**1**	47%
42	Surface Water	Water Quality	*Changes in Athabasca River water quality and the quality of tributaries.	39, 41, 43, 47, 68 Cat B					65%	X	X	X			X	**2**	**2**					44%
10	Air	Ambient Air Quality Guidelines	*Meeting ambient air quality guidelines for criteria emissions, e.g. SO2 and NOX (Recognizing that some guidelines are in the process of being updated and that others may need updating, e.g. SO2 and NOX).	7, 8, 9, 11, 13, 15, 19, 20, 21,25 Cat A					65%	X				X	X							33%
39	Surface Water	Surface Water	*Changes in open water areas, including lakes and streams. This is an overall issue of watershed management and cumulative changes in flow regimes due to development.	27, 36, 37, 41, 42, 43, 47, 68 Cat C					59%			X		X	X	**2**						67%
19	Air	Oxides of Nitrogen	*Cumulative impact of increasing NOX emissions. These emissions can contribute to the increase of ambient NOx concentrations, formation of ground level ozone, acidification, vegetation effects and human health effects. High temperature combustion processes produce oxides of nitrogen (NOX) emissions.	7,8,9,10, 11, 13, 15, 20, 21, 25 Cat B					59%	X	X	X	X	X	X							61%

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13	Air	Ground Level Ozone	*Impact of Ground Level Ozone on human health and vegetation. (Ground-level ozone is a secondary pollutant formed from NOX and VOC emissions).	7,8,9,10, 11, 15, 19, 20, 21, 25 Cat A				**NR**	57%	X	X				X							56%
25	Air	VOCs	Impact of VOC concentrations on human health, vegetation and wildlife. Volatile Organic Compounds (VOC) is a group of compound with relatively few ambient air quality guidelines that have been stipulated. VOCs are from industrial and natural sources and are a major contributor to odour and ozone formation. Issues here are odour, health and perception of problem.	7,8,9,10, 11, 13, 15, 18, 19, 20, 21, 24 Cat A					53%	X	X			X	X							83%
7	Air	Air Pollutant Interactions	*Cumulative impacts of concentration and deposition of air pollutants on human health, wildlife, and vegetation in the region (individual emissions and their interactions, including synergistic effects of ozone). ***CEEMP felt this issue was very similar to issue 9.***	8,9,10,11, 13,15,19, 20,21,25 Cat A					53%	X	X	X		X	X							67%
8	Air	Air Quality Notification	*Establishing community air quality notification levels, incorporating both human health and aesthetic needs.	7,9,10,11, 13,15,19, 20,21,25 Cat A					53%	X					X							67%
9	Air	Air Toxics	*Cumulative impact of concentration and deposition of air pollutants (Air Toxics, Priority Substances List 1/2) on human health and wildlife (especially amphibians) due to air emissions. ***CEEMP felt this issue was very similar to issue 7.***	7,8,10,11, 13,15,19, 20,21,25 Cat A					53%		X	X	X	X	X							67%
21	Air	Tailings Pond Emissions	Emissions of Volatile Organic Compounds (VOC) and Total Reduced Sulphur (TRS) compounds from the tailings pond is a concern to nearby residents. Tailings pond issues revolve around the uncertainty respecting emissions and mitigation strategies for odours and VOC concentration.	7,8,9,10, 11, 13, 15, 18, 19, 20, 24, 25 Cat B					53%	X	X			X	X							67%
18	Air	Odours	Cumulative impact of odour levels in residential settlements and odours from individual projects.	21,24,25 Cat B					53%	X				X	X							61%
24	Air	VOC Emissions	Minimising the loss of solvent diluents with the long-term objective of eliminating the release of untreated froth treatment tailings solvents. ***Issue not rated for Baseline and Stresses portions of Scientific Information by CEEMP as they felt it was not applicable.***	18,21,25 Cat B					53%	X	X			X		**2**	**2**					61%
34	Surface Water	CT Reclamation	The potential toxicity of CT release water and its duration on the landscape.	Cat B				**NR**	50%			X		X	X							67%

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36	Surface Water	Surface Water	Changes in flows, sediment concentrations and channel regime in receiving streams in local basins and their impacts on fish habitat. ***CEEMP felt this issue very closely resembled issue 37.***	37, 39, 27 Cat B					47%			X		X	X	**2**	**2**					44%
37	Surface Water	Drainage Regime	*Restructuring of drainage regimes may contribute to increased erosion and result in impacts to wetlands and change flow rates in tributaries, increase sediment concentration, and have an impact on fish habitat. ***CEEMP felt this issue very closely resembled issue 36.***	36, 39, 27 Cat B					47%			X		X	X	**2**	**2**					44%
30	Groundwater	Water Quantity	Changes in groundwater quantity associated with mines (other than Basal Aquifer depressurization).	Cat C					47%			X		X	X							39%
16	Air	Long-range Transport	Monitoring and assessment of long-range transport of air emissions including acidifying emissions.	3, 4, 5, 57 Cat E					41%		X	X			X							33%
15	Air	Inhalable Particulate Matter (PM10 and PM2.5)	*Impact of inhalable particulate matter on human health and wildlife.	7,8,9,10, 11, 13, 19, 20, 21, 25 Cat A					35%	X	X			X	X							67%
23	Air	Visibility	*Deterioration of atmospheric visibility due to elevated concentrations of dust, smoke and smog.	Cat A					24%	X				X	X							72%
12	Air	Greenhouse Gas Emissions	Regional plans to address Canada's commitments to reduce net emissions of greenhouse gases, such as carbon dioxide (CO2) emissions that occur from combustion of fossil fuels.	Cat D					24%			X			X							56%
22	Air	Upset Emissions	*Cumulative impacts of repetitive short-term acute levels of emissions of odorous (reduced sulphur) compounds and volatile organic compounds on human health.	Cat D					24%	X				X	X		**2**		**2**	**2**	**2**	56%
29	Groundwater	Water Quantity	*Changes in groundwater quantity associated with withdrawal due to water supply. ***(In-Situ)***	Cat C					24%		X	X		X								44%
17	Air	Noise	Cumulative impact of noise levels in residential settlements and impact of noise by individual projects.	Cat E					24%	X	X			X	X							33%
47	Surface Water	Water Quantity	*In-stream flow needs in the Athabasca River and developed tributaries.	39, 41, 42, 43, 68 Cat C	N/A	N/A		**NR**	20%	X	X			X	X	**2**	**2**					61%
2	Air	Traditional Resource Use	*Effect of air pollution on bird flyways. ***The issue was not well understood by the workshop group therefore there is no rating provided. Also not rated by CEEMP at the April 23 Workshop; defined as "effects of air pollution on waterfowl".***	Cat A	**ISSUE NOT RATED**			**NR**	0%	X	X	X			X	**ISSUE NOT RATED**							0%
35	Surface Water	Water Quality	*Effects of runoff from Coke and Sulphur piles on water quality. ***Not filled out at workshop as it was considered to be mitigated by approvals and there are already runoff channels to treatment ponds. Also not rated at the April 23/99 CEEMP meeting.***	Cat B	**ISSUE NOT RATED**			**NR**	0%							**ISSUE NOT RATED**							0%

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