3

ENVIRONMENTAL IMPACT STATEMENT

for the Mackenzie Gas Project

BRIEFING PACKAGE

Presented to the
Joint Coordinating Committee (Yellowknife) and
Federal Coordinating Committee (Ottawa)

November 2004

Esso Imperial Oil | APG | ConocoPhillips | Shell Canada | ExxonMobil

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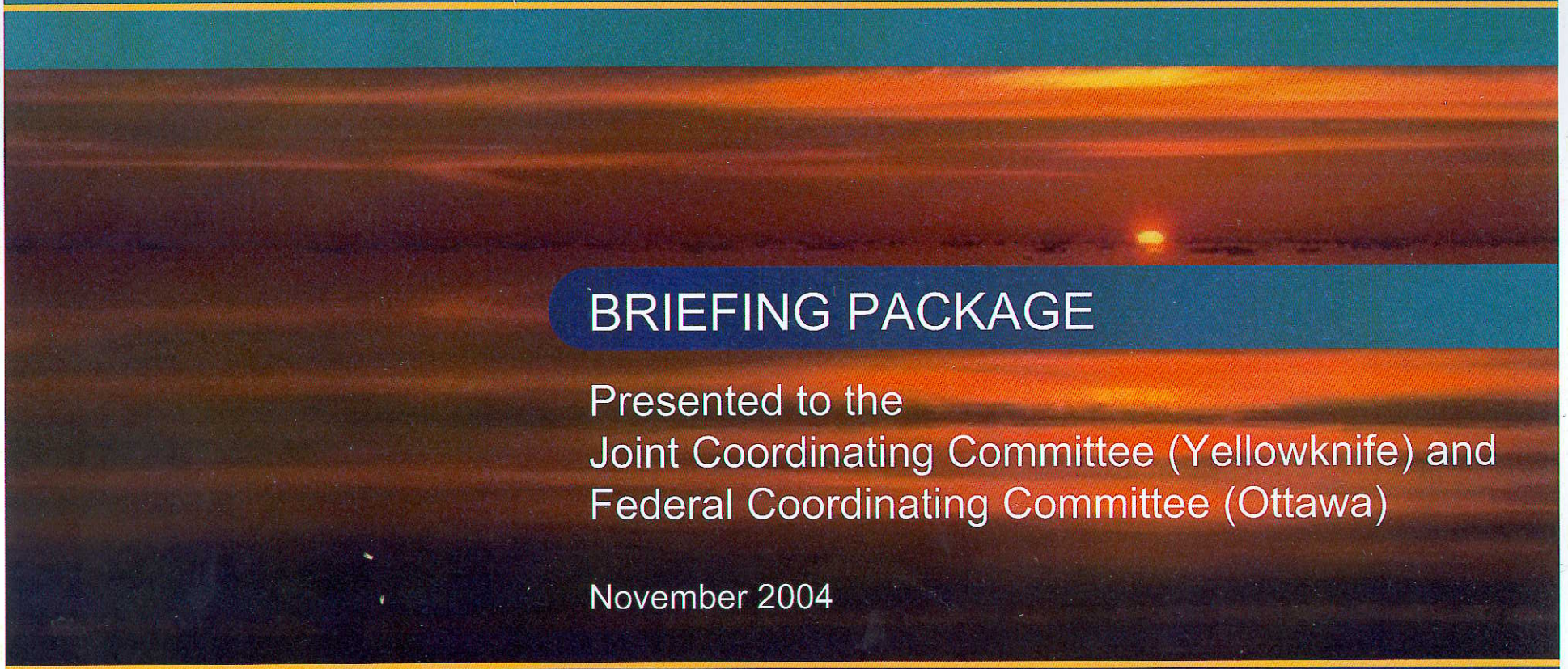

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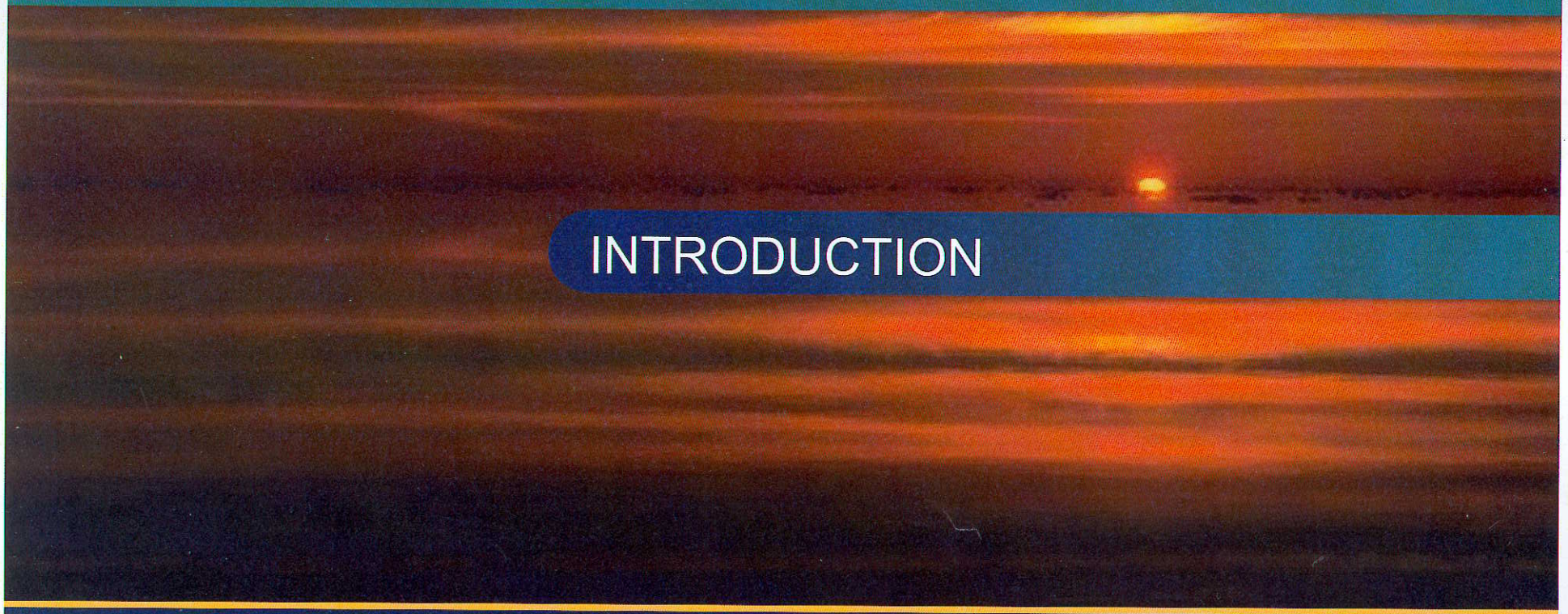

INTRODUCTION

Imperial Oil | APG | ConocoPhillips | Shell Canada | ExxonMobil

Presentation Topics

Introduction to the EIS • Historical Context • Approach and Structure • Public Participation • Traditional Knowledge	Alan Kennedy Esso

Project Description
• Anchor Fields
  • Taglu
  • Parsons Lake
  • Niglintgak
• Gathering System
• Gas Pipeline
	Rick Luckasavitch (Presenter)
	Esso
	Bruce Parent Esso
	Linda Graf - Conoco Phillips
	Kim Johnson - Shell

Biophysical Assessment	Dave Kerr - Golder
Socio-Economic Assessment	Gord Rozon - AMEC
Environmental Management Plans	Evan Birchard - Indep. Consult.

Date

2000 – Feasibility Study recommended a coordinated regulatory approach

2001 – Environmental Gap Analysis Completed

- Environmental data largely out-of-date
- Ecological Land Classification field data needed
- Large number of water crossings require statistical sampling technique
- Socio-economic data sparse, not collected in recent past
- TK data not specific to project
- Consultation initiated

Date (cont'd)

2002 - 2003 – Extensive Field Baseline Studies

up to 150-200 consultants in field

- Major project description changes
- First draft of baseline and assessment reports
- EIS preliminary draft "A"

2004

- EIS first draft January, final draft March
- EIS filed October 2004
- Consultation continues from 2001 - 2004

EIS Structure

EIS in three parts

- Environmental (Biophysical) Assessment
- Socio-Economic Assessment
- Environmental Management Plans

EIS includes:

- Volume 1: Overview and Impact Summary
- Volume 2: Project Description
- Volume 3: Biophysical Baseline
- Volume 4: Socio-Economic Baseline
- Volume 5: Biophysical Impact Assessment
- Volume 6: Socio-Economic Impact Assessment
- Volume 7: Environmental Management
- Volume 8: Environmental Alignment Sheets

Environmental Assessment Principles

- **Assessment is focused on those issues of greatest concern to stakeholders**
- **Cumulative effects of past, present and future activities will be assessed**
- **Open and transparent process with communities**
- **Assessment will use both traditional knowledge and scientific studies to:**
  - Identify issues
  - Assess potential effects
  - Develop measures for impact management

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PUBLIC PARTICIPATION PROCESS

Esso Imperial Oil APG ConocoPhillips Shell Canada ExxonMobil

Community–Based Approach

- **Basic to the EIS and integral to the overall assessment approach**
- **Public participation activities are designed to be responsive to local and regional information needs and concerns**
- **Facilitated development and verification of the SEIA baseline**
- **Two rounds of EIS public participation activities are completed; a follow-up round is planned to review the EIS submission**
- **A total of 23 communities in 5 regions consulted**
  - All communities in the project area
  - Other communities that may have socio-economic effects

Range of Participation Activities Used

Participation methods recognized the needs, capabilities, and schedules of the communities involved, and included:

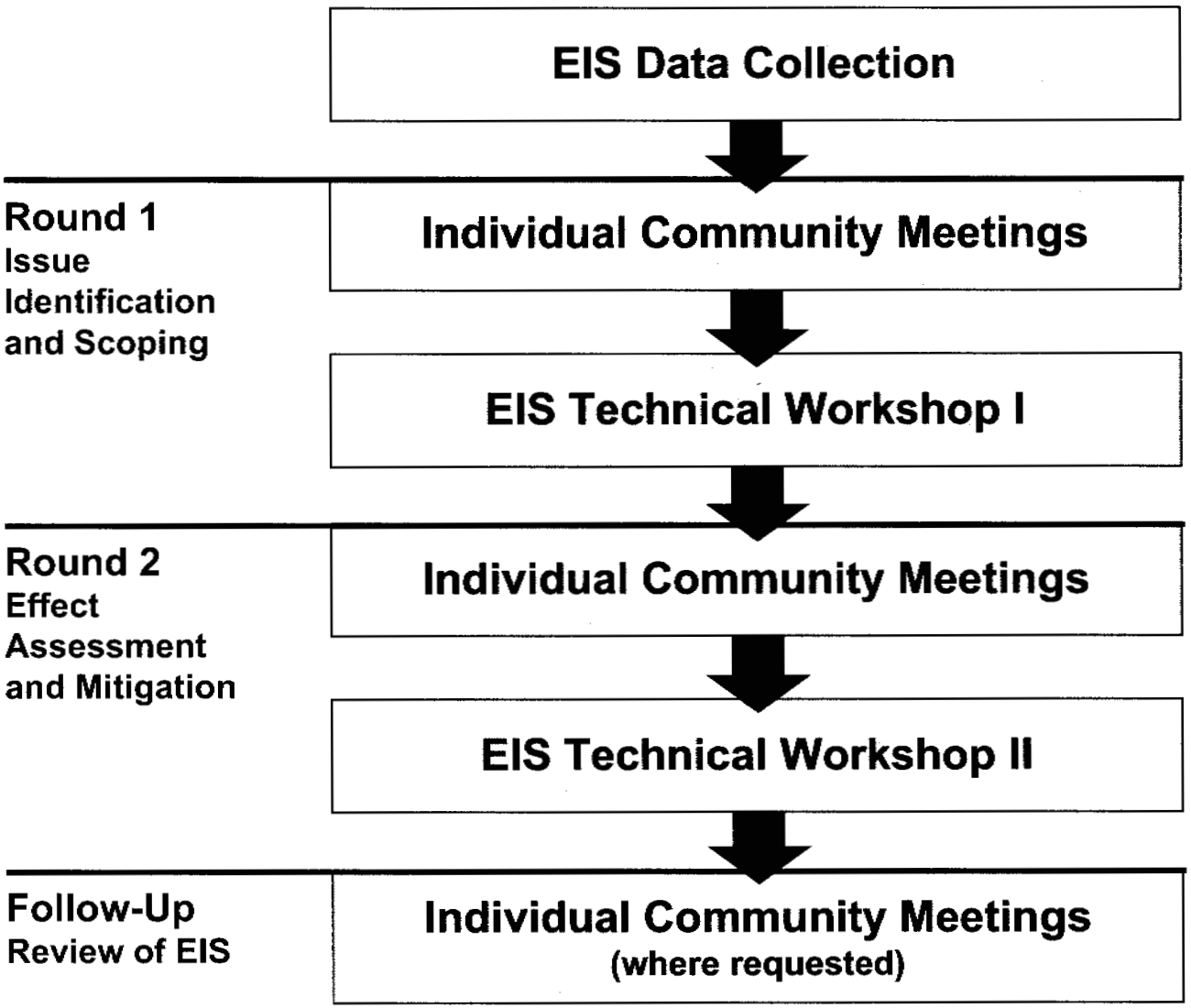
- Interviews
- Group meetings
- Community dinners
- Open houses
- Workshops
- Visits by EIS discipline experts

Project information was presented through pamphlets, pictures, posters, oral presentations and videos.

Stakeholders Involved

- Band Councils
- Co-Management Boards
- Community Corporations
- Elders' Committees
- Hamlets and Towns
- Hunters and Trappers Committees
- Land Corporations
- Métis Corporations
- Non-Governmental Organizations (environmental and community service)
- Renewable Resource Councils
- Youth Committees
- Schools
- Territorial Agencies

Phases in the EIS Public Participation Process



Public Participation Methods: Two Rounds of Consultation

ROUND ONE: Issue Identification and Scoping

- Community members provided a basic understanding of:
  - what the project entails
  - the possible implications of the project
  - the process by which these implications would be refined and assessed
- Documentation of issues identified by community members

ROUND TWO: Effect Assessment and Mitigation

- More detailed and focused discussions facilitated with community participants regarding:
  - more specific information requests about the project
  - the kinds of effects expected
  - expectations in terms of mitigation
- Documentation of discussions

Follow-up Review of EIS (planned)

- Provide description of EIS results and how community concerns were addressed

Format for EIS Technical Workshops

- A regional workshop followed community participation activities for rounds 1 and 2
- Workshops brought together stakeholders from the region to discuss and identify points of consensus and difference
- Participants included representatives from:
  - communities across the region
  - regulatory agencies
  - the project

Results for Community Participation

Region	**Community Contacts** (in-person meetings and telephone contacts)
ISR and GSA (Beaufort Delta Region)	303
Sahtu	139
Deh Cho	159
Northwestern Alberta	8

Results from Regional Workshops

Regions	Work-shops	Number of Workshop Participants			
		Total	Community	Regulatory	Other (e.g., NGOs)
ISR and GSA	2	150	124	20	6
Sahtu	3	166	125	41	0
Deh Cho	2	116	77	30	9

Results for NGO Workshops

	Total No. of Participants*	NGO Participants**	Community Participants
First Workshop	43	24	16
Second Workshop	46	21	22

* includes government representatives

** NGO participants drawn from northern and southern communities

Results of Participation Activities: Communicated, Documented and Verifiable

- **Meeting notes made of all discussions and recorded in a database**
- **All concerns registered were forwarded to engineering designers and senior management**
- **EIS scientists and engineers participated in community and workshop teams, supporting two-way communication**
- **Workshop proceedings prepared and distributed to all attendees**
- **Concerns, issues and suggested mitigations documented in-depth in EIS Volume 1**

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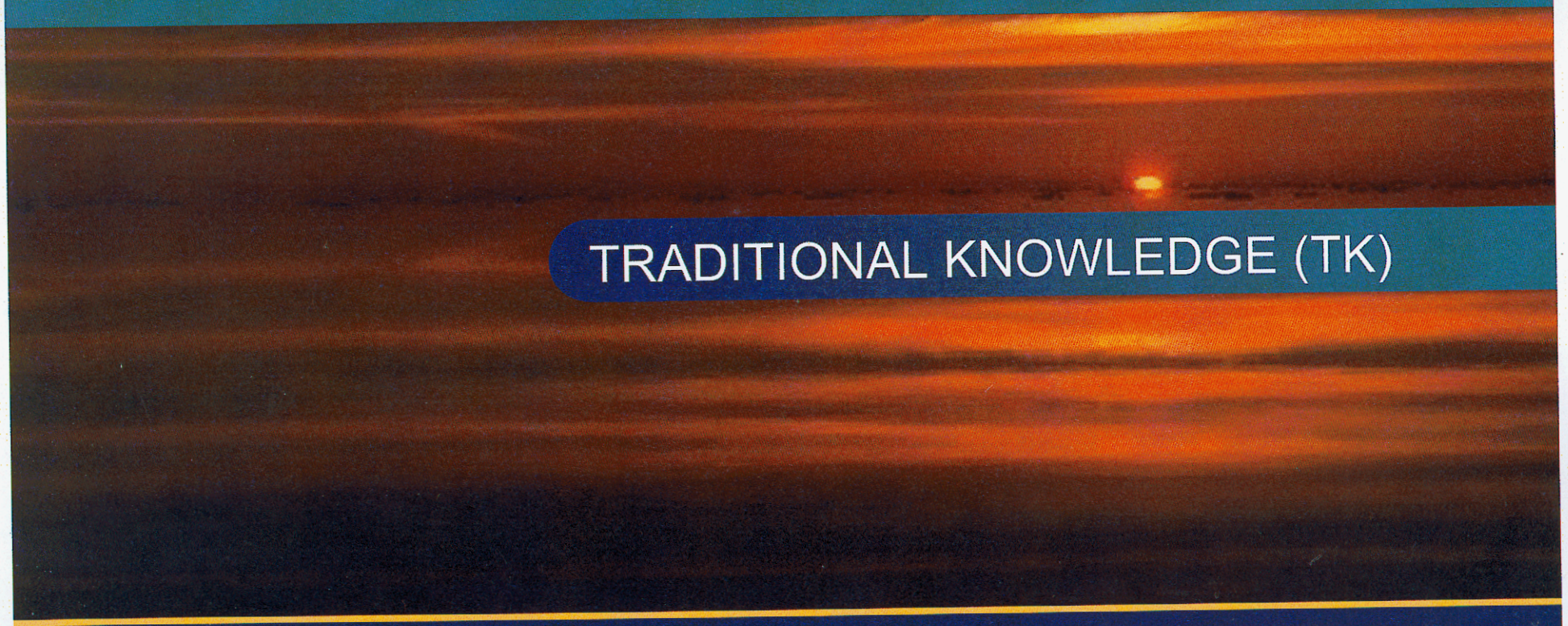

TRADITIONAL KNOWLEDGE (TK)

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Traditional Knowledge (TK)

TK studies will:

- Provide specific TK information for the project and improve the project's understanding of impacts
- Facilitate meaningful participation in the EIS by communities and benefit project planning and design
- Build capacity in TK collection, documentation and analysis
- Fulfill regulatory requirements

Cooperative TK studies recognize that:

- TK is the property of Aboriginal communities
- Communities will determine who are the holders and providers of TK
- Communities and proponents will agree upon procedures for collecting and using TK
- Communities will decide what TK can be shared

TK Study Methods - A Community-Based Approach

Key Steps:

- Obtain agreement with community to participate
- Enter into contract with community to undertake study
- Establish cooperative TK Working Groups that:
  - include elders, local harvesters, local government officials and project members
  - are responsible for:
    - developing the research framework based on the project's proposal
    - determining study content based on the project's outline
    - determining who the holders of TK are
    - determining community capacity and researchers
    - facilitating community participation
    - stewarding the study process
    - facilitating approval of study results

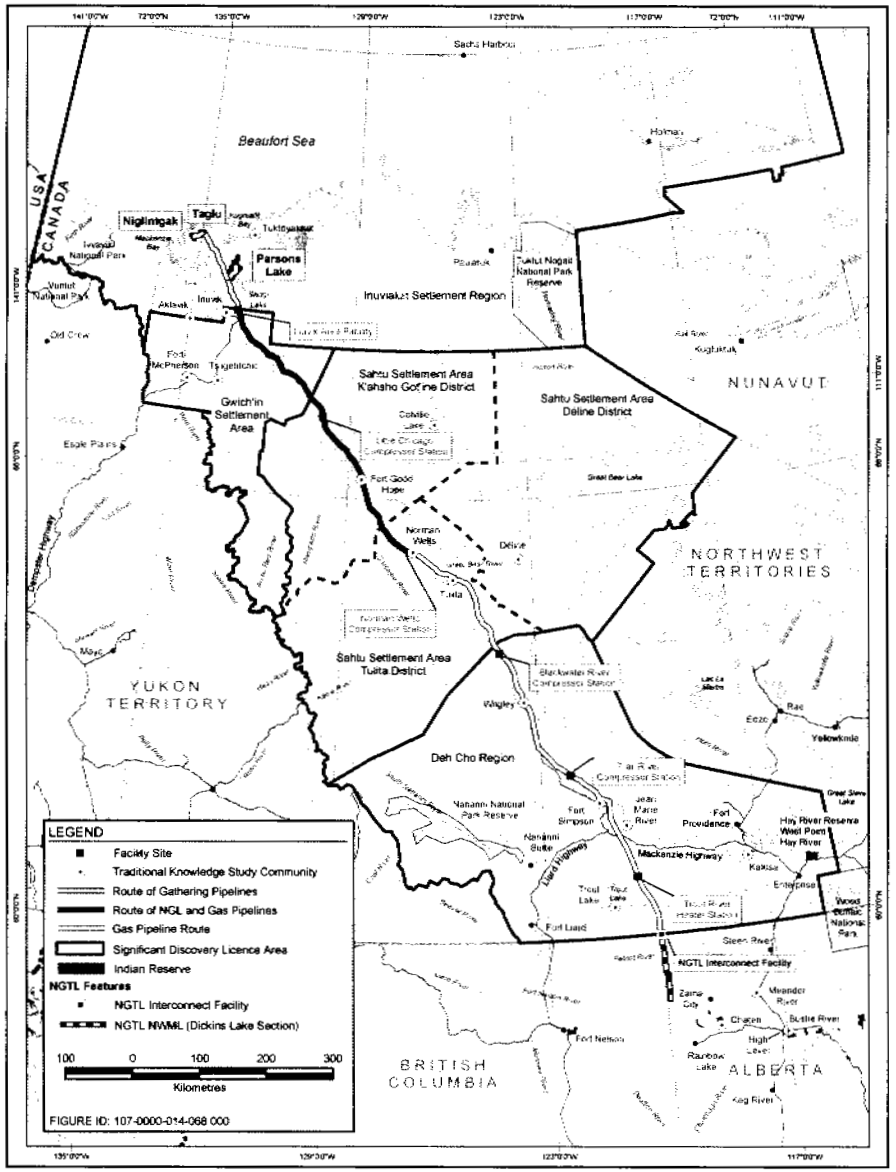
Key Steps (cont'd):

- Hire and train community members as community researchers to:
  - collect and verify existing TK information
  - collect new TK information through open-ended interview questions and participatory land use mapping techniques
- Review and validate information with communities
- Incorporate information into environmental assessment and project design

Key Steps (cont'd):

- TK subjects identified in the studies include:
  - Traditional land and resource use
  - Heritage resources, cultural and spiritual sites
  - Terrain, soils and vegetation
  - Birds, fish and wildlife
  - Hydrology, water quality and aquatic ecosystems
  - Climate change
  - Human health and socio-economic issues
  - Cumulative effects

