

Application for Approval of the
Development Plan for

Parsons Lake Field

Project Description

Submitted to:
National Energy Board

Submitted by:
ConocoPhillips and ExxonMobil

August 2004



PREFACE

APPLICATION FOR APPROVAL OF
THE DEVELOPMENT PLAN FOR
PARSONS LAKE FIELD
PROJECT DESCRIPTION

EXECUTIVE SUMMARY

P.1.1 PURPOSE OF THIS PLAN

ConocoPhillips Canada (North) Limited (ConocoPhillips), a wholly owned indirect subsidiary of ConocoPhillips Canada Limited, and ExxonMobil Canada Properties (ExxonMobil) propose to develop natural gas and natural gas liquids (NGLs) from Significant Discovery Licences SDL 32 and SDL 30 (the Parsons Lake field). The Parsons Lake field is located at Parsons Lake in the Northwest Territories, about midway between Inuvik and Tuktoyaktuk. ConocoPhillips, the field operator, holds 75% of the Parsons Lake field and ExxonMobil holds 25%. ConocoPhillips, on behalf of itself and ExxonMobil, is submitting this development plan for the Parsons Lake field to the National Energy Board (NEB) for approval under the *Canada Oil and Gas Operations Act* (COGOA).

P.1.2 EXPLORATION HISTORY

The proponents and their predecessors have acquired a significant amount of 2-D seismic data on the Parsons Lake field since the late 1950s. Some of this seismic exploration led to the drilling of the Parsons F-09 well, the discovery well for the Parsons Lake field, in 1972. The Parsons F-09 well and subsequent delineation wells resulted in the issuance of SDLs 32 and 30 in 1988. ConocoPhillips and ExxonMobil also conducted a major 3-D seismic program over the Parsons Lake field in winter 2001–2002. In the more than 40 years since the proponents and their predecessors began their exploration activities in the Mackenzie Delta, they have spent in excess of \$270 million (2003\$) on exploration of the Parsons Lake field and in preparing regulatory applications for its development. The opportunity to realize the full value of the Parsons Lake field, including recovery of this investment, is the primary motivation for the proponents' proposal to develop the field. Based on their most recent interpretations of the exploration data obtained, the proponents estimate that the Parsons Lake field could contain about 64 Gm³ (2.3 Tcf) of recoverable raw natural gas and NGLs.

P.1.3 PRODUCTION FACILITIES**P.1.3.1 Main Production Pads**

The main production facilities at the Parsons Lake field will be located on two main gravel pads, the most northerly and larger of the two near the northeast shore of Parsons Lake. This north pad will be built first, with construction currently planned to begin in late 2006. The gas conditioning facility for the

P.1.3.1 Main Production Pads (cont'd)

Parsons Lake field will be located there, as will two injection wells for disposing of drilling cuttings, produced water and other waste from the field. The connection to the planned Mackenzie gathering system will also be located at the north pad. The second, smaller well pad will be constructed about five or six years after construction of the north pad (around 2015) and will be located about 14 km from it, south of Parsons Lake. An elevated, two-phase flow line will transport natural gas from the south pad to the north pad's gas conditioning facility.

P.1.3.2 Planned Wells

Nine producing wells are expected to be located on the north pad, although space has been reserved for drilling about 10 additional wells. The south pad is expected to require three producing wells, although space has been reserved for drilling about four additional wells. Although additional wells are planned to be drilled on both the north and south pads, the final number of wells will depend on the drilling and production results.

P.1.3.3 Potential Additional Pads and Wells

In addition to the two main pads, one or more small pads, for one or several wells, might also be required. These wells are contingent upon the results of the drilling of the currently planned wells, as well as on the results of potential continued exploration drilling in SDLs 32 and 30. Therefore, the number, potential locations and timing for such contingent wells and well pads have not been determined. If any of these single well pads are eventually required, elevated flow lines will connect them to the gas conditioning facility on the north pad.

P.1.4 ESTIMATED CAPITAL AND OPERATING COSTS

Currently, ConocoPhillips and ExxonMobil initially plan a design rate of about 8.5 Mm³/d (300 MMcf/d) at the Northwest Territories–Alberta boundary, over an estimated field life of 25 to 30 years. The estimated capital costs for field development, using the base case of the north and south pads and an inter-pad flow line, are about \$895 million (2003\$), including a 25% contingency. Operating costs over 25 years are currently estimated to be about \$252 million (2003\$).

P.1.5 TRANSPORTATION PLAN

One of the main conditions required for realizing the opportunity presented by the resources of the Parsons Lake field is a means of transporting the natural gas and NGLs to market. The Mackenzie Gas Project, described conceptually in the *Preliminary Information Package for the Mackenzie Gas Project* submitted to various regulatory agencies in June 2003, includes the development of three gas fields, known as the anchor fields:

- Parsons Lake
- Taglu, held by Imperial Oil Resources Limited
- Niglintgak, held by Shell Canada Limited (Shell)

The proponents of the three anchor fields are proposing to construct:

- a gathering system, including gathering pipelines, a processing facility near Inuvik and an NGL pipeline from Inuvik to Norman Wells
- a natural gas pipeline from Inuvik to northwestern Alberta

The Aboriginal Pipeline Group is also a proponent of the natural gas pipeline. Imperial Oil Resources Ventures Limited will operate both the gathering system and the gas pipeline system.

The proposed Mackenzie gathering system will transport natural gas and NGLs from the anchor fields and other potential fields to the