TK Studies



Study Area Map - EIS Volume 1, Figure 3-1

Extensive discussions required to reach agreements to conduct studies

- Discussions began in 2002

Communities selected the study areas:

Region	Study Area
ISR	Regional
GSA	Regional
Sahtu	District
Deh Cho	Community

TK Study Progress – Status

Study Area	Current Status	Anticipated Completion Date
ISR	Regional study underway	February 2005
GSA	Regional study underway	April 2005
K'ahsho Got'ine	In discussion	To be determined
Tulita	Study underway	January 2005
Norman Wells	Study underway	January 2005
Déline	Study underway	January 2005
Wrigley	In discussion	To be determined
Fort Simpson	Study underway	November 2004
Jean Marie River	Study underway	January 2005
Trout Lake	Final report complete	July 2004
Kakisa	In discussion	To be determined
Hay River Reserve	In discussion	To be determined
Fort Providence	In discussion	To be determined
Dene Tha' First Nation	In discussion	To be determined

TK Study – Integration into EIS

- **Project review of publicly available TK that was incorporated into EIS**
- **Additional TK filing will:**
  - document TK information by region
  - identify changes to or support for EIS baseline and assessment

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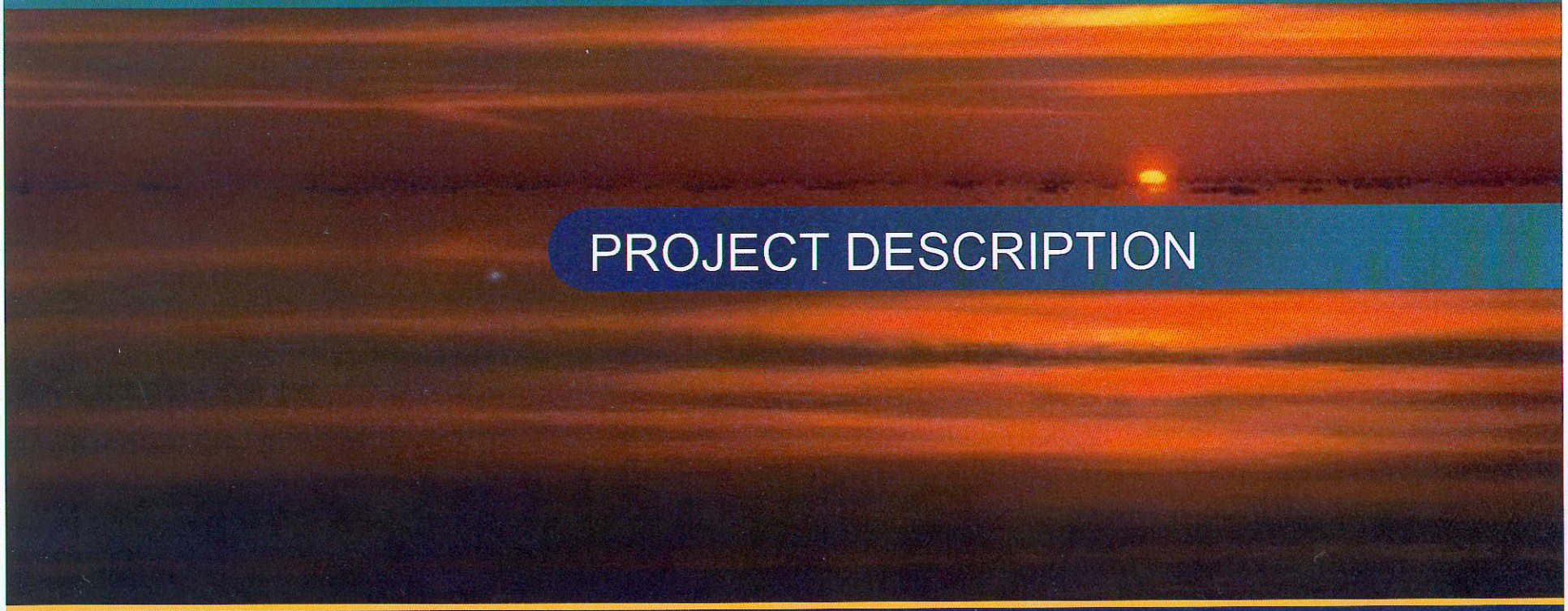
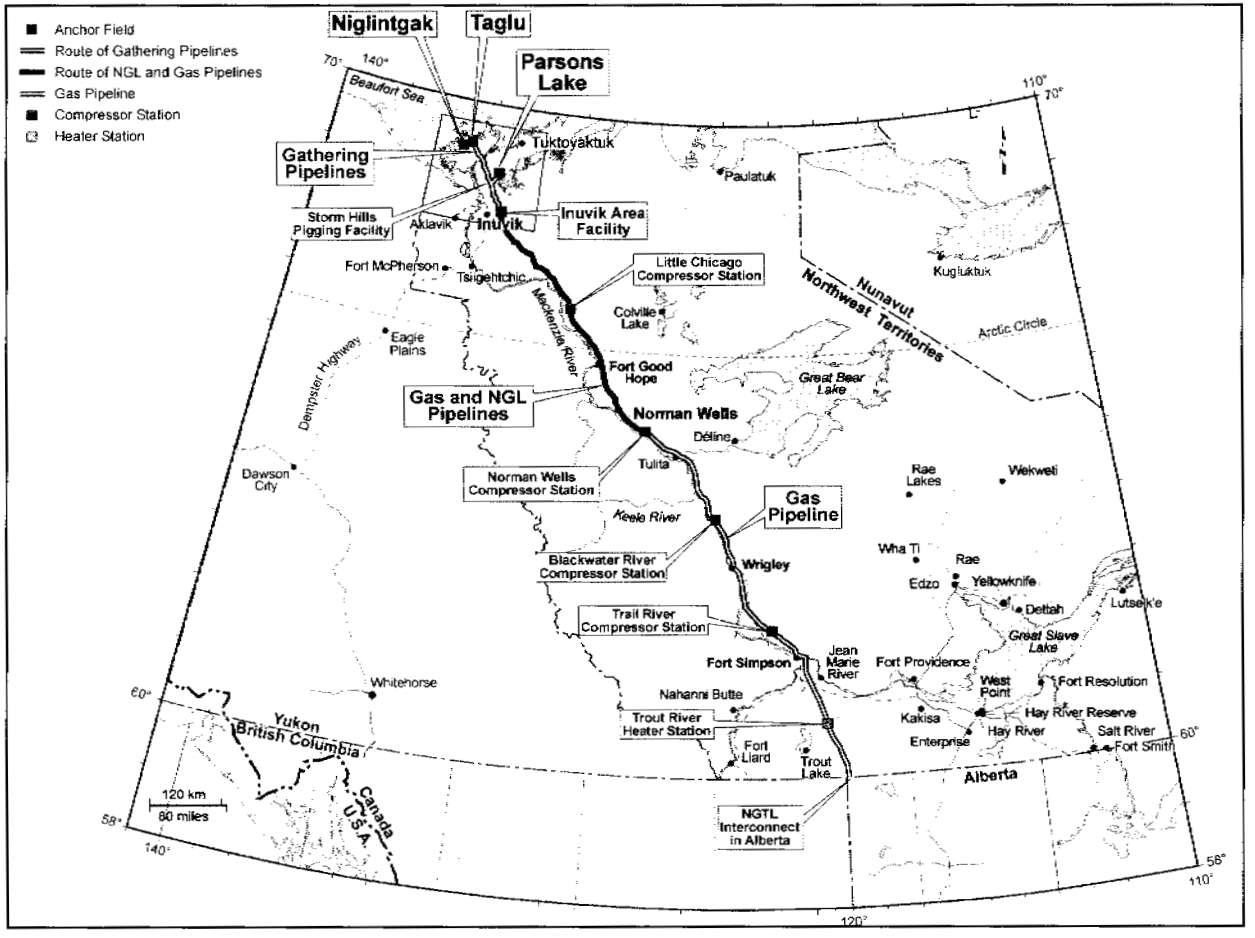


PROJECT DESCRIPTION

Esso Imperial Oil APG ConocoPhillips Shell Canada ExxonMobil

Project Description



NOTE:

Nova Gas Transmission Ltd. (NGTL) will apply separately to the Alberta EUB to extend the existing Alberta pipeline system to the NGTL interconnect facility

Onshore development

Three anchor fields

- Sweet natural gas and natural gas liquids
- Well pads and gas conditioning facilities

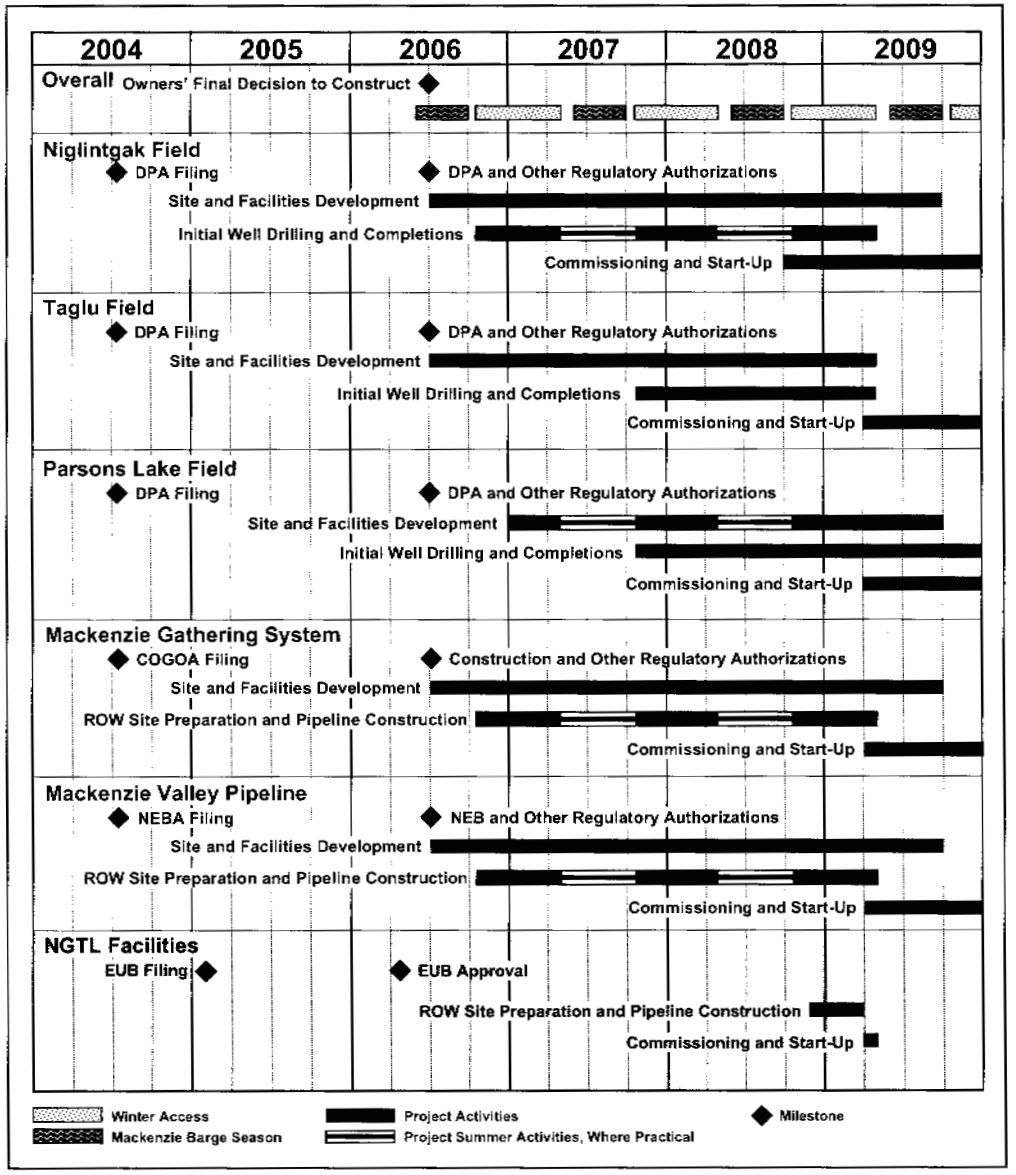
Mackenzie Gathering System

- 176 km buried gathering pipelines
- Pigging facility at Storm Hills
- Processing facility near Inuvik
- 476 km buried NGL pipeline

Mackenzie Valley Pipeline

- 1,220 km buried gas pipeline
- Four compressor stations
- Heater station
- Terminates in Alberta

MGP Summary Schedule



The Cooperation Plan forms the basis for the MGP schedule

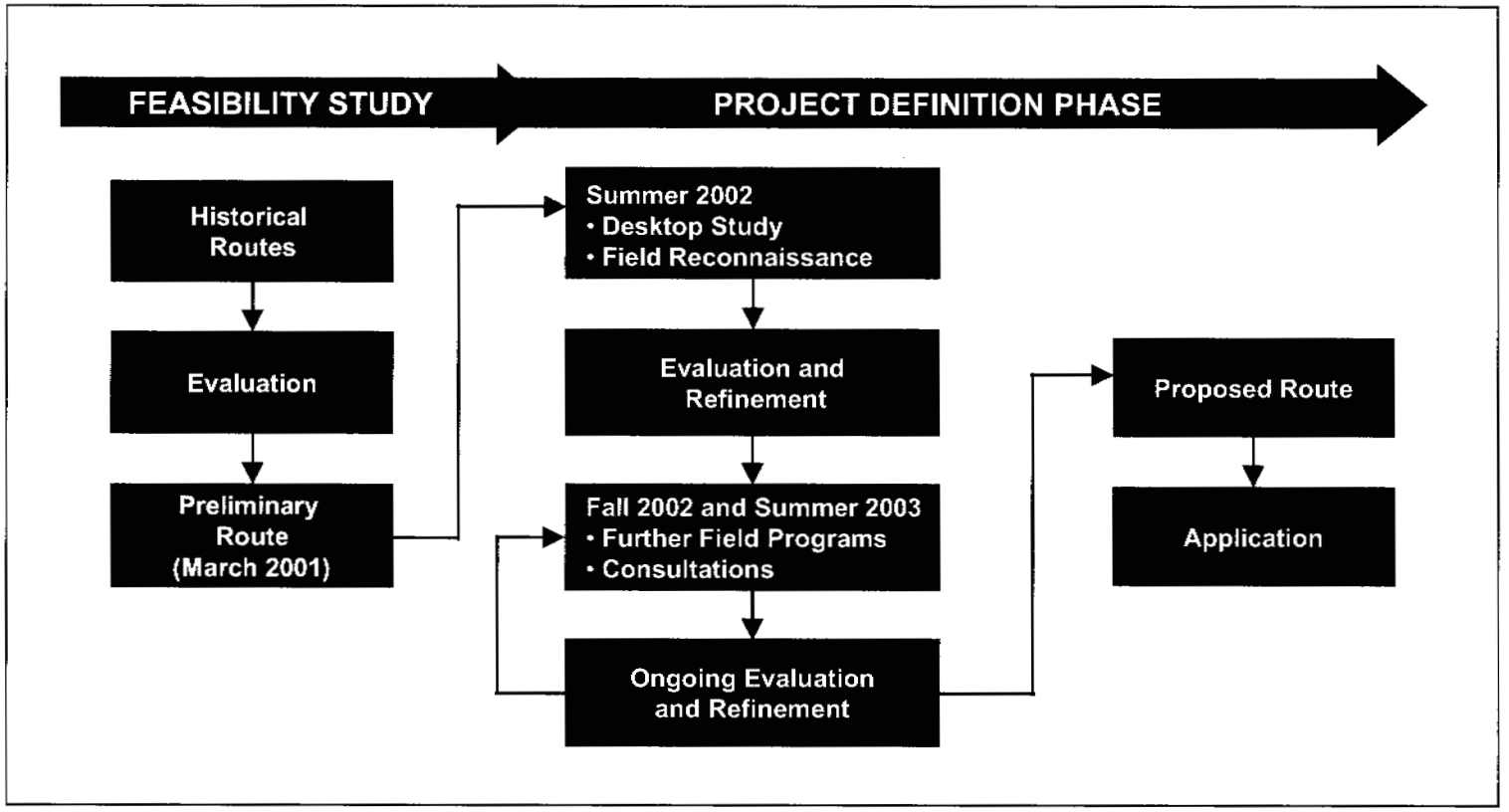
Owners' decision to construct based upon factors including:

- The terms and conditions of the regulatory approvals
- Project costs
- The outlook for natural gas markets

2009 start-up is dependent on 2006 work initiatives:

- Regulatory approval conditions must be understood by early 2006 to facilitate proponents' decision to construct

Route and Site Selection



Objectives

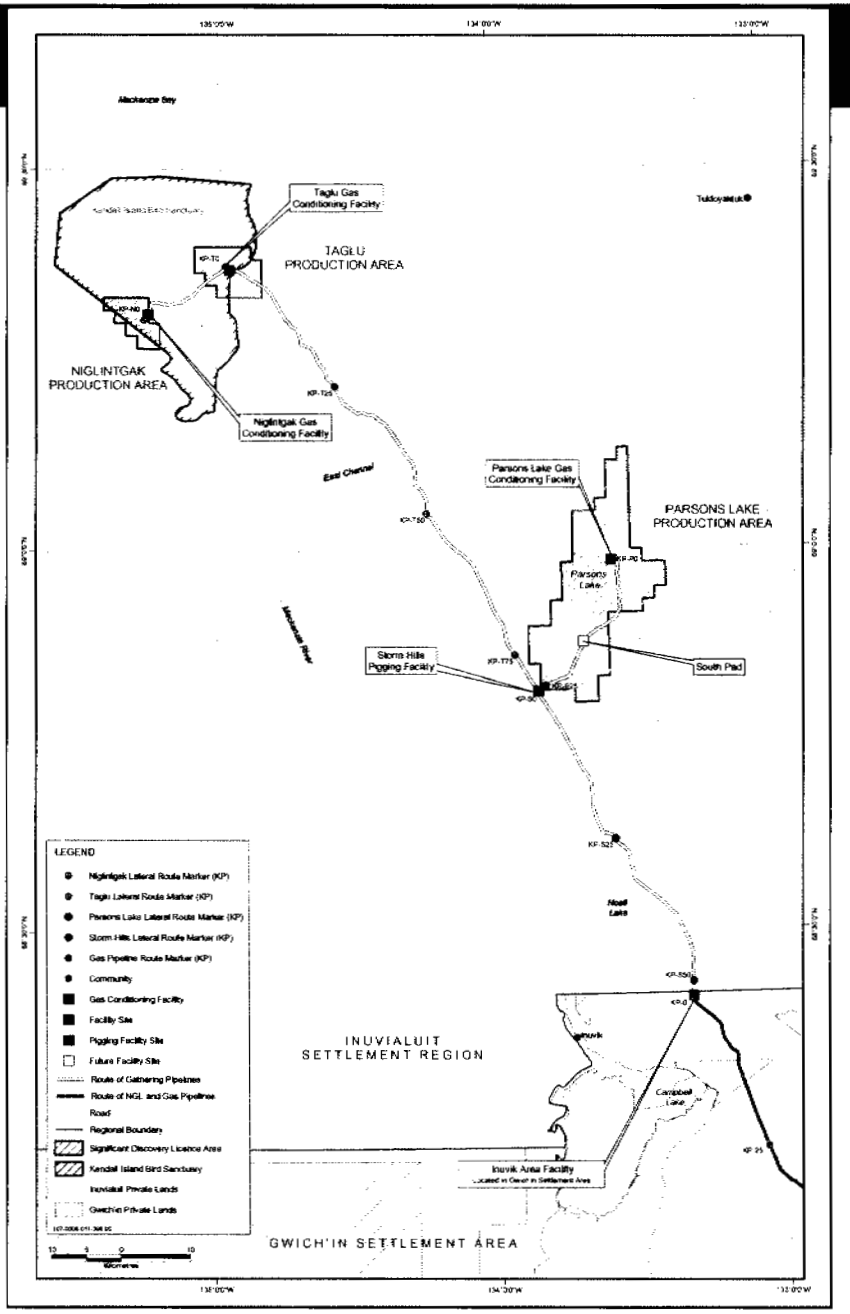
- Avoiding sensitive environmental and cultural areas
- Reducing disturbance to communities and the landscape
- Satisfying engineering and construction requirements
- Reducing cost

Anchor Fields

Project anchored by the development of about 172 Gm^3 (6.1 Tcf) of sweet natural gas

Three anchor fields

- Niglintgak (Shell)
- Taglu (Imperial Oil)
- Parsons Lake (ConocoPhillips and ExxonMobil)



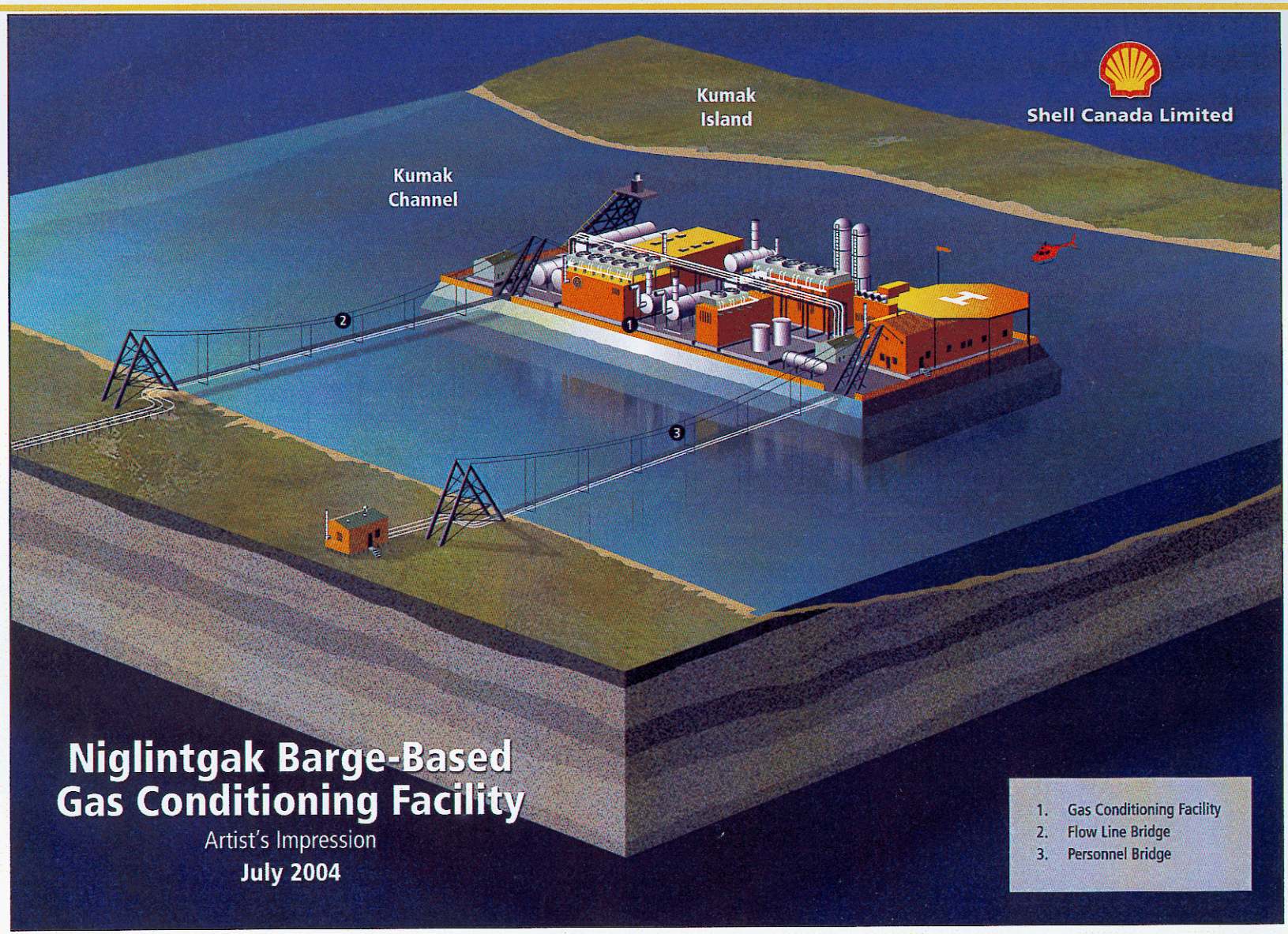
Anchor Fields Map - EIS Volume 2, Figure 2-2

Anchor Field Development Summary - Niglintgak

- **Shell Canada Limited (Shell) will develop the Niglintgak field**
- **The field is within the Kendall Island Bird Sanctuary**
- **About 27 Gm^3 (1 Tcf) of raw natural gas and NGL production**
- **Field development will include:**
  - Three well pads (north, central and south)
  - Six to 12 production wells
  - A gas conditioning facility
  - A disposal well
  - Flow lines
  - A remote drilling sump
  - Supporting infrastructure
- **Estimated total area required is: 55 ha (barge option), 74 ha (land option)**

Artist's Impression – Niglintgak

Artist's Impression – Niglintgak



Anchor Field Development Summary - Taglu

- **Imperial Oil Resources Limited will develop the Taglu field**
- **The field is within the Kendall Island Bird Sanctuary**
- **About 81 Gm^3 (2.8 Tcf) of raw natural gas and NGL production**
- **Field development will include:**
  - One well pad
  - 10 to 15 production wells
  - A gas conditioning facility
  - Flow lines
  - One or two disposal wells
  - Supporting infrastructure
- **Estimated total area required is 30 ha**

Anchor Field Development Summary - Parsons Lake

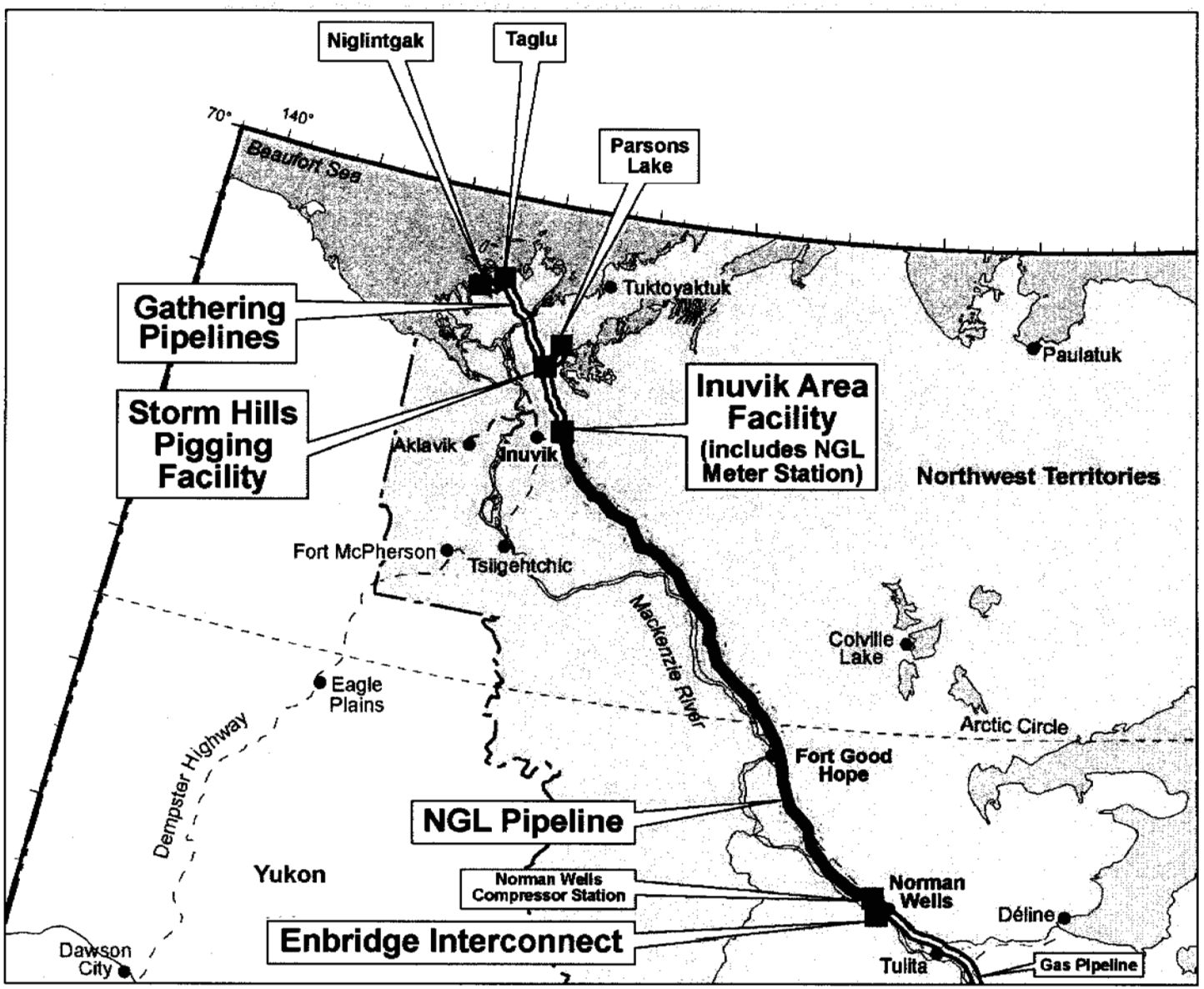
- **ConocoPhillips Canada (North) Limited and ExxonMobil Canada Properties will develop the Parsons Lake field**
- **About 64 Gm^3 (2.3 Tcf) of raw natural gas and NGL production**
- **Field development will include:**
  - A north pad consisting of
    - nine to 19 production wells
    - two disposal wells
    - a gas conditioning facility
  - A south pad consisting of three to seven production wells
  - Flow lines
  - Supporting infrastructure
- **Estimated total area required is 28 ha**

Artist's Impression – Taglu

Artist's Impression – Parsons Lake

Artist's Impression – Parsons Lake

Gathering System



Mackenzie Gathering System Pipelines

	Length	Pipe Size (inches)	ROW Width
Gathering pipelines:			
Niglintgak lateral	16 km	NPS 16	30 m
Taglu lateral	81 km	NPS 26	40 m
Parsons Lake lateral	27 km	NPS 18	30 m
Storm Hills lateral	52 km	NPS 30	40 m
NGL pipeline	476 km	NPS 10	50 m

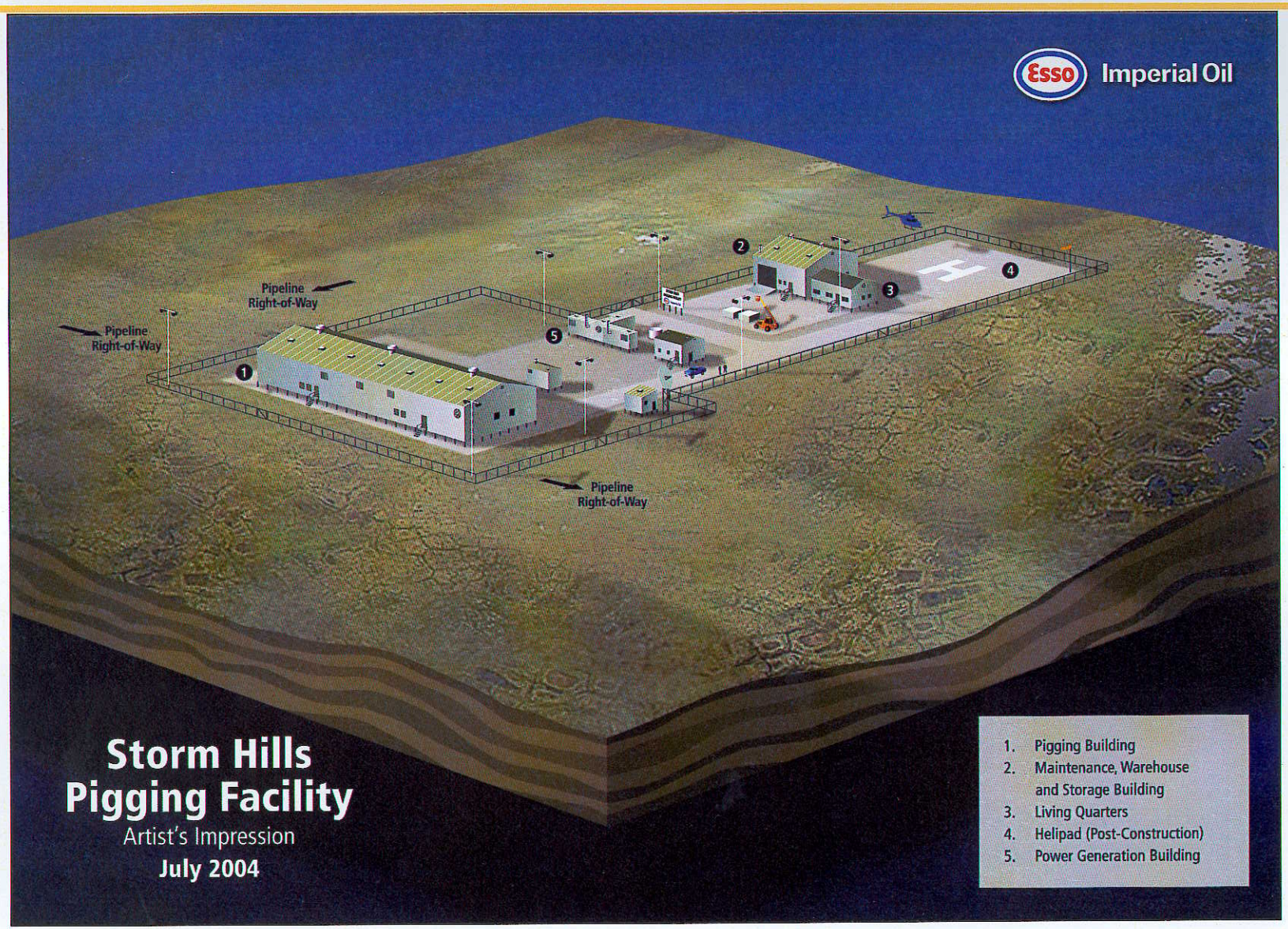
- Right-of-way (ROW) shared with gas pipeline from Inuvik to Norman Wells
- 1 km of 30 m ROW for interconnection to Enbridge pipeline at Norman Wells
- Designed for 3,900 m^3/d, expandable to 6,700 m^3/d by adding 2 pump stations

Mackenzie Gathering System Facilities

Facilities include:

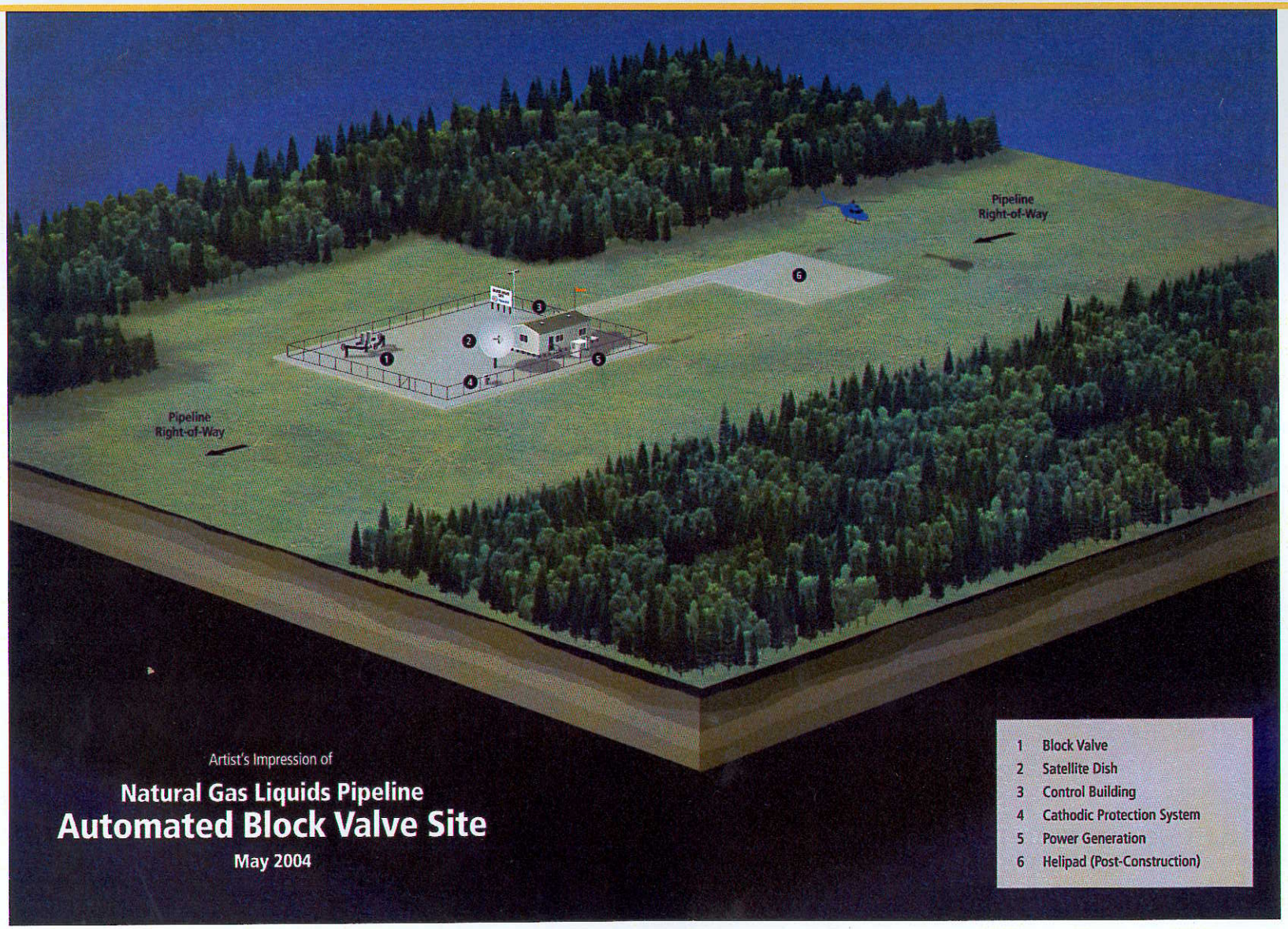
- Storm Hills pigging facility located at junction of the laterals
- Inuvik Area facility; process equipment to meet gas and NGL pipeline specifications
  - Designed for about 1.1 Bcf/d natural gas, 3,400 m^3/d NGL
- Block valves to isolate pipeline segments for maintenance and operations
  - Gathering laterals - 10 valves
  - NGL pipeline - 29 valves
- Cathodic protection sites
  - 16 sites shared with other facilities
  - Two sites standalone

Artist's Impression – Storm Hills

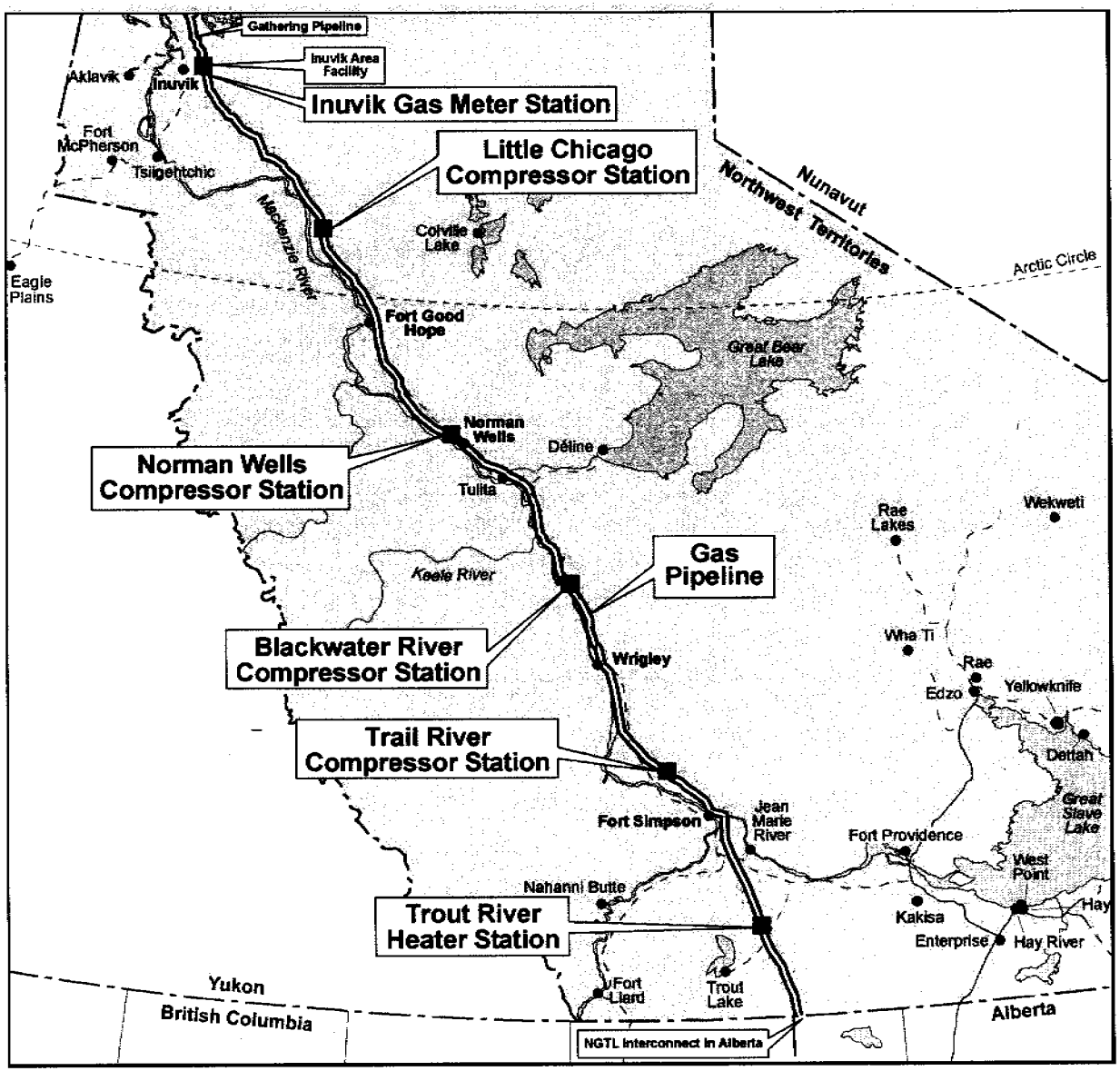


Artist's Impression – Inuvik Area Facility

Block Valve


Pipeline
Right-of-Way
Pipeline
Right-of-Way
Artist's Impression of
Natural Gas Liquids Pipeline
Automated Block Valve Site
May 2004
1 Block Valve
2 Satellite Dish
3 Control Building
4 Cathodic Protection System
5 Power Generation
6 Helipad (Post-Construction)

Gas Pipeline and Facilities



Gas pipeline

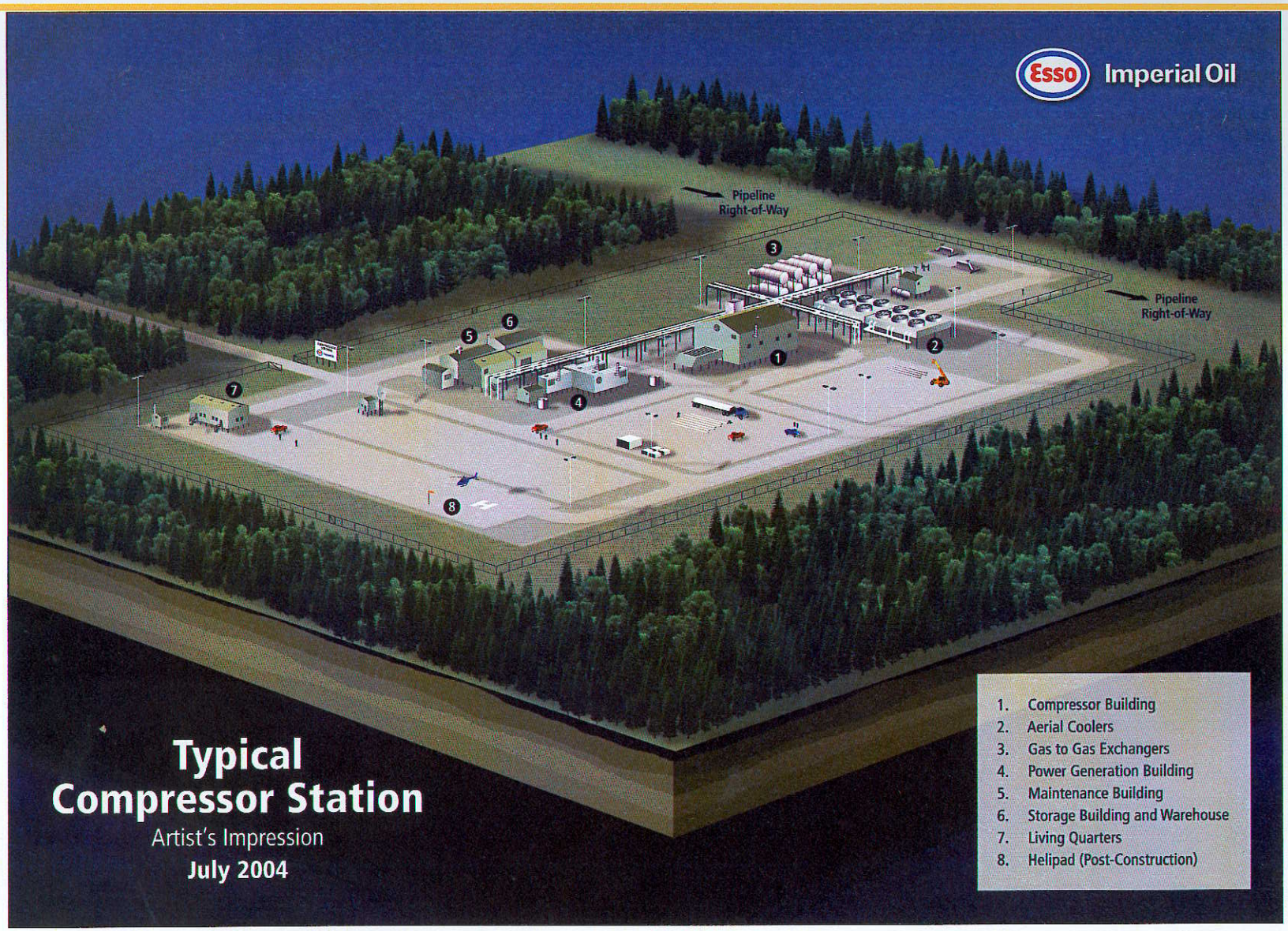
- 1,220 km, buried NPS 30 pipeline
- 50 m right-of-way shared with NGL pipeline from Inuvik to Norman Wells
- 40 m right-of-way from Norman Wells to interconnection with NGTL just south of NWT-Alberta boundary
- Designed to deliver 1.2 Bcf/d sales gas to Alberta in summer
- Expandable to 1.7 Bcf/d by adding 10 compressor stations

Mackenzie Valley Pipeline Facilities

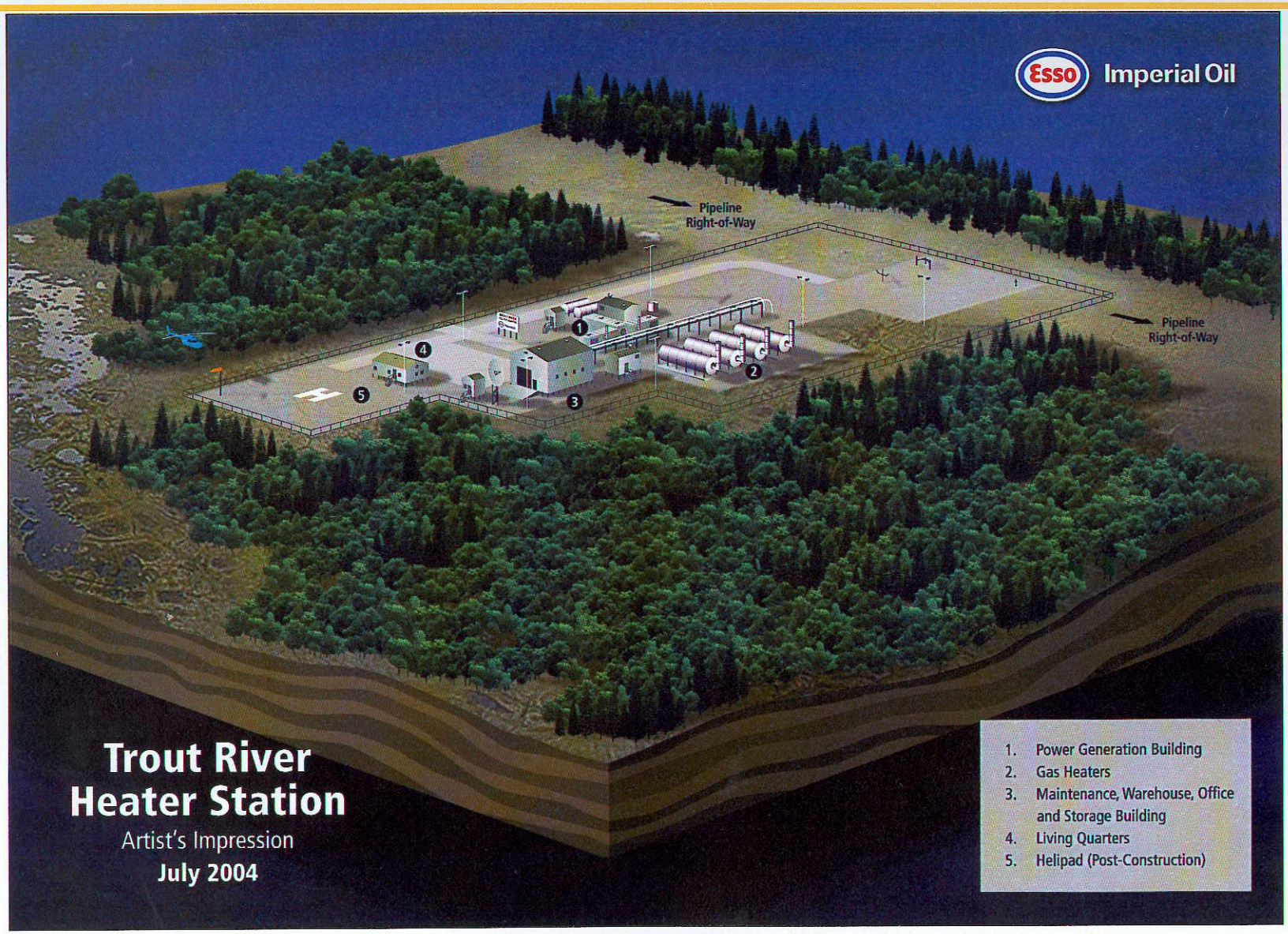
Facilities include:

- Four compressor stations: Little Chicago, Norman Wells, Blackwater River, Trail River
  - Stations are spaced about 225 km apart
- Trout River heater station located about 100 km north of Alberta boundary
- 10 block valves located at sites of potential future compressor stations
- Cathodic protection sites
  - 21 sites shared with other facilities
  - 8 standalone sites

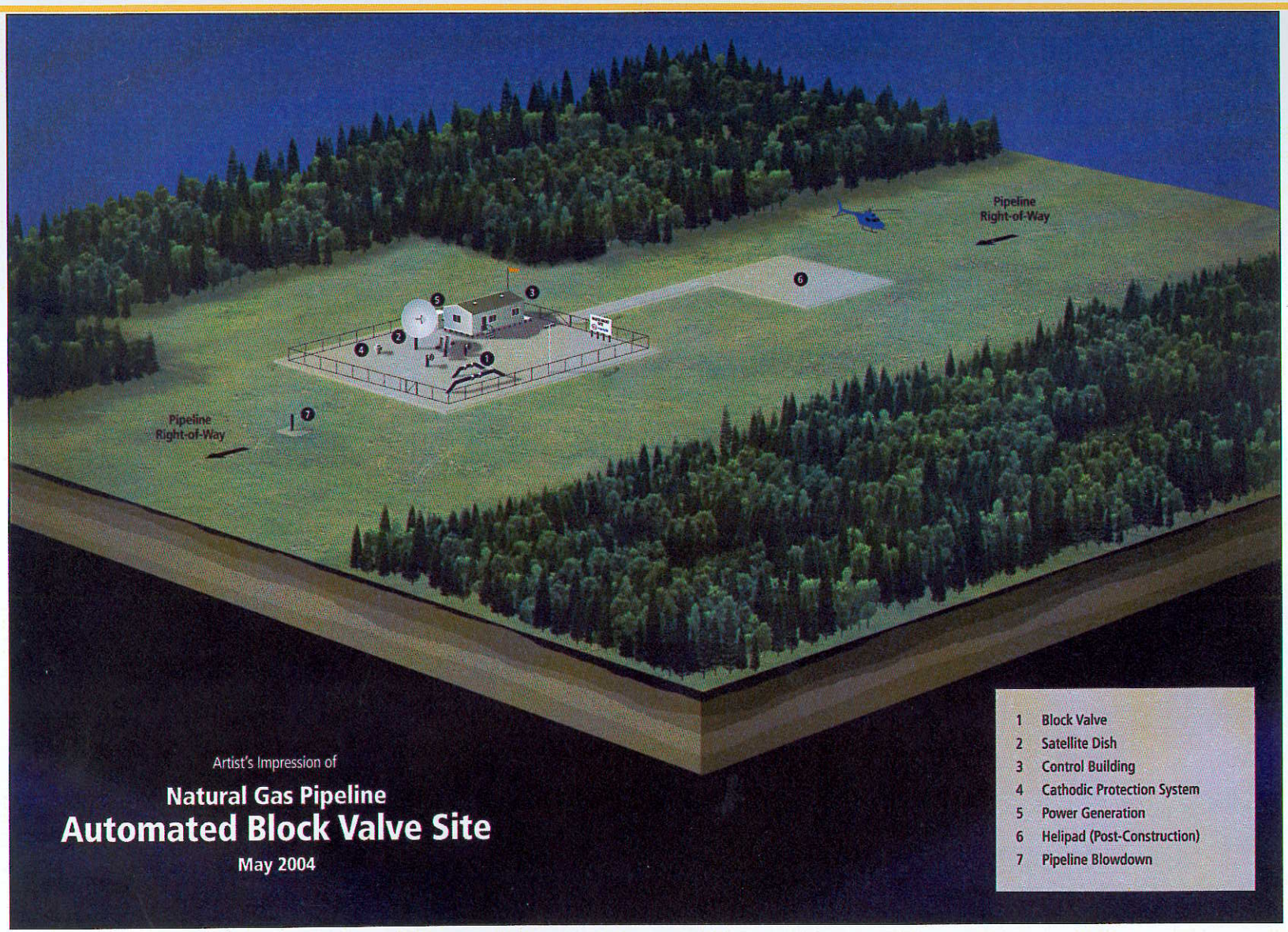
Compressor Station



Heater Station

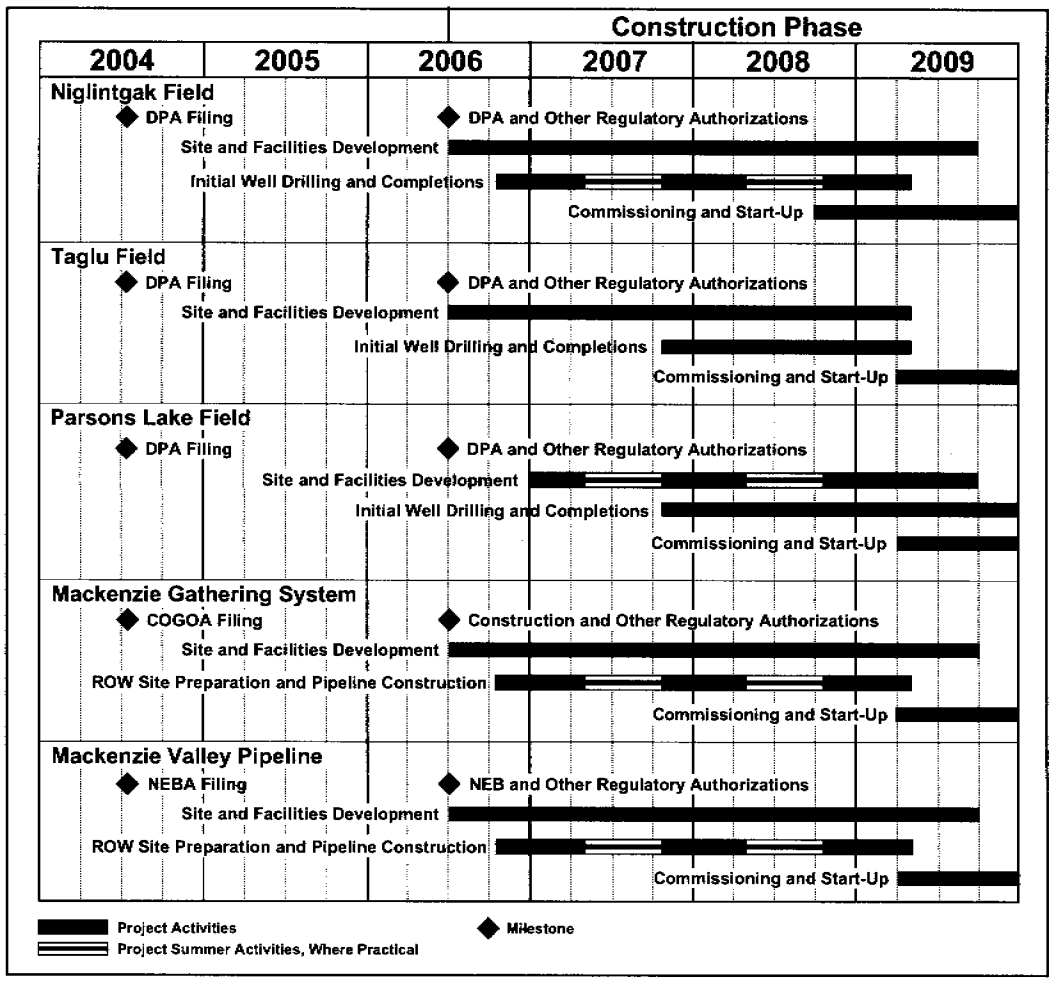


Block Valve


Pipeline
Right-of-Way
Pipeline
Right-of-Way
1 Block Valve
2 Satellite Dish
3 Control Building
4 Cathodic Protection System
5 Power Generation
6 Helipad (Post-Construction)
7 Pipeline Blowdown
Artist's Impression of
Natural Gas Pipeline
Automated Block Valve Site
May 2004

Preliminary Construction Schedule

Starts in Q3 2006 with barge landings, camps and borrow sites constructed to support winter 2006/2007 activities



Anchor Fields

- Drilling commences after well pads constructed
- Facilities design based upon modules
- Constructed offsite, shipped by truck and barge to site

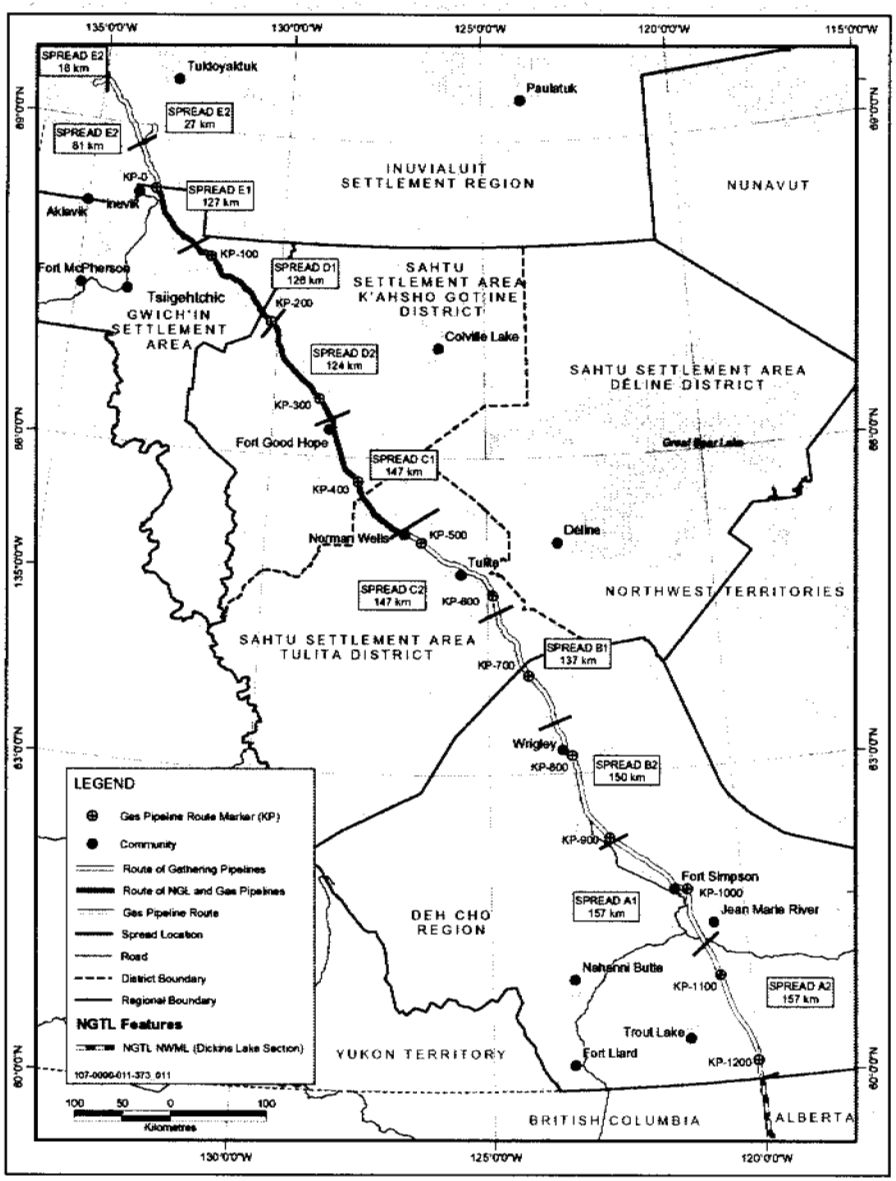
Pipelines

- Route divided into 10 spreads
- Right-of-way clearing begins in first winter season prior to pipeline installation
- Pipeline installed over two subsequent winter seasons

Facilities

- Design based upon modules
- Constructed offsite, shipped by truck and barge to site
- Year-round construction at each site

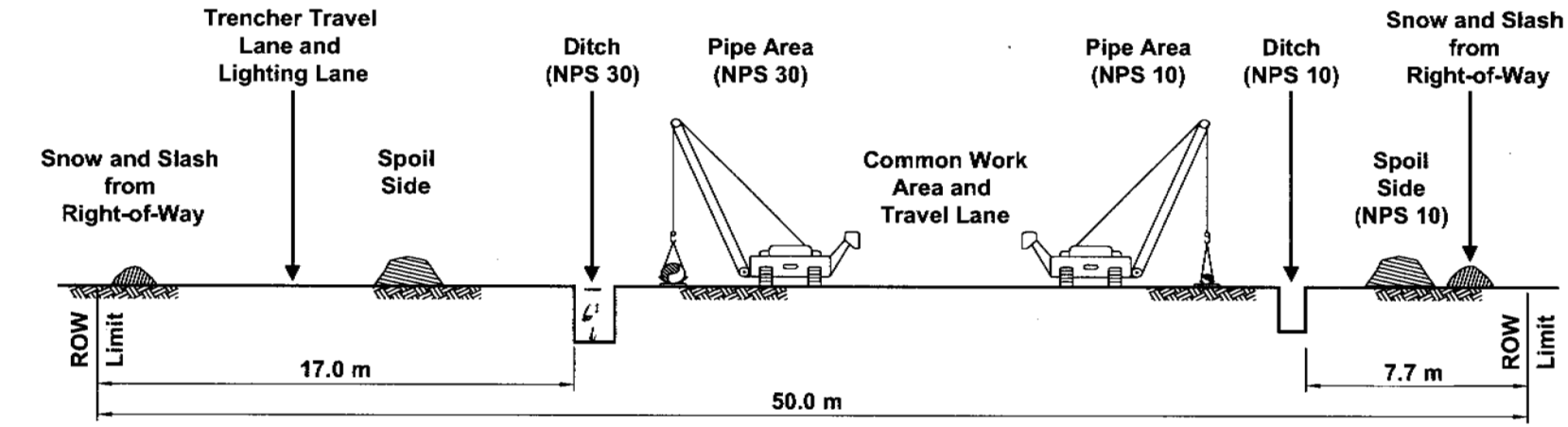
Pipeline Construction Spreads



Pipeline Construction Spreads Map - EIS Volume 2, Figure 4-7

Typical Right-of-Way Cross-Sections

Gas and NGL Pipelines – Inuvik Area Facility to Norman Wells



Not to scale

SK-107-0000-130-007

Infrastructure Requirements

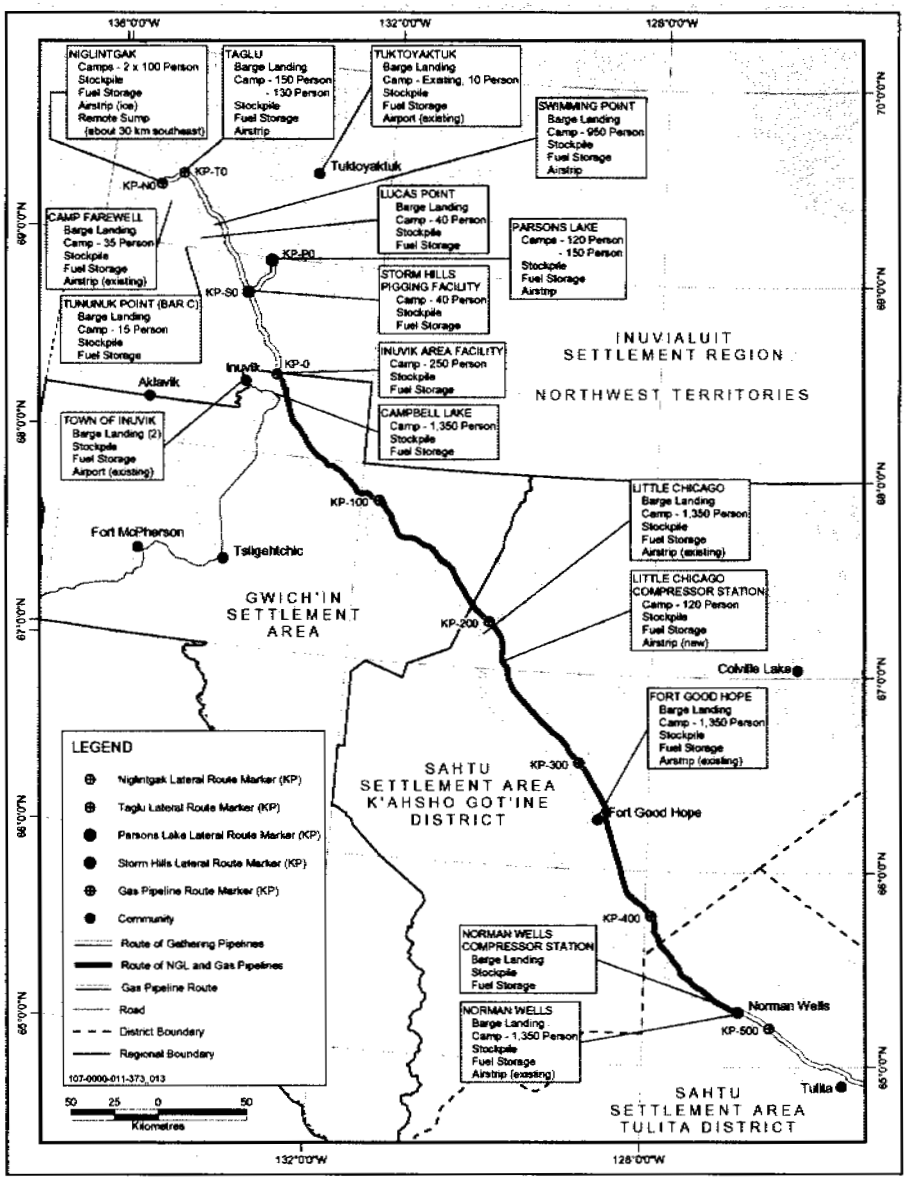
The project plans to use existing infrastructure, and upgrade where required

New sites are also required

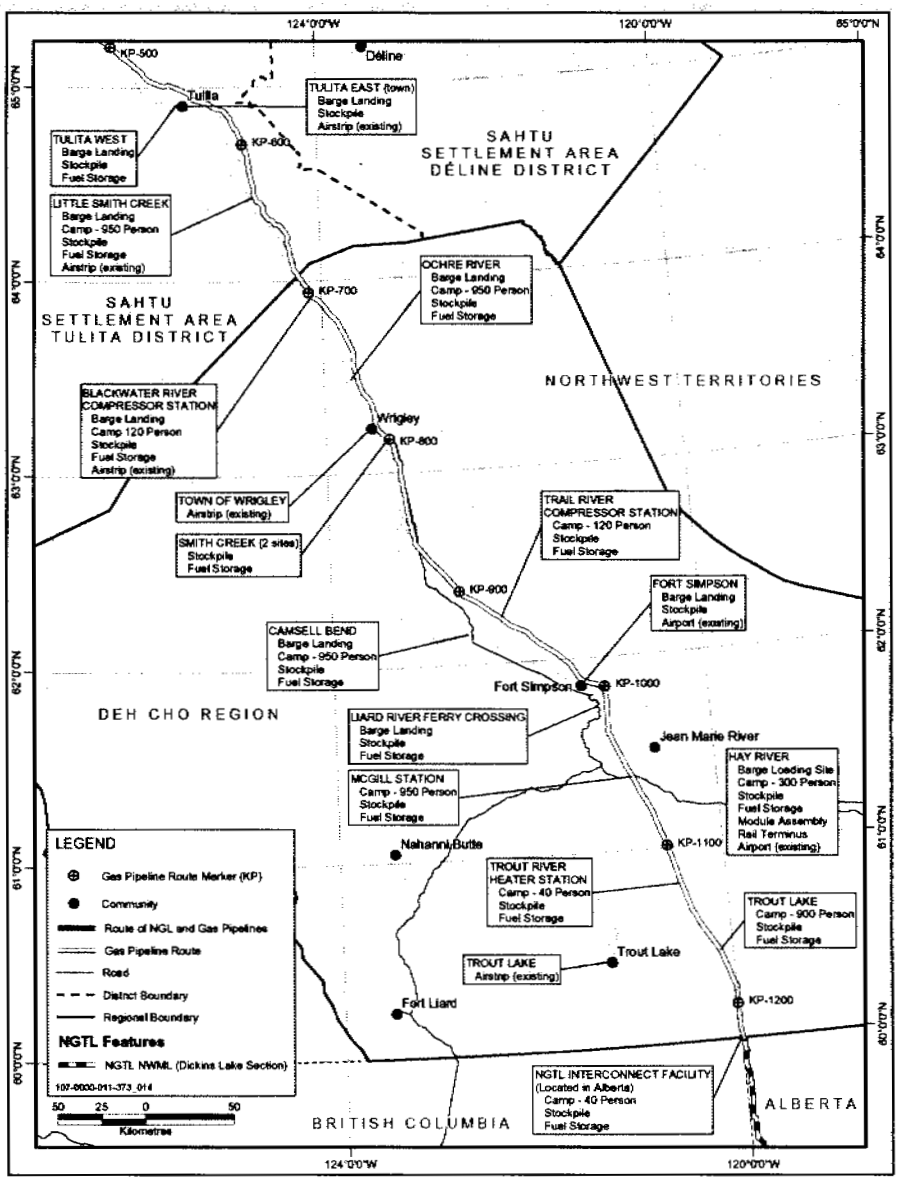
Requirements include:

- 22 barge landing sites   2 new   .5-1 ha each
- 27 camps - 10 with 900 to 1,350 beds   20-33 ha
- 32 stockpile sites for equipment, material and fuel   - most at camps
- Using existing commercial airports - Inuvik, Yk., NW, Ft. Simpson
- Building new all-weather airstrips at Taglu, Parsons Lake, Little Chicago, Blackwater River
- Using existing highways and building new roads
  - 300 winter roads (860 km) - borrow, barge access
  - 15 all-weather roads (75 - 80 km)   19 km Dempster → Inuvik facility; 26 km · Camsell Bend ferry to Compressor
- Developing 70 borrow sites

Infrastructure Overview (cont'd)



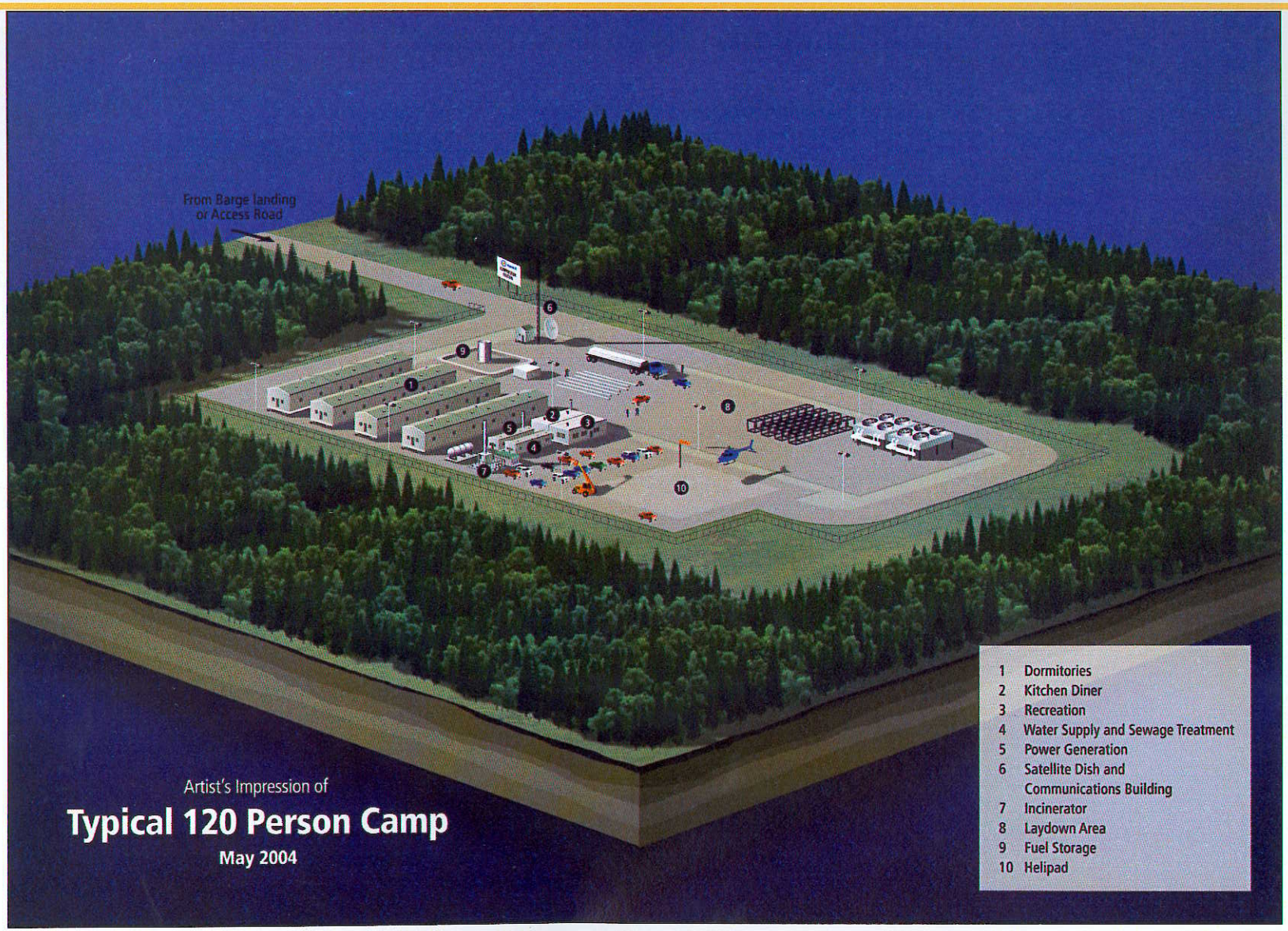
Infrastructure Map - EIS Volume 2, Figure 6-1



Infrastructure Map - EIS Volume 2, Figure 6-2

Camp - 950 Person

Camp - 120 Person



Artist's Impression of

Typical 120 Person Camp

May 2004

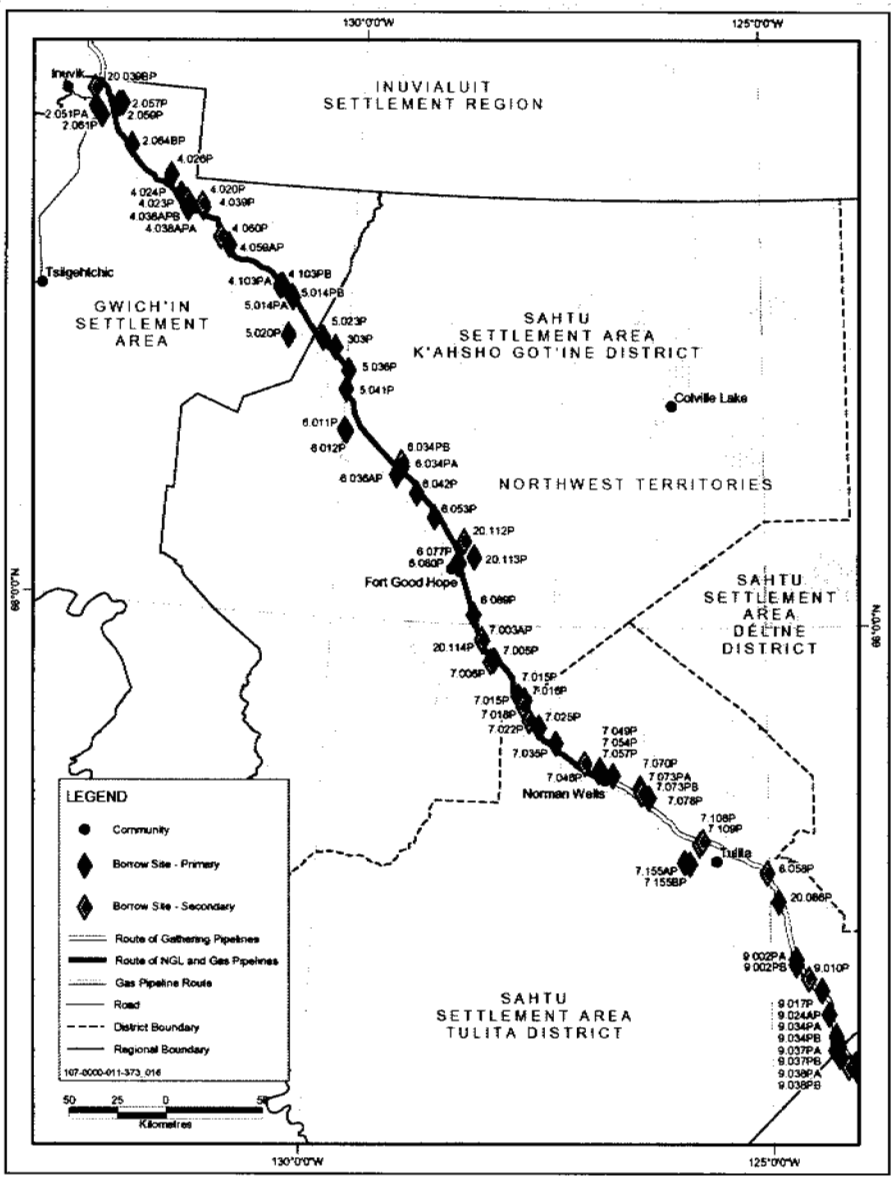
Barge Landing Site

Artist's Impression of

Typical Temporary Barge Landing Site

May 2004

Borrow Sites



Infrastructure Map - EIS Volume 2, Figure 7-2

- **Project requirements total 5 Mm³ from about 70 sources distributed along the route** 20 existing
- **Required for facility pad construction, camps and roads, pipeline construction**
- **Evaluating 120 borrow sources**
  - Volume, extent, quality, ice content
- **Additional sites might be required if material available at identified sites is insufficient or poor quality**
- **Access is site dependent, plans include using:**
  - The pipeline right-of-way
  - A winter road
  - An all-weather road

Borrow Site Development

Artist's Impression of

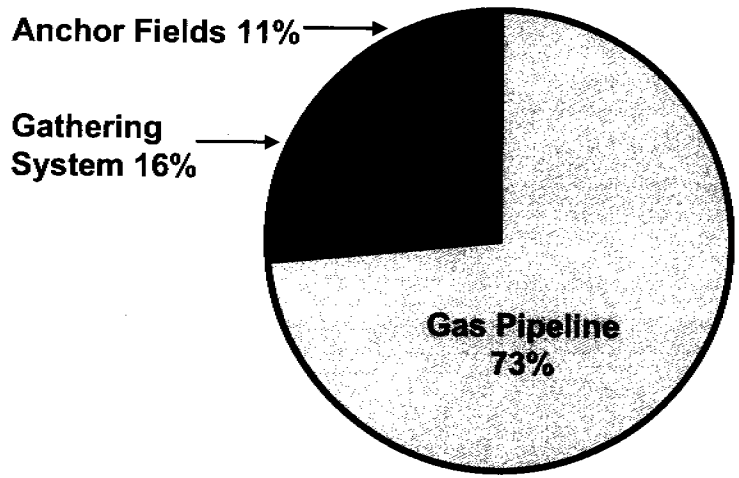
Typical Borrow Source Development Site

(up to 50,000 m³)

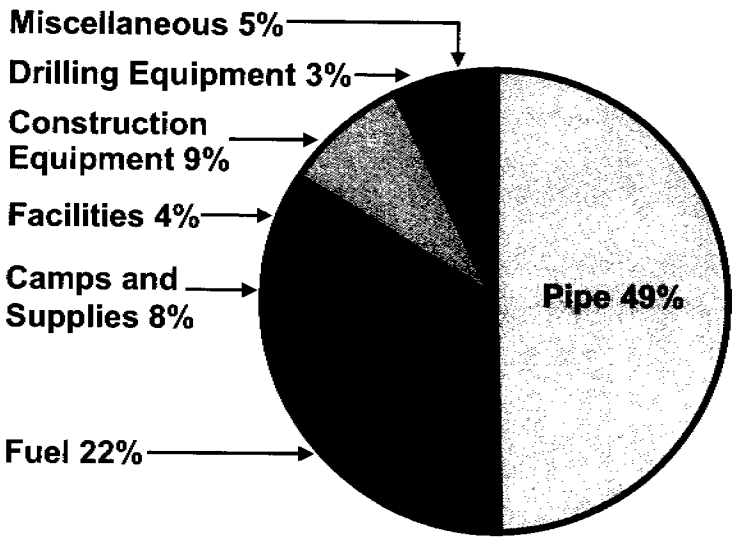
May 2004

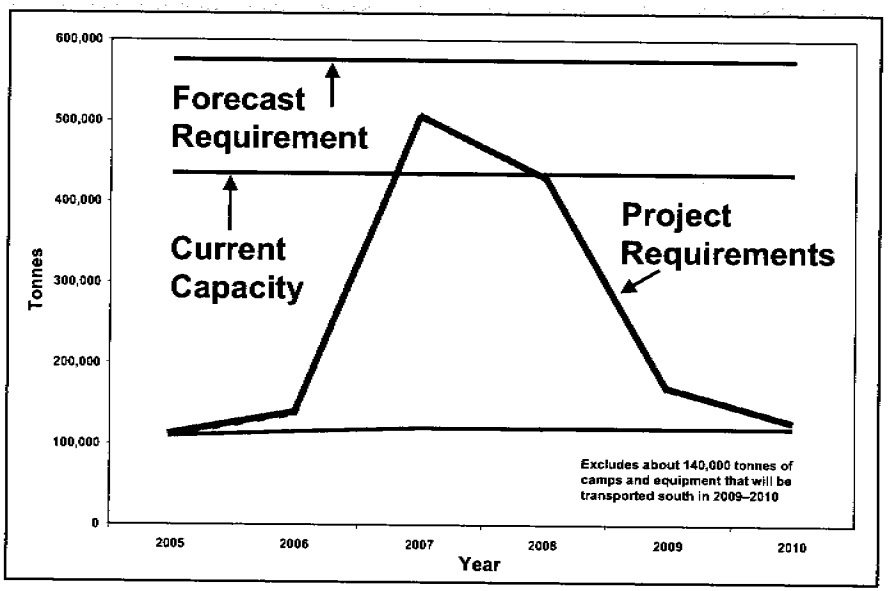
Logistics Overview

Cargo - by Project Component



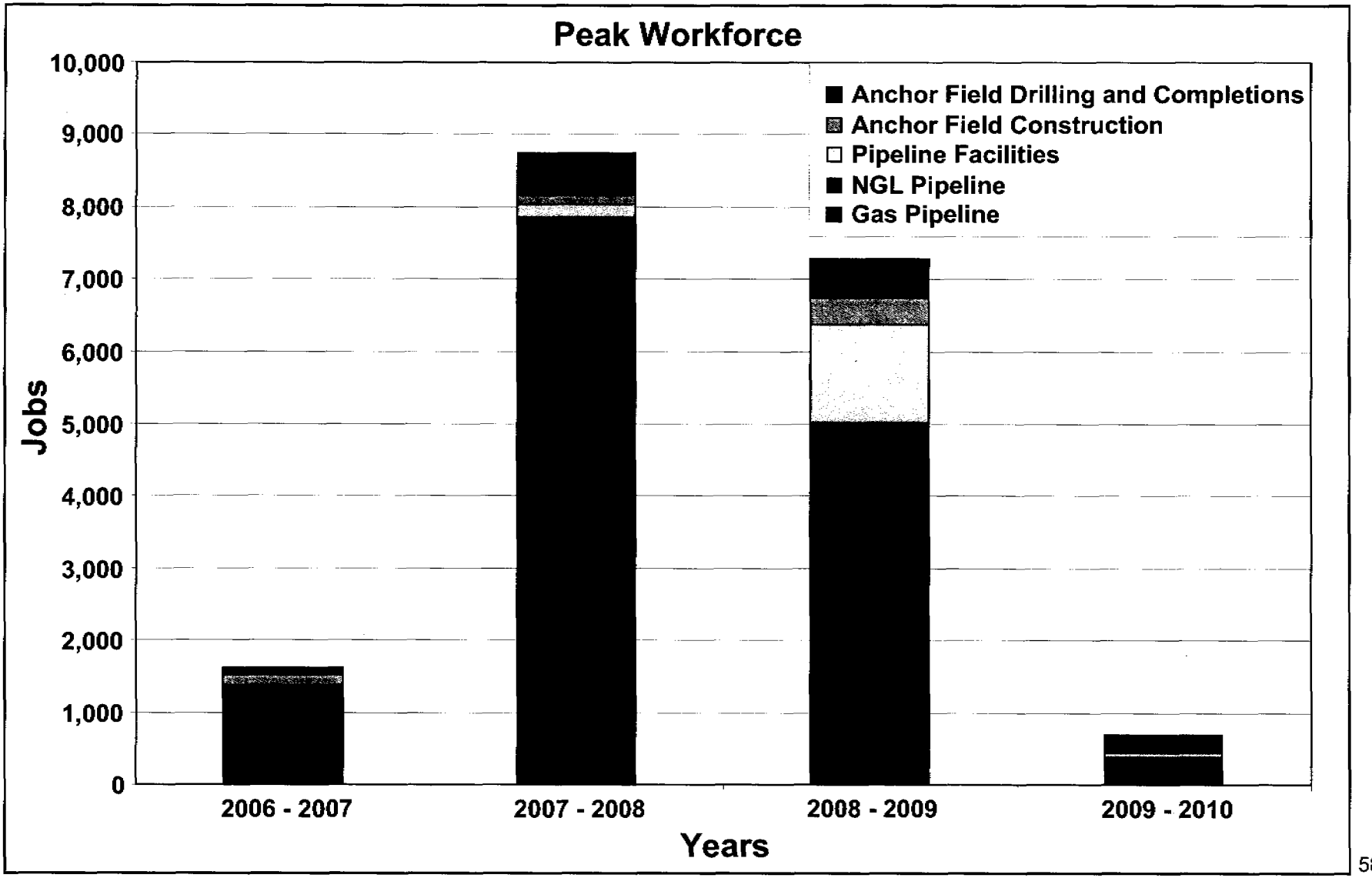
Cargo - by Type





- Cargo requirements estimated at 868,000 tonnes with peak deliveries in 2007
- Deliveries by truck and rail to NWT - primarily truck s. of Ft. Simpson, barge to North of F.S.
- Peak activities in summer by barge and in winter by truck to project sites
- Personnel travel by 737 aircraft through hubs at Inuvik, Norman Wells and Fort Simpson, and smaller aircraft to airstrips near camps

Workforce - Construction Phase



Project Expenditures

Estimated direct project expenditures to 2010, total 7 $billion

2003 $

- To mid 2006, 750 $million
- Construction to mid 2010, 6.25 $billion

SEIA assessed impacts of construction phase activities (6.25 $billion, mid 2006 to 2010)

Project Component	Estimated Cost [1] to 2010 ($Million)
Niglintgak[2]	369
Taglu	555
Parsons Lake	603
Mackenzie Gathering System	1,653
Mackenzie Valley Pipeline	3,838
Subtotal[3]	7,017
Future Anchor Field Investments	715
Total	7,732

NOTE:

1. Costs are in constant Q1 2003 Canadian dollars.
2. Barge-option. Preliminary estimate for a land-based gas conditioning facility is 10 to 15% higher.
3. Numbers might not add up because of rounding.

Summary

- About 155 people initially, 150 $million/year operating costs
- Inspection and maintenance programs planned to
  - Ensure the safety of employees and the public
  - Reduce environmental impacts
  - Protect the installed pipelines and facilities
  - Maintain reliability
- Operations and maintenance personnel are expected to live in Inuvik and Norman Wells

Anchor Fields

- About 55 people initially, 37 $million/year operating costs
- Each field will initially be continuously staffed with onsite personnel
- When operations are stable, it is expected that each site will be remotely monitored, with staff visits as required
- Additional drilling and installing compression facilities are planned for Taglu and Parsons Lake to maintain gas deliveries (cont'd)

Operations (cont'd)

Mackenzie Gathering System

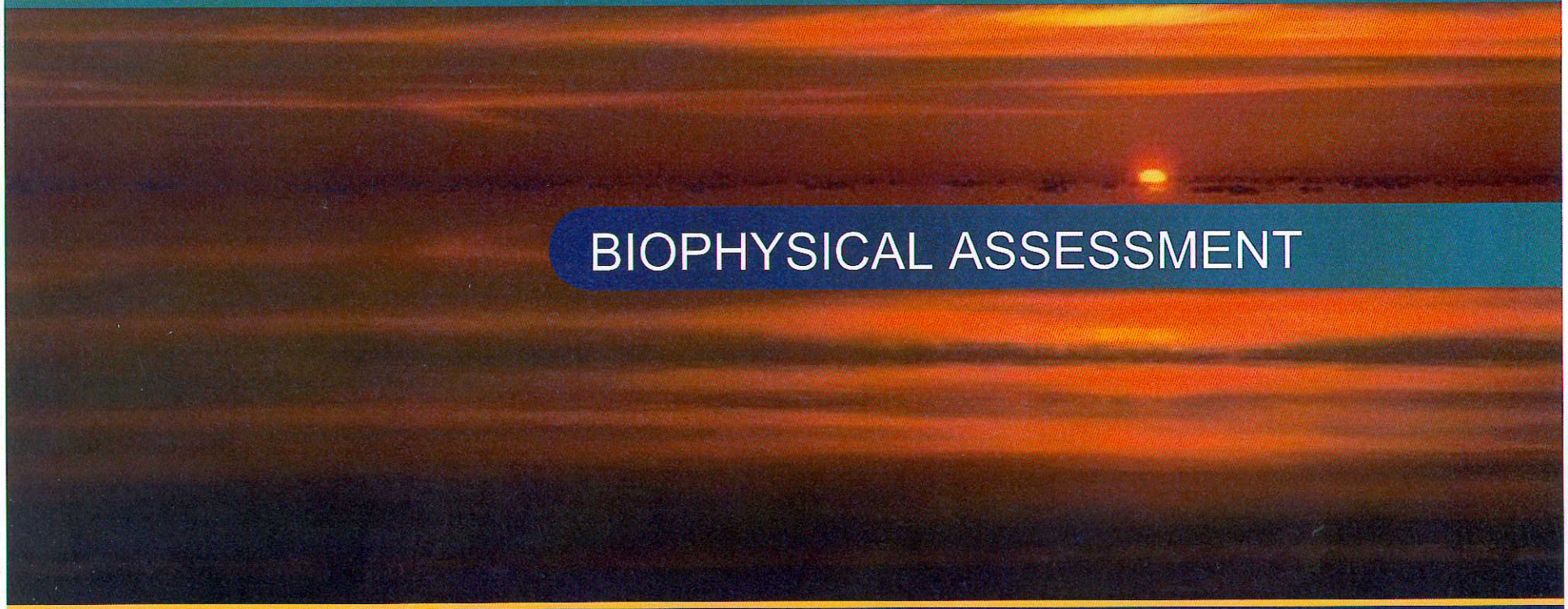
- About 50 people initially, 50 $million/year operating costs
- The gathering pipelines and facilities will be continuously monitored and operated by a control room at the Inuvik area facility
- The NGL pipeline will be continuously monitored and operated by a control room in Calgary

Mackenzie Valley Pipeline

- About 50 people initially, 62 $million/year operating costs
- The gas pipeline and facilities will be continuously monitored and operated by a control room in Calgary

ENVIRONMENTAL IMPACT STATEMENT

for the Mackenzie Gas Project



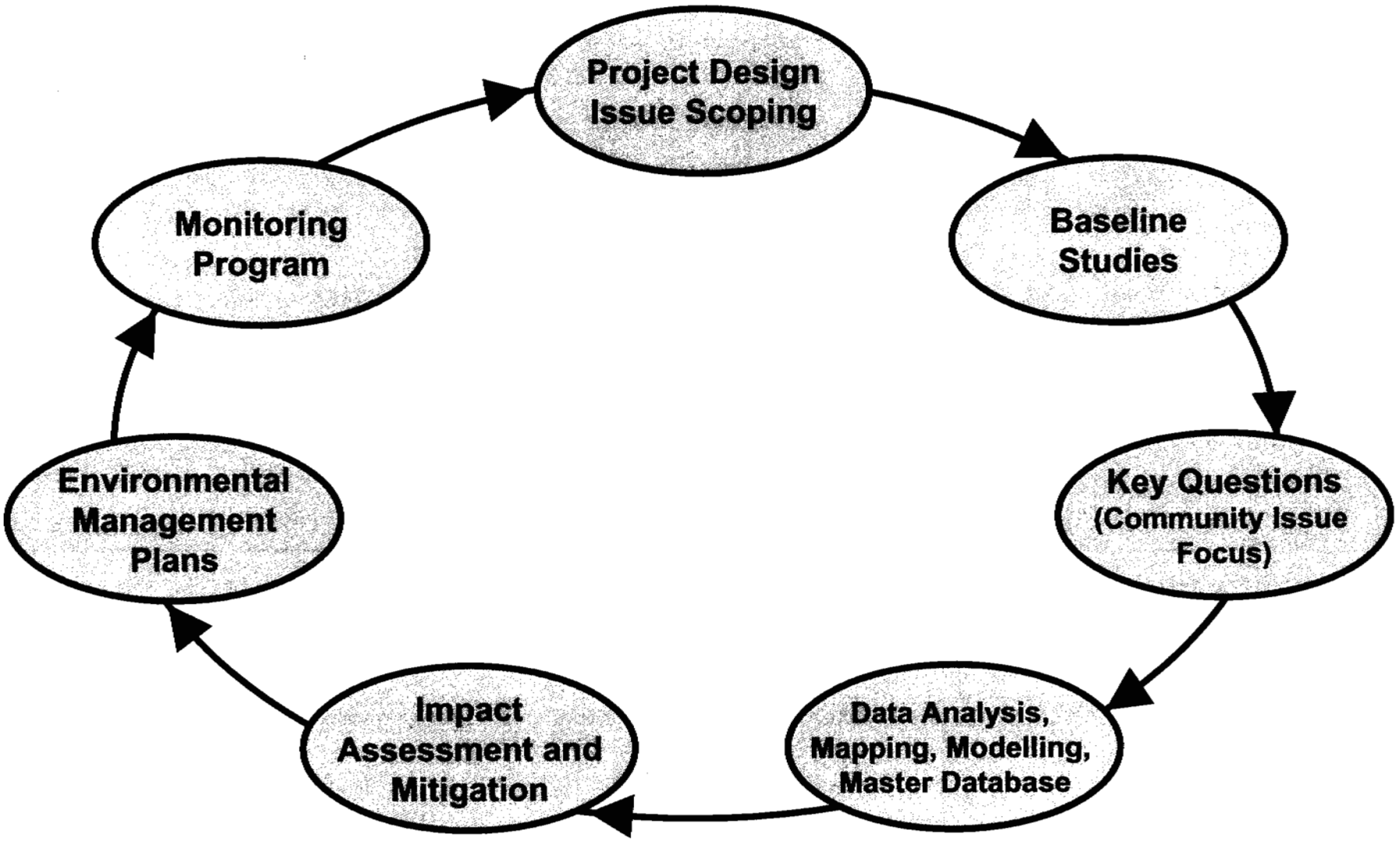
BIOPHYSICAL ASSESSMENT

Esso Imperial Oil | APG | ConocoPhillips | Shell Canada | ExxonMobil

Presentation Topics

- **Methodology**
- **Air Quality and Noise**
- **Groundwater**
- **Hydrology and Water Quality**
- **Fish and Fish Habitat**
- **Soils, Landforms and Permafrost**
- **Vegetation**
- **Wildlife**
- **Climate Change**
- **Cumulative Effects**
- **Biodiversity**
- **Changes to the Project Caused by the Environment**

Biophysical Impact Assessment - Process



Significance – Framework and Effects Criteria

- **Concept: Based on environmental and socio-economic sustainability for future generations**
- **Framework: Sustainable development goals for the Northwest Territories (MVEIRB 2002):**
  - Economic vitality
  - Environmental integrity
  - Social and cultural well-being
  - Equity
  - Control over natural resources
- **Significance**
- **Effects Criteria: Residual effects assessed according to:**
  - Magnitude
  - Geographic extent
  - Direction

Significance – Biophysical and Socio-Economic Criteria

Biophysical effect significant if:

- Moderate or high magnitude and extending into the far future, i.e., >30 years after project decommissioning
- High magnitude and occurs outside the Local Study Area at any time

Socio-economic effect significant if:

- High magnitude, short term and regional, beyond regional or national in extent
- High magnitude, long term and any geographic extent
- Moderate magnitude, long term and beyond regional or national in extent

Air Quality – Baseline

- **Ambient air quality; emissions data modelling and analysis**
- **2001-2002 passive and active monitoring stations established**
- **Natural gaseous and particulate emissions from:**
  - Forest fires
  - Terrestrial and Marine sources
- **Anthropogenic emissions from:**
  - Transportation – air, ground, marine
  - Oil and gas exploration, development and production
  - Commercial and residential heating sources
- **Current concentrations of gases and compounds are below detection limits**

Air Quality – Key Findings

- **Effects largely due to emissions from compressor stations and heater facilities during project operations**
- **Dust generated from vehicle traffic and equipment**
- **Assessment focussed on Key Indicators (KIs)**
  - Sulphur dioxide (SO_2)
  - Nitrogen dioxide (NO_2)
  - Carbon Monoxide (CO)
  - Particulate Matter ($PM_{2.5}$)
  - Potential acid input (PAI)
  - Benzene
  - Benzene, toluene, ethylbenzene, xylene (BTEX)
- **Ground level modelling predictions of all compounds are below Federal and Territorial guidelines at all project locations**
- **Effects predicted to be adverse, moderate to low magnitude, local and long-term**
- **No significant effects on air quality**

Air Quality – Mitigation Measures

- **Using equipment that meets relevant air quality standards (NWT regulations, CCME standards and Alberta standards)**
- **Ensuring flare stack design and performance are consistent with industry regulations**
- **Applying Best Management Practices to reduce fuel use**
- **Implementing air quality monitoring program (construction and operations)**

Noise – Baseline

- **Ambient sound level surveys at production area and pipeline corridor (winter and summer)**
- **Natural sounds are the norm:**
  - Wind, rainfall, wildlife
- **Anthropogenic sources are localized and intermittent:**
  - Vehicle, barge and boat, air traffic, oil and gas exploration activities, settlements, e.g., Fort Simpson, Norman Wells, Inuvik

Noise – Key Findings

- **Effects generated primarily from construction activities, transportation and well drilling and west test flaring**
- **Well drilling and well test flaring will range from 30 dBA to 42 dBA at 1.5 km but effects are local and of short duration (no regulatory guidelines)**
- **Production area facility noise will range from 20 dBA to 40 dBA at 1.5 km (within regulatory guidelines)**
- **Compressor stations will range from 37 to 38 dBA; heater stations from 23 to 25 dBA**
- **No significant effects on noise levels**

Noise – Mitigation Measures

- **Designing facilities to meet Alberta EUB Guide 38 noise guidelines for remote sites, i.e., 40 dBA at 1.5 km**
- **Using engineering noise controls such as silencers, insulation, upgraded building shells**
- **Scheduling discretionary activities (e.g., maintenance) in sensitive areas or during sensitive time periods**
- **Implementing Noise Monitoring Program (operations)**

Groundwater – Baseline

- **2001- 2003 literature review; aerial surveys, waters samples, ground surveys**
- **Groundwater in the Mackenzie Valley provides base flow for many streams and maintains under-ice flow, winter habitat for fish**
- **Production Area (Mackenzie Delta Region)**
  - Groundwater moves through shallow flow systems in the seasonally active layer, above the permafrost
  - Unfrozen groundwater (taliks) beneath large lakes and rivers
  - Features include seasonal springs, icings, pingos, thermokarst

Groundwater – Baseline (cont'd)

- **Pipeline Corridor (Mackenzie Valley Region)**
  - Groundwater flow all year in the form of springs, seeps, especially in carbonate rocks (karst topography in south of study area)
  - Features include icings and open water stretches along streams in winter, seepage from permeable sediments in zones of continuous permafrost

Groundwater – Key Findings

- **Effects on groundwater from:**
  - Changes to recharge or discharge patterns during construction, e.g., borrow pits
  - Flow obstruction from frost bulbs around pipeline
  - Changes in permafrost from vegetation removal
  - Subsidence, e.g., from gas extraction at Niglintgak and Taglu
- **Groundwater effects will be local and primarily induced during construction**
- **Some effects will be long-term where changes in local flow patterns occur, e.g., production area, pipeline trench, borrow pits**
- **Effects predicted to be adverse, generally low magnitude, local and long-term to far future**
- **No significant effects on groundwater**

Groundwater – Mitigation Measures

- **Installing drainage controls in areas of substantive groundwater flow during pipeline trenching**
- **Adopting hydrology and water quality mitigation measures**
- **Monitoring visual changes in locations or extent of groundwater discharge areas**
- **Monitoring environmental effects of frost bulbs along pipeline corridors**

Hydrology and Water Quality – Baseline

- **2001 - 2003; Literature surveys, aerial and ground surveys (channels, hydrometric monitoring stations, spring and winter flow conditions, water quality samples)**
- **Stream classification system: large, active or vegetated (495 watercourse crossings)**
- **Mackenzie Delta ephemeral drainages to large river channels, lakes and coastal bays of the southern Beaufort Sea**
- **Mackenzie River – largest north-flowing river in North America (4,000 km), drainage basin is 20% of Canada's land mass**

Hydrology and Water Quality – Key Findings

- **Effects from:**
  - Land disturbance during construction
  - Water withdrawal for winter road construction and camp use
  - Land settlement along pipelines
  - Flow obstruction (frost bulbs)
  - Land subsidence (gas extraction)
- **Effects on runoff amount, drainage pattern, water level and velocity predicted to be low magnitude, local and medium to long-term**
- **Some potential for high magnitude, local, but short-term effects from re-direction of groundwater or surface flow, or at watercourse crossings**
- **No significant effects on hydrology and water quality**

Hydrology and Water Quality – Mitigation Measures

- **Grading and ditching to direct runoff through silt fences, sediment traps, vegetation or berms**
- **Using a minimum setback from watercourses to reduce effects on local drainage patterns and stream flow**
- **Designing structures for thaw settlement**
- **Monitoring drainage conditions and sediment control along pipeline right-of-way**
- **Monitoring streambed conditions and bank stability at watercourse crossings**

Fish and Fish Habitat – Baseline

- **Three years of data collection at 495 watercourse crossings (aerial survey; habitat assessment; spring, fall and winter surveys)**
- **Baseline report; environmental alignment sheets**
- **More than 75% of the smaller streams along the pipeline corridor are intermittent and poor habitat for fish**
- **Mackenzie River system supports 41 species of fish (20 species harvested for food). Arctic grayling and northern pike are the most widely distributed, along with longnose sucker, slimy sculpin and lake chub.**

Fish and Fish Habitat – Key Findings

- **Effects from:**
  - Pipeline watercourse crossing construction, dredging, or constructing infrastructure facilities such as barge landings
  - Changes in water levels and water flow related to water withdrawal or the formation of frost bulbs around pipelines
  - Sediment during pipeline construction and dredging
- **Effects will range from no effect to low magnitude, local to regional in extent, with most effects not extending beyond long-term**

Fish and Fish Habitat – Key Findings (cont'd)

- **Land subsidence is the only effect predicted to last into the far future. Effects are considered to be low magnitude, local and occur gradually over time.**
- **No significant effects predicted on key indicators, i.e., fish habitat, fish health or fish abundance and distribution**

Fish and Fish Habitat – Mitigation Measures

- **Using drainage, erosion and sediment controls such as grading and ditching to direct runoff through silt fences, sediment traps, vegetation, or berms**
- **Conducting most pipeline construction activities in winter**
- **Developing and implementing management practices, contingency plans, mitigation and emergency response plans to prevent and address leaks and spills**
- **Avoiding spawning, rearing and overwintering fish habitats**
- **Prohibiting personnel from fishing while on the jobsite**
- **Monitoring water quality, subsistence and recreational fish harvesting at selected waterbodies**

Soils, Landforms and Permafrost – Baseline

- **2001 - 2003 Literature review; aerial and ground surveys (1,308 boreholes; 483 survey sites)**
- **ELC mapping input, environmental alignment sheets**
- **Mackenzie Valley**
  - Hummocky moraine, glacio-fluvial deposits, elevations range from 90 m (north) to 450 m (south)
- **Soils – Cryosols, organic soils and Gleysols**
- **Permafrost**
  - Depth ranges from >600 m in north to <10 m in south of pipeline corridor
  - Annual active layer from 0.5 to 1.5 m depth

Soils, Landforms and Permafrost – Key Findings

- **Effects from:**
  - Disturbance during construction can affect soils, cause erosion, and remove uncommon landforms
  - A changed thermal regime can cause localized settlement or frost heave along the pipeline right-of-way
- **All project effects on soils, landforms and permafrost are limited to the local study area**
- **Some moderate-magnitude effects are predicted for settlement along the pipeline right-of-way, erosion and frost heave in sensitive aeolian deposits**
- **Low-magnitude, far-future effects are predicted for patterned ground and moderate-magnitude, long-term effects for soil quality**
- **No significant affects are predicted**

Soils, Landforms and Permafrost – Mitigation Measures

- **Reducing surface disturbance through design, e.g., reducing route length, reducing facility footprints**
- **Reducing grading and levelling to that required to prepare a safe and efficient working surface**
- **Reclaiming, stabilizing and armouring slopes and banks, as necessary**
- **Monitoring effects of thaw settlement and frost heave, soil erosion, slope movement and drainage conditions at selected project sites**

Vegetation – Baseline

- Vegetation mapping (ELC); satellite imagery; aerial and ground surveys 2001 - 2003
- 1,400 survey plots over pipeline corridor; mapping at 1:30,000 scale
- Production area part of Tundra Ecological Zone
- Pipeline corridor located in North and South Taiga Plains Ecological Zones
- Rare plants and uncommon vegetation communities associated with features such as lakeshores and springs
- Traditionally, uses of plants include food, medicine or ceremonies

Vegetation – Key Findings

- **Effects on vegetation types, uncommon communities and rare plants from:**
  - Clearing and grading
  - Dust and air emissions
- **Vegetation abundance and distribution:**
  - Local loss and alteration of vegetation, changes in site conditions
  - Low magnitude effect but duration will extend to far future
  - Self-sustaining native plant communities on reclaimed sites within the long term
  - Losses of rare plants will have a beyond regional effect

Vegetation – Key Findings (cont'd)

- **Vegetation Health**
  - Combined project effects of dust and air emissions on vegetation health are not significant
  - Effects will be long-term near all-weather roads during construction and operations

Vegetation – Mitigation Measures

- **Reducing surface disturbance through engineering design, e.g., reducing route length, reducing facility footprints**
- **Controlling weeds to prevent weedy species invasion**
- **Reclaiming sites at completion of their use**
- **Monitoring vegetation composition and cover, vegetation health and vigour, and presence of weeds at selected sites**
- **Survey of site-specific vegetation to be completed once infrastructure sites have been determined**

Wildlife – Baseline

- **2002 - 2004 – Aerial surveys and ground surveys**
- **Ungulate (especially caribou), furbearers, bird species, baseline, habitat modelling, analysis**
- **Diverse wildlife habitat supporting over 66 species of terrestrial mammals, 235 species of birds, seven species of amphibians and two species of reptiles**
- **Mammal Valued Components, e.g., barren-ground caribou, grizzly bear, wolverine, gray wolf, muskrat, snowshoe hare**
- **Bird Valued Components, e.g., waterfowl, hawks and eagles, shorebirds, and songbirds**
- **Outer delta is an important area for migratory waterfowl, e.g., Kendall Island Bird Sanctuary**

Wildlife – Key Findings

- **Effects from:**
  - Direct habitat loss from construction, or sensory disturbance
  - Barriers to wildlife movement, such as trenches or pipelines
  - Increased mortality from human-wildlife conflicts and increased access along roads or pipeline rights-of-way
- **Habitat Availability**
  - Magnitude of effects will be low, with sensory disturbance an important factor. Revegetation, particularly lichen, will mean some far-future effects.
- **Wildlife Movement**
  - Low-magnitude effects on wildlife movement, but moderate-magnitude effects on barren-ground and woodland caribou during construction

Wildlife – Key Findings (cont'd)

- **Wildlife Mortality**
  - Moderate level of effects on the grizzly bear because of attraction to camps
  - Increased access could result in moderate-magnitude effects on moose
- **No significant effects on habitat availability, wildlife movement or mortality predicted**

Wildlife – Mitigation Measures

- **Managing access in cooperation with communities and regulatory agencies**
- **Controlling pipeline right-of-way vehicle use and barriers to wildlife movement**
- **Preventing harvesting, harassment and feeding of wildlife**
- **Reducing the pipeline footprint and related vegetation clearing**
- **Scheduling work activities to avoid sensitive life-cycle stages, where feasible**
- **Developing reclamation plans to re-establish wildlife habitat**
- **Managing waste effectively to avoid attracting wildlife**

Biodiversity assessed at landscape, vegetation community and species level

Key Issues:

- Ecosystem and habitat loss
- Habitat fragmentation and barriers to movement
- Habitat and species recovery
- Edge effects
- Species distribution
- Invasive and non-native species

Results:

- Landscape
  - habitat losses at local scale not expected to affect regional biodiversity

Results (cont'd):

- loss of uncommon landforms, e.g., eskers may have local effects
- project design, mitigation and management expected to limit effects to local, or occasionally regional, scale

- Vegetation community
  - less than 5% of any one vegetation type will be affected by the project
  - effects on vegetation health are not significant
  - edge effects vary with species response; reclamation will limit effects to local scale
- Species
  - individual species affected, but not populations

Climate Change – Modelling Results

Assessment considered:

- Potential climate change in local and regional study areas over the life of the project
- Revisions to the assessment because of predictions about climate change
  - actual emissions and project contributions
  - cumulative effects
  - priority issues

Methodology:

- Literature review, climate modelling (global climate models: 29 simulations run), focus on temperature and precipitation change over 30 year period

Climate Change – Modelling Results (cont'd)

Results:

- Natural variability over last 30 years of 3 to 6°C
- Trends suggest gradual warming
- Modelling shows an increase of up to 2.5°C and 11.8% increase in precipitation from 2010 to 2039
- Warming is greater in northern regions

Climate Change – Potential Effects on Baseline Condition

Uncertainty:

- Complex, interactive, dynamic systems
- Difference between natural and anthropogenic influence difficult to discern
- Environmental response may take a long time
- Natural system adaptation to change

Groundwater and Hydrology:

- Changes in permafrost distribution, depth of active layer, open water season, surface flow patterns, sea level change

Fish and Fish Habitat:

- Earlier spring break up, later freeze-up, change in fish species distribution and abundance
- Onset of spawning, life-cycle timing changes

Soils, Landforms and Permafrost:

- Surface water ponding, ground settlement, thawing in peat bogs, changes in thaw depth beneath the pipeline

Vegetation – Northward extension of treeline (minor):

- Changes in plant phenology (flowering and fruiting)
- Seed germination, seedling survival
- Changes in forest fires, insect distribution, forest diseases

Wildlife:

- Change in distribution, abundance of species
- Changes in snow cover and temperature affect wildlife movement, predation patterns
- Habitat distribution changes

Conclusions:

- Predictive modelling shows temperature and precipitation change within normal range of natural variability
- Rate of change in the next 30 years likely to be similar to the last 30 years
- Unlikely effects of climate change over the life of the Mackenzie Gas Project will change baseline conditions that in turn would change conclusions of the assessment of potential effects

Cumulative Effects – Approach and Components

Scoping	Define study areas, terminology and identify Valued Components or Key Indicators
Analysis	Describe and quantify existing land uses (mapping and analysis)
	Identify incremental project-specific effects
	Assess effects of reasonably foreseeable (public disclosed) projects
	Assess effects of hypothetical (possible future) projects
Mitigation	Project design, Environmental Management Plans, community involvement, regional planning
Significance	Effects on Valued Components
Follow-up	Monitoring, Feedback, Regional Management Frameworks

Cumulative Effects – Summary of Results

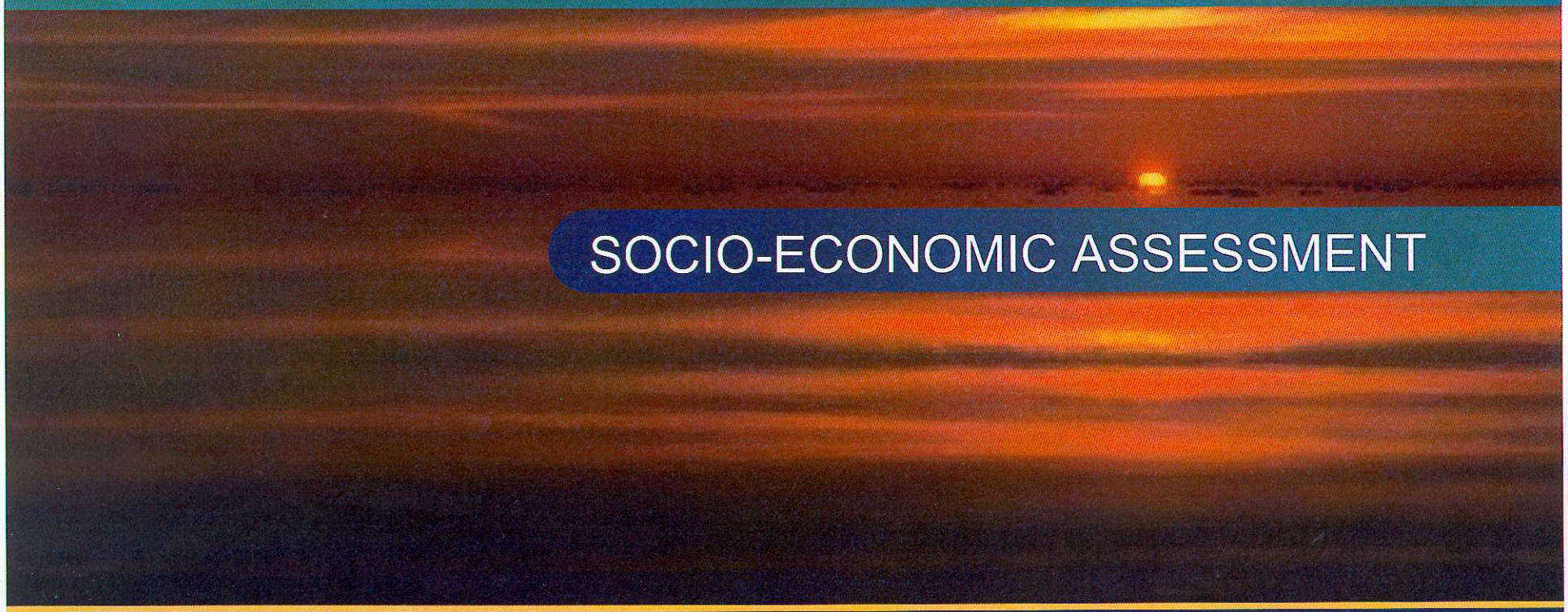
- **Mackenzie Gas Project does not contribute significant cumulative effects**
- **The project footprint will disturb a negligible proportion of the regional study area (0.11%)**
- **Project contributes to one potential cumulative effect of management concern: direct grizzly bear mortality, to be addressed through monitoring and management by responsible parties**
- **Project might encourage other development, particularly gas exploration and production in the Northwest Territories; however, information on future projects is currently not available**

Environmental Effects on the Project

Environmental Factors	Northern Design Considerations	Environmental Management Plans	Monitoring
Terrain Stability	• Northern Latitude	• Construction and Operations Procedures	• Construction and Operations Monitoring Programs
Hydrologic Processes	• Climate		
Weather	• Permafrost		
Forest Fires	• Remoteness		
Specific Flora and Fauna	• Limited Infrastructure		
Human Use and Values	• Traditional Cultures and Land Uses		

ENVIRONMENTAL IMPACT STATEMENT

for the Mackenzie Gas Project



SOCIO-ECONOMIC ASSESSMENT

Esso Imperial Oil | APG | ConocoPhillips | Shell Canada | ExxonMobil

The SEIA predicts there will be:

- Low to high magnitude adverse effects but short-term and not significant
- Positive effects on NWT employment and personal income during construction and operations
  - Significant to construction
- Positive effects on the economies of the communities and the regions affected by the project, the NWT, and Canada
  - Significant to regions and NWT

SEIA: Presentation Topics

Data, Methods, Assumptions

The Economy

- Procurement, employment, income
- National economic effects
- Demography
- Governance

Infrastructure and Community Services

- Transportation
- Housing

Individual, Family, and Community Wellness

- Community well-being and social services
- Health conditions and services
- Public Safety and protection
- Education

Traditional Culture

- Traditional harvesting and land use
- Traditional culture and language

Non-Traditional Land and Resource Use

- Land uses
- Protected areas

Heritage Resources

- Baseline studies
- Regional assessment

SEIA Monitoring Plan

Data and Methods

- Economic Modeling
  - Quantitative economic data
- Social Analysis
  - Quantitative and qualitative economic and social data
- Participative Assessment Process
  - Public input in the collection and verification of social science data
- Community Focused Public Participation
  - Input from stakeholders through public participation program during assessment process

Assumptions

- Many potential effects will be the result of how individuals, groups, and communities choose to respond to the project and its other effects
- The identification of and importance attached to potential effects will vary among stakeholders (individuals, groups, communities, etc.), and over time and depend upon attitudes, beliefs, perceptions and experiences
- The sources of data used, and the methods to select, collect, analyze and validate this data reflect these assumptions

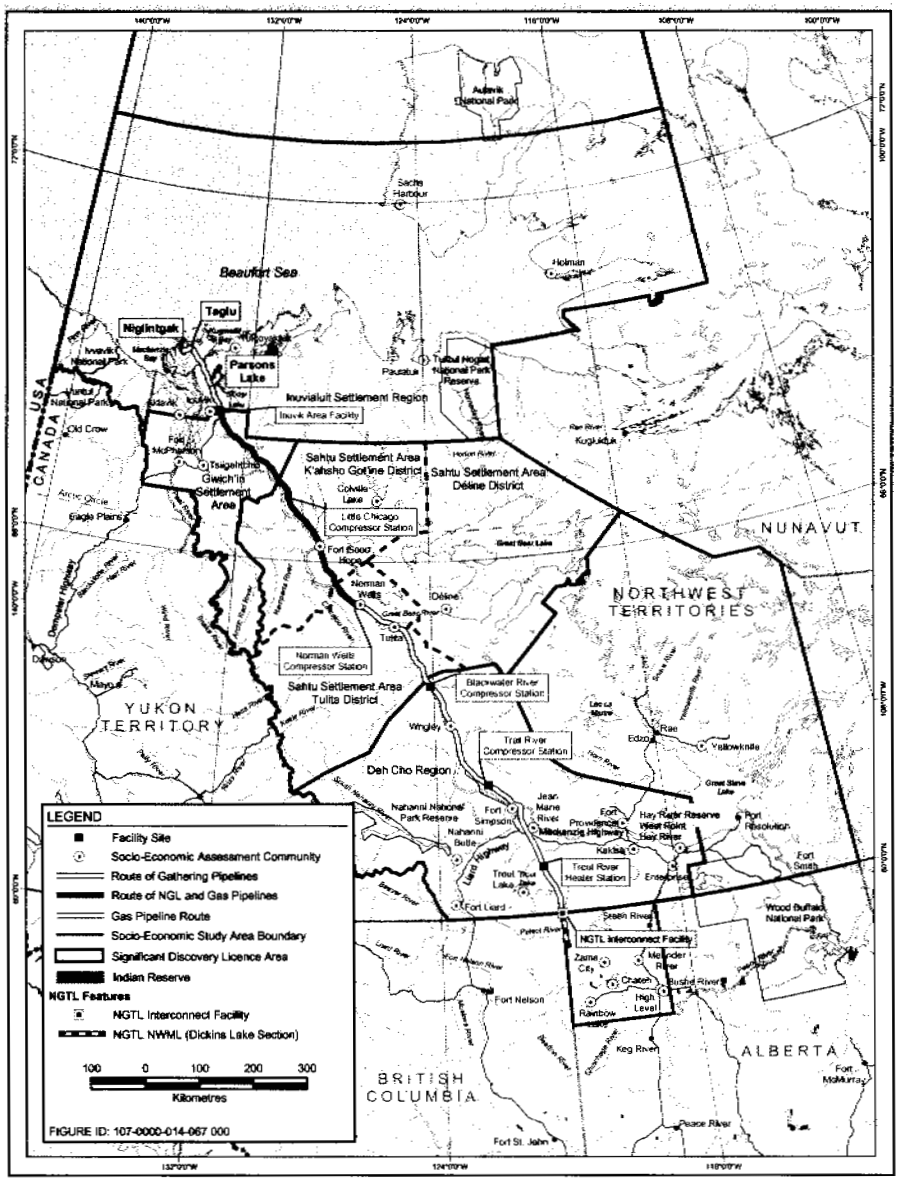
SEIA: Assessment Activities

- **Documented pre-project baseline conditions using quantitative and qualitative data**
- **Validated and updated existing data and sources with input from stakeholders**
- **Developed key questions, determined effects pathways and assessed effects attributes**
- **Conducted economic modelling using standard models**
- **Forecasted the project-specific effects (which, by nature are combined effects)**
- **Obtained community input to issues scoping, assessment and mitigation planning**
- **Assessed the cumulative effects in combination with other large-scale developments**

SEIA: Study Area

Study Areas

- **Inuvialuit Settlement Region**
- **Gwich'in Settlement Area**
- **Sahtu Settlement Area**
- **Deh Cho Region**
- **Industrial and Commercial Centres**
  - Hay River
  - Yellowknife
- **Northwest Alberta**



SEIA: Study Area Map - EIS Volume 1, Figure 2-5

Shared Responsibility for Effects Management

Baseline:

- Labour supply and businesses in the NWT currently have significant capacity limitations relative to project demands

Key Findings:

- Project construction will generate a large demand for qualified labour and suppliers of goods and services from the NWT and elsewhere in Canada

Key Findings – Construction:

- Investment (constant 2003 Canadian $):
  - $7.7 billion in total
  - $6.2 billion construction (mid 2006 to mid 2010)
  - $900 million in NWT
- Construction Labour Demands (annual average):

Total Demand		**Filled from NWT**	
Direct	5,000	Direct	800
Indirect	15,000	Indirect	500
Induced	8,500	Induced	200
Total	**28,500**	**Total**	**1,500**

- Labour Income (2006 – 2010):
  - $4.7 billion in total
  - $300 million to NWT residents

Key Findings – Operations (2010 - 2030):

- Labour Demands (annual average):

Total Demand		**Filled from NWT**	
Direct	*190	Direct	185
Indirect	630	Indirect	225
Induced	360	Induced	90
Total	**1,180**	**Total**	**500**

***includes future investment activities at Taglu and Parsons Lake**

- Labour Income (annual average):
  - $59 million in total
  - $28 million to NWT residents

Management Measures:

- Management measures include plans to maximize the use of northern capacity:
  - Procurement Plan to enhance participation by northern businesses
  - Education and training for employment to enable more northerners to qualify for project jobs
  - Employment policies and programs to enhance employment of northerners
- All plans require cooperative effort among the project, the business community and educators

Key Findings:

- The project will provide large tax revenues to various governments:

	Construction (2006 – 2010)	**Operations (Annual Average 2010 - 2030)**
NWT	$55 million	$122 million
Alberta	$378 million	$3 million
Canada	$1,900 million	$286 million

- Gross tax revenues of the federal, Alberta and NWT governments will increase substantially
- The current formula financing grant to the GNWT would reduce GNWT tax revenues to 18% of the above
  - $10 million during construction
  - $22 million/year during operations

Key Findings (cont'd):

- The project will create large contributions to the gross domestic product (GDP) of Canada, Alberta and the NWT:

	Construction (2006 - 2010)	Operations (Annual Average 2010 - 2030)
NWT	$1.0 billion	$758 million
Alberta	$3.7 billion	$20 million
Canada	$7.1 billion	$819 million

The Economy: Demography

Baseline:

- Communities are generally growing, but at a decreasing rate, as birth rates decline

Findings:

- The project will attract some migrants to regional centres during construction

Mitigation:

- Project hiring policies will discourage southern job-seekers from coming north
- Hiring offices for northerners in their home communities will discourage migration to regional centres

Key Findings and Observations:

- Aboriginal groups have political authority but lack financial independence
- Northern financial options are limited but will change because of devolution, self government and project activities
- Funds are required to prepare for the project
- The project will produce substantial tax revenue but not until the Operations Phase

Management Measures:

- Shared responsibility and timely funding is needed to manage project-related effects
  - Funding agreements among governments prior to construction

Baseline:

- NWT communities are reasonably accessible:
  - by air and highway or winter road
  - by barge on the Mackenzie River or Beaufort Sea
  - by rail to Hay River

Key Findings:

- High project demands on all transportation modes during construction
- Existing community demands must be met

Management Measures:

- Timely, coordinated and collaborative planning, financing, agreements by GNWT transportation, service providers, affected communities and the project

Baseline:

- All communities are self-sufficient in infrastructure and utilities:
  - Telephones, satellite TV and Internet service, treated water supply, electricity, heating fuel, solid and liquid waste disposal

Key Findings:

- Community infrastructure, energy supply and utilities will not be adversely affected by the project

Management Measures:

- All isolated camps will be self contained in terms of energy and utilities and all waste handling
- Camps located near communities might negotiate agreements for use of community infrastructure, energy and utilities

Individual, Family and Community Wellness

Refers to:

- Community well-being and social services
- Health conditions, and health care services
- Protection and policing services
- Education attainment and services

Key Findings:

- The project will not create new social problems
- Project effects will be additive to existing social problem conditions

Baseline:

- Many study area communities have substance abuse and other well-being problems
- Social services in some communities are currently overburdened

Key Findings:

- Project activities will increase the income of many NWT residents
- Individual choices about spending of increased income will enhance or reduce the quality of life of the income earners, their families and their communities
- The demand for social services in many communities will increase

Management Measures:

- Mitigation measures support good choices and address the consequences of poor choices
- Implementation of the management measures must be shared by the project, the GNWT, and local communities
- Examples:
  - The project will provide substance abuse counselling, provide money management programs, and initiate a program such that workers can choose to assign part of their wages to a savings account
  - Communities could enact a bylaw that limits the amount of alcohol that can be purchased or imported per trip
  - The territorial government could provide lifestyle training in communities and ensure that all community wellness centres in the study area are adequately staffed

Baseline:

- Substance abuse is the greatest health problem
- Nurses are overworked and replacement staffing is often difficult
- Regional hospitals and community health centres have limited resources

Regional Findings:

- Community residents spending large incomes will add to existing problems
- A large construction workforce working in isolated locations in extreme temperatures presents health and safety challenges

Management Measures:

- Impact on existing health services will be addressed by medical personnel in the camps following policies developed with GNWT Public Health and the regional health authorities
- Mitigation measures for social service effects also address increased demand on health care services by community residents

Baseline:

- Current police services are overworked:
  - 80 to 90% of workload is related to substance abuse

Key Findings:

- The project will increase the workload during construction:
  - Increased alcohol abuse and related family and community problems
  - Project camp and transportation activities

Management Measures:

- Effects can be managed by:
  - Effective camp policies and security
  - Coordination between camps and RCMP
  - Increase in police staffing in selected locations

The NWT has a well-developed education system, with:

- low attainment of high school graduation

The project will affect educational attainment through:

- greater demand for educational upgrading and additional training courses
- elevated dropout levels

Effects can be managed with a planning strategy involving the project proponents, GNWT, educators, communities, Aboriginal organizations and industry

- Examples include Pipeline Operations Technical Committee, Aboriginal Skills Enhancement Program, Stay-in-School message

Traditional Harvesting

Baseline:

- Harvesting is widespread and important in Aboriginal communities

Key Findings:

- Effects during construction will be:
  - Income to purchase better equipment and supplies
  - Less time for traditional harvesting

Management Measures:

- Potential adverse effects will be addressed by the project through:
  - Providing flexible work schedules where practical to accommodate traditional harvesting
  - Supporting community-based traditional lifestyle initiatives

Traditional Language and Culture

Baseline:

- Traditional culture is essential to the identity of Aboriginal people

Key Findings:

- The project is predicted to have very little effect on traditional language and culture

Management Measures:

- The project will support traditional language and culture through:
  - Cultural awareness training for all workers
  - Periodically serving country foods in camps
  - Providing access to Aboriginal language media and materials
  - Enabling the sale of Aboriginal art and crafts in camps

Non-Traditional Land and Resource Use

Baseline:

- Non-traditional use of land is slowly increasing in the NWT

Key Findings:

- Little or no project effects on non-traditional land and resource use are predicted

Management Measures:

- Effects will be managed by:
  - Obtaining all necessary land and access permits
  - Using access management techniques
  - Providing compensation for granular resources
  - Prohibiting hunting and fishing by workers while on site
  - Salvaging timber

Key Findings:

- Low to moderate effects are expected in terms of:
  - Loss of available land base within protected areas
  - Disturbance to land and marine protected areas

Management Measures:

- These effects will be addressed through:
  - Various access management techniques
  - Optimized timing of any disturbance
  - Consultation with affected parties

Heritage Resources

- The project will increase knowledge of heritage resource sites
- Two years of project-focused field reconnaissance studies have resulted in identification of areas with low, medium and high potential for heritage resources
  - Influenced geotechnical investigations
  - Will focus future work on high potential areas
- Project will complete a thorough heritage resource impact assessment that meets regulatory requirements as final route and site selections are made
- Appropriate mitigation measures will be implemented based on impact assessment
  - Collection, excavation, avoidance

Cumulative Effects Assessment

- Same methods used as for biophysical CEA
- One potential socio-economic cumulative effect of management concern: competition for qualified northern goods, services and labour

Mitigation:

- Diligent monitoring and adaptive management by responsible parties

SEIA Monitoring Plan

Objectives:

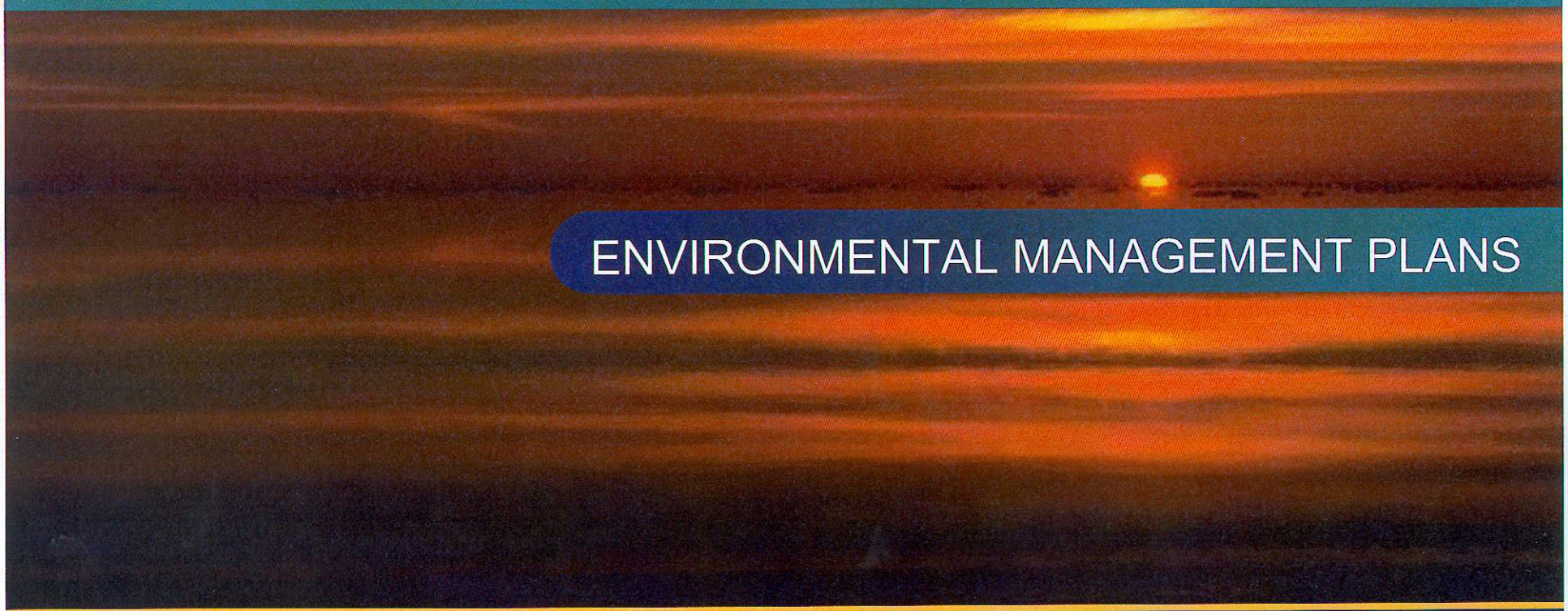
- To verify accuracy and completeness of identified effects
- To determine effectiveness of mitigation
- To enable adaptive management as necessary

Activities:

- Focus on project construction phase
- Use participative process involving regional working committees (project and management agencies)
- Use selected effects indicator data with direct causal linkages to project activities, and for which there is baseline data available

ENVIRONMENTAL IMPACT STATEMENT

for the Mackenzie Gas Project



ENVIRONMENTAL MANAGEMENT PLANS

Esso Imperial Oil | APG | ConocoPhillips | Shell Canada | ExxonMobil

Environmental Management Plans

Scope

- Environmental management encompasses systems, plans and programs which ensure that environmental mitigative options are taken into account during all phases of project design and construction planning
- Environmental management systems will be put in place by each of the project proponents, and will:
  - be based on the proponents' policies and principles
  - use experience of existing operational systems examples, including Imperial Oil's Operations Integrity Management Systems and ISO 14000
  - build an appropriate safety, health and environmental organization
- Environmental management plans discussed in this volume are broad and conceptual to support the findings in the EIS

Scope (cont'd)

- As the project advances into detailed engineering design and detailed pre-construction planning, these plans will be revised and updated to meet:
  - needs of the proponents and their contractors on an operational basis
  - requirements and conditions attached to approvals and permits
  - expectations of the public and northern communities
- Although these plans are focused on construction and drilling activities, all of the environmental management plans will be updated for the Operations Phase

Environmental Design and Planning Considerations

- These considerations provide early guidance during preliminary engineering and pre-construction planning, to avoid or reduce potential adverse impacts and enhance positive features of the project
- They are intended to:
  - comply with applicable regulatory requirements
  - incorporate industry standard practices
  - respond to community inputs
- Appropriate federal, territorial, regional and provincial regulations, and industrial associations' standards and codes that were applied to this project are listed

Environmental Design and Planning Considerations (cont'd)

- Where a specific standard was needed for the NWT and did not exist under federal or territorial legislation, an applicable Alberta standard was selected as the basis for project design
- General design and planning considerations are identified for each of the major EIS biophysical disciplines

Environmental Management Plans (EMPs):

- Address project-wide issues associated with all pipelines, anchor fields and associated infrastructures
- Are based on current best management practices (i.e., a practice or combination of practices that will be implemented by a proponent and considered to be an effective and practical means of planning, constructing, operating and decommissioning the project)
- Address areas of particular concern coming from northern consultations
- Meet regulatory requirements and the proponents' policies and principles

Environmental Management Plans (cont'd)

EMPs have been developed for:

- Emissions
- Water
- Waste
- Hazardous materials
- Transportation and logistics
- Wildlife
- Reclamation
- Operations

Emissions Management

- Includes air quality and noise guidelines, equipment design and operations, and unforeseen events

Water Management

- Includes water supply and demand, water quality requirements, and water withdrawal, treatment and disposal

Waste Management

- Takes an integrated approach, including identification and classification, waste types, sources and quantities, handling, storage, transportation, reduction, treatment, disposal, tracking and documentation

Hazardous Materials Management

- Follows a similar integrated approach as for waste, with further emphasis on training, safety and regulatory requirements

Transportation and Logistics Management

- Provides guidelines for day-to-day movement of project personnel and materials by land, water and air

Wildlife Management

- A specific commitment is made under this plan to develop worst case scenarios for the purpose of wildlife compensation under the Inuvialuit Final Agreement

Reclamation Management

- Includes general strategies for reclamation of terrain and vegetation ground cover

Operations Management

- Provides guiding principles which will be applied to operations and to decommissioning and abandonment

Environmental Protection Plan

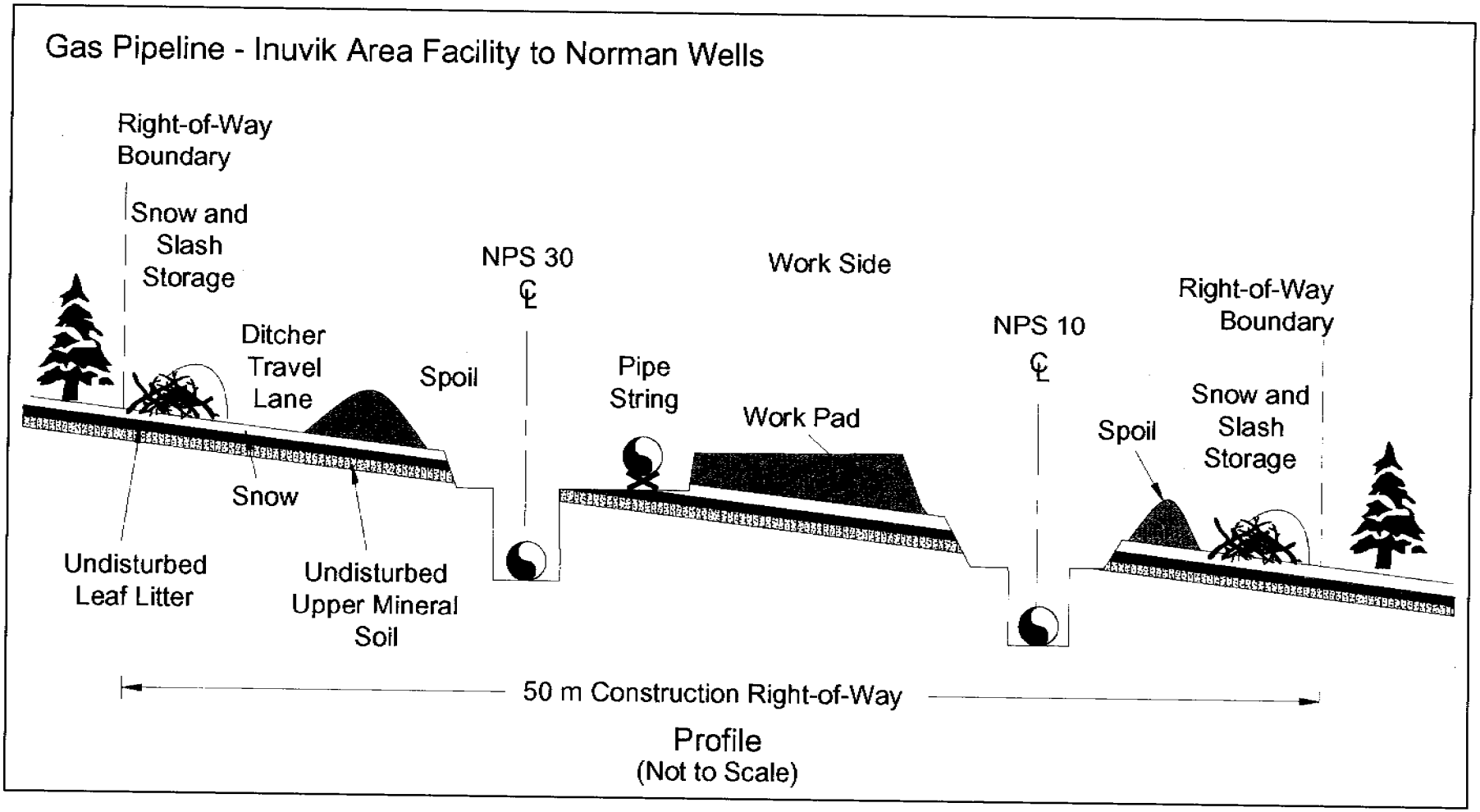
- Provides more detailed directions, methods and measures for protection
- Based on practical and proven experience in the industry (e.g., Canadian Pipeline Watercourse Crossing Committee)
- Focuses on construction and drilling activities, and on immediate post-construction reclamation and remediation of sites no longer required during operations
- Designed to provide special attention to environmental and cultural resources
- Identifies:
  - general protection measures that have a wide applicability
  - sensitive periods for fish in critical watercourse crossings

Environmental Protection Plan (cont'd)

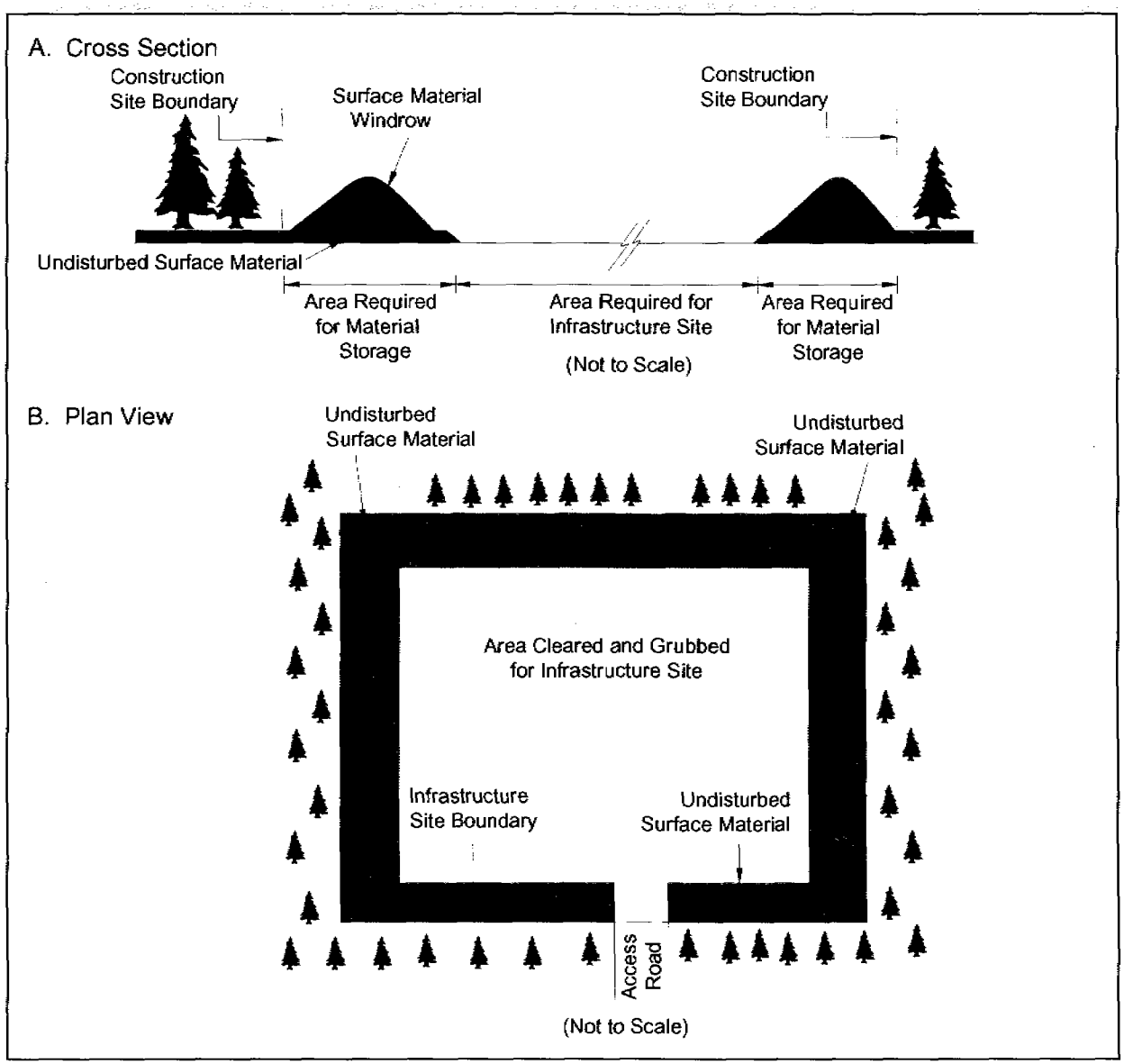
- watercourse crossing options
- specific wildlife mitigation measures (e.g., ROW breaks at known wildlife trails)
- heritage resources mitigation
- waste handling
- right-of-way and facility site preparation (e.g., levelling and grading)
- rare and endangered plant mitigation (e.g., narrowing down of the ROW at certain locations)
- construction activities mitigation (e.g., installation of trench breakers)
- procedures for hydrostatic testing of pipeline integrity
- cleanup and reclamation (e.g., seed application)

Plan to avoid side slopes > 2° site specific mitigation where unavoidable

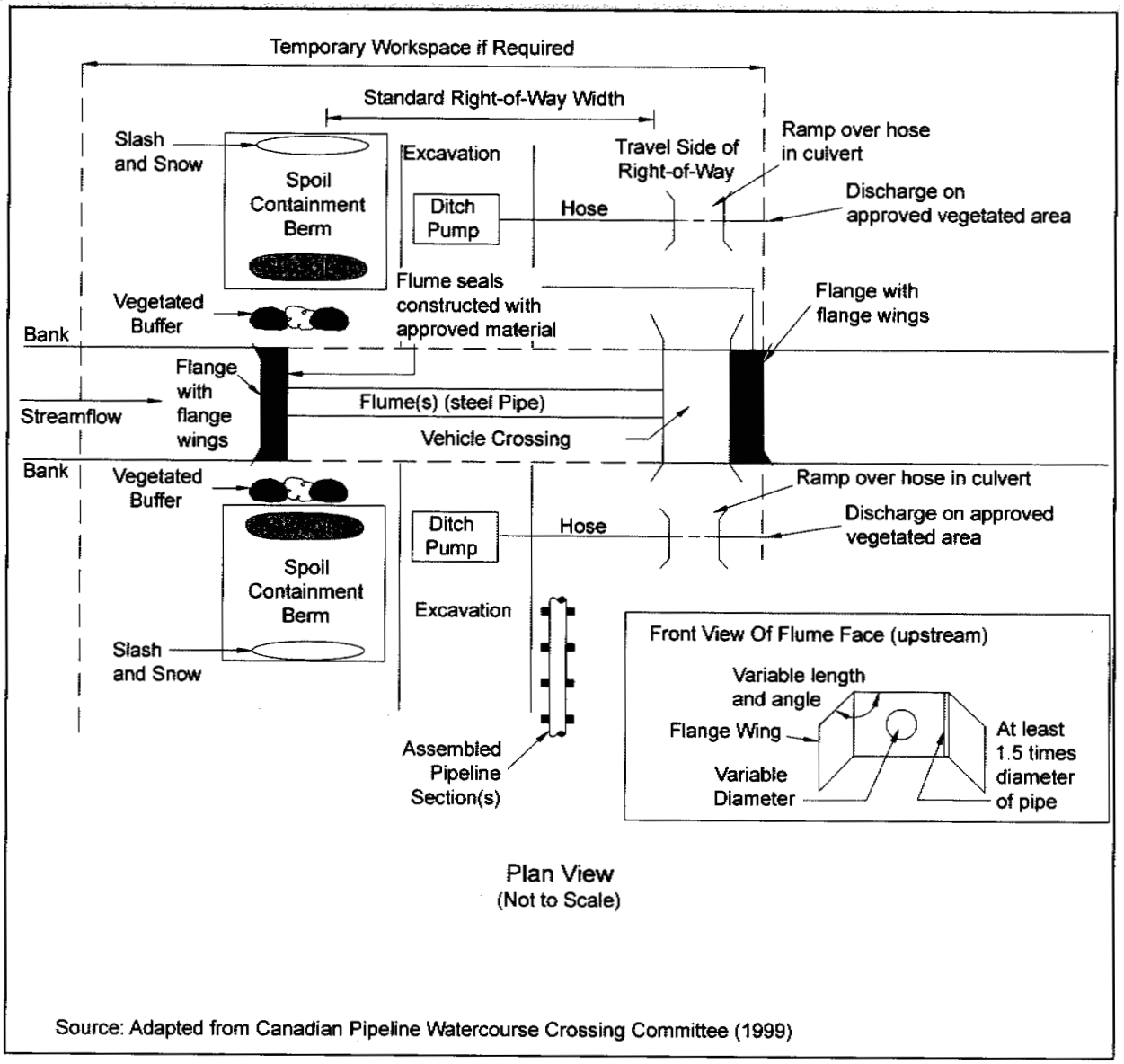
Conceptual Cross Slope Right-of-Way Configuration for Two Pipelines



Conceptual Surface Preparation at Infrastructure Sites

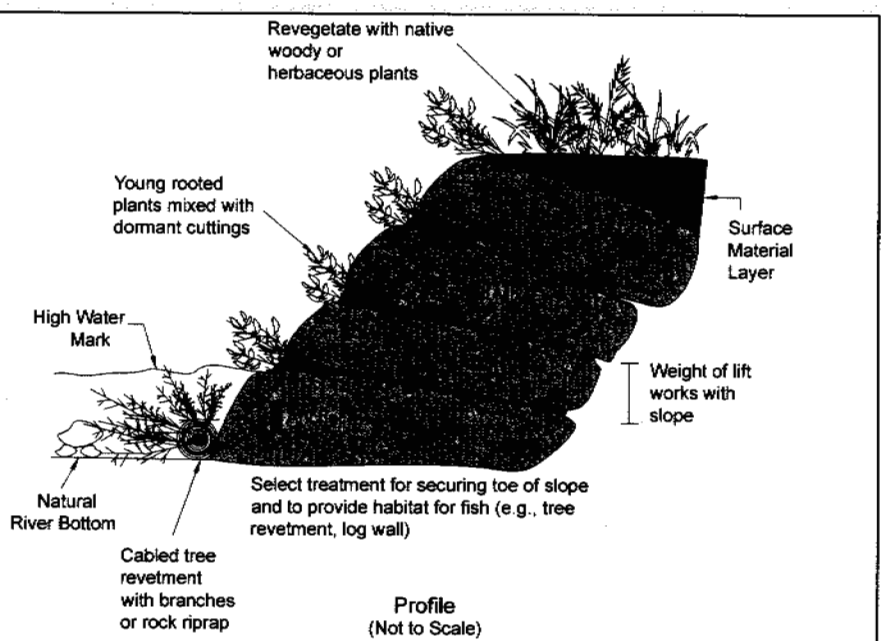


Conceptual Isolated Crossing – Flume



Source: Adapted from Canadian Pipeline Watercourse Crossing Committee (1999)

Conceptual Brush Layering



Source: Adapted from Canadian Pipeline Watercourse Crossing Committee (1999)

Contingency Plans

- Describe procedures to be implemented if unforeseen events occur that could have adverse impacts
- Focus on construction and drilling, but some plans will be applicable to operations and updated accordingly
- Address areas of concern coming from northern consultations
- Meet regulatory requirements
- Each plan identifies:
  - Initial response actions that might be undertaken, depending on the specific situation
  - Specific mitigation options
  - Communications procedures (e.g., callout and notifications)

Contingency Plans (cont'd)

- Functional contingency plans with a higher level of detail (e.g., names, roles and responsibilities, telephone numbers) will be in place for all types and locations of unforeseen events, such as:
  - Spills and uncontrolled releases during transportation, storage, vehicle fueling, well control
  - Wildfires caused by the project or in the project vicinity
  - Discovery of unknown heritage resources
  - Discovery of unknown rare or endangered species in project vicinity
  - Warm or wet conditions caused by extreme weather
  - Unexpected erosion of soils by sudden rainfall or flood
  - Higher than expected siltation of a watercourse during construction
  - Unexpected release of drilling mud into a fracture or surface spill during HDD operations

Environmental Compliance Monitoring Plan

- Compliance monitoring will ensure all applicable regulations and permit conditions are met
- Compliance is accomplished through:
  - Proponents' environmental inspector and environmental auditor functions in the field
  - Cultural and environmental training of all onsite personnel
  - Regular environmental reporting to regulators and proponents' senior management
- Environmental inspectors will be present at pipeline spreads and facilities sites during construction, to:
  - Ensure mitigation measures are adhered to
  - Ensure all permit conditions are strictly met
  - Ensure that the proponents' environmental policies and commitments are met

Environmental Compliance Monitoring Plan (cont'd)

- Maintain regular contact with relevant government agencies
- Work with environmental monitors and resource specialists, as required
- Provide immediate onsite environmental advice, as requested
- Work with onsite personnel about a course of action if an unforeseen event occurs
- Suspend work if necessary, in consultation with the chief inspector

- Environmental auditors will periodically assess compliance and inspection procedures at all construction sites
- In their role, the environmental auditors will report directly to the Project Manager and will be independent of the environmental inspectors

Environmental Effects Monitoring Plan

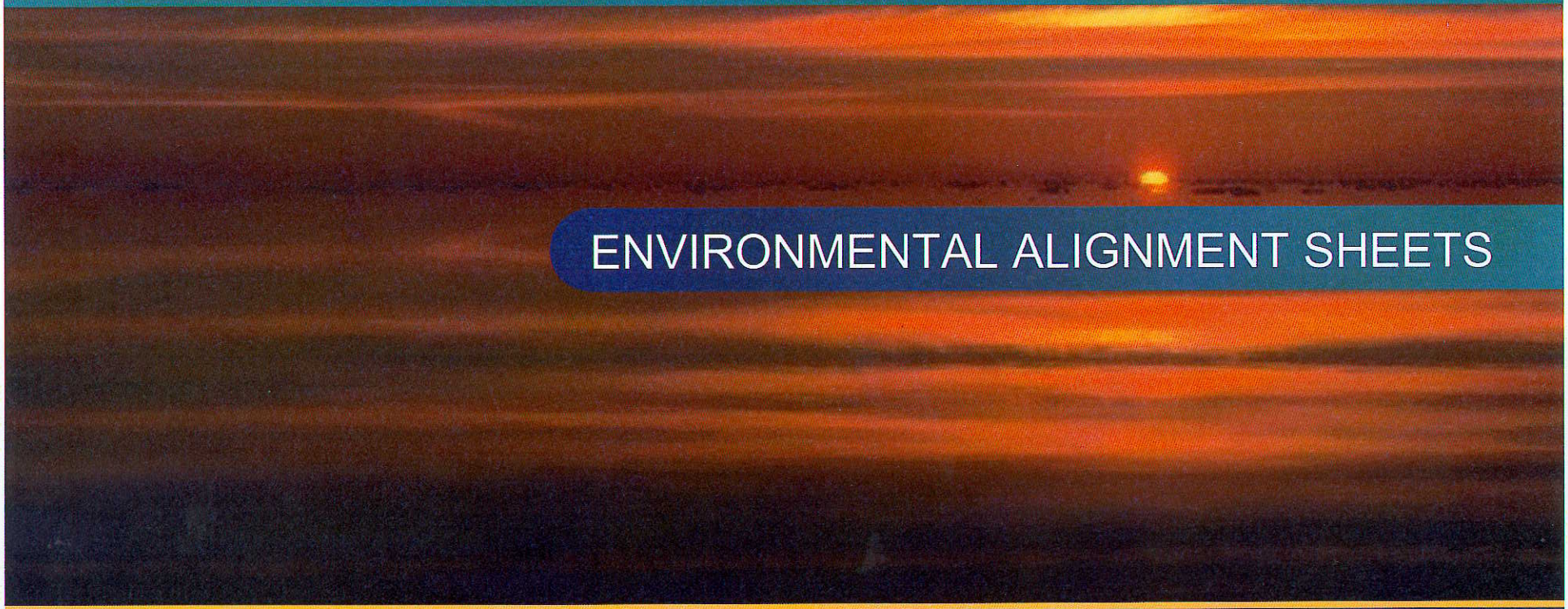
- Environmental effects monitoring will be implemented by the proponents in consultation with local communities and regulators to:
  - Confirm the effectiveness of applied mitigative measures
  - Continuously improve protection measures through regular feedback to the proponent and their contractors
  - Verify the accuracy of impact predictions
  - Identify any new effects not predicted
  - Respond to community concerns expressed by environmental monitors
  - Identify long term trends or changes and their significance

Environmental Effects Monitoring Plan (cont'd)

- Environmental monitors will be put in place through the Construction Phase by agreements between the proponents and local communities. The monitors' role will be to:
  - Monitor specific activities or sites of particular interest or concern to the community
  - Report their observations back to the community leaders and the proponents
- The proponents will collaborate, as appropriate, with other industry and government-sponsored monitoring programs occurring in the Mackenzie Delta and Mackenzie Valley during the Operations Phase of the project

ENVIRONMENTAL IMPACT STATEMENT

for the Mackenzie Gas Project



ENVIRONMENTAL ALIGNMENT SHEETS

Imperial Oil | APG | ConocoPhillips | Shell Canada | ExxonMobil

Environmental Alignment Sheets

Purpose

- Environmental alignment sheets (EAS) have been prepared to meet NEB guidelines
- Alignment sheets are a tool to review environmental effects and management plans
- Before construction begins, a set of construction alignment sheets (CAS) will be prepared. They will take into account the EAS and include more site-specific environmental data and mitigation measures.

Environmental Alignment Sheets

Scope

- EAS are prepared for each of the:
  - Gathering pipelines
  - NGL pipeline
  - Gas pipeline
  - NGTL Northwest Mainline (Dickins Lake Section) in NW Alberta
- EAS in the NWT are presented north to south, and in Alberta, south to north
- A preferred 1-km-wide corridor for the pipelines and associated facilities has been applied for. A preliminary pipeline route has been identified within the corridor in the EAS.
- The environmental information is given in data bands

Environmental Alignment Sheets

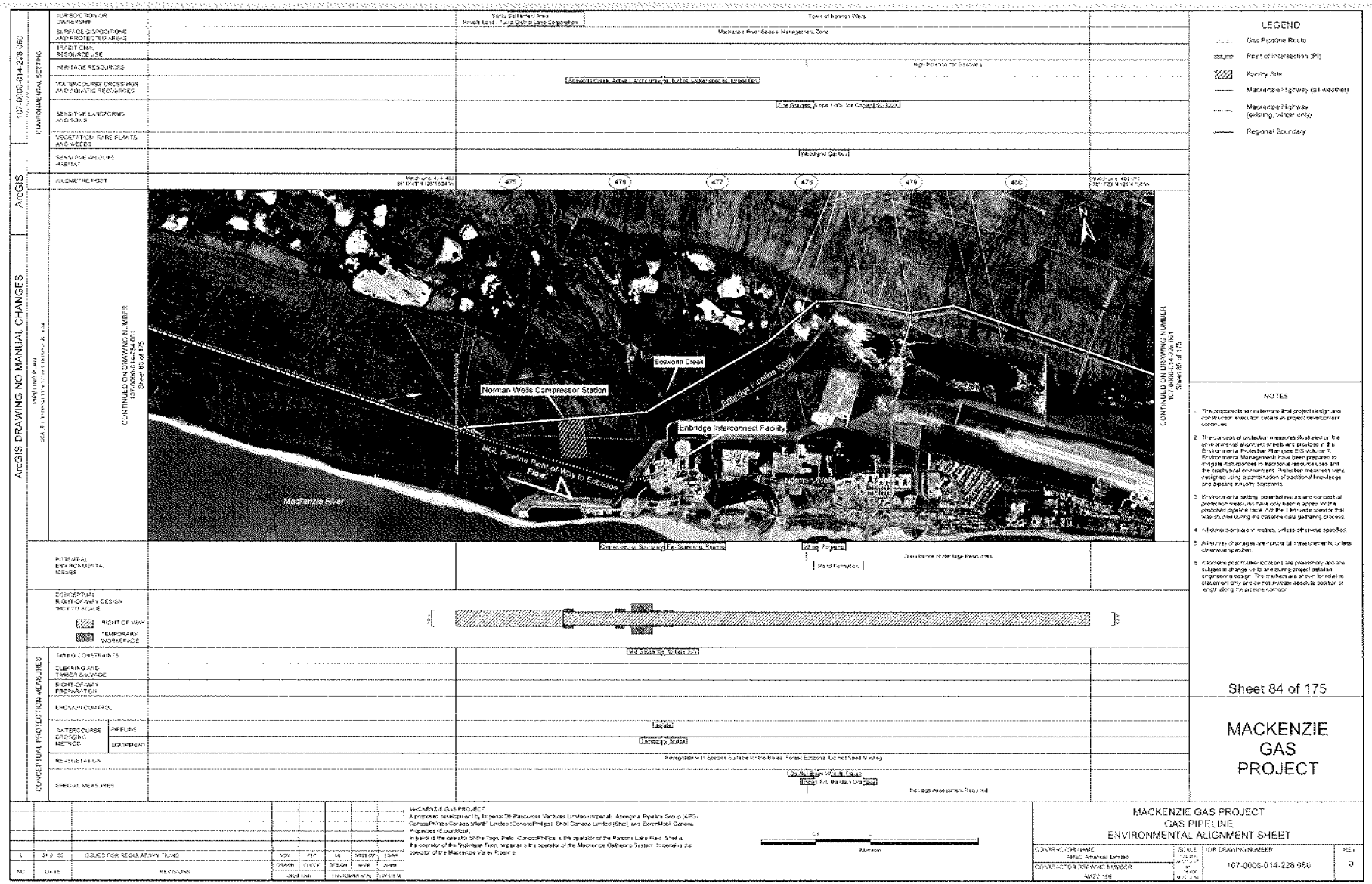
Content

- EAS are designed to show a large amount of information about the pipeline corridors
- An introduction guides the reader through simplified examples of each sheet's features
- Each EAS consists of a photomosaic and data bands
- The photomosaics were assembled from orthophotographs produced from 1:30,000-scale aerial photographs obtained over a four-year period ending in 2003

Content (cont'd)

- Data bands describe five main subject areas:
  - Environmental setting
  - Kilometre post (KP)
  - Potential environmental issues
  - Conceptual right-of-way design and extra workspace
  - Possible protection measures
  - Most data bands only show more susceptible or critical features

Environmental Alignment Sheets



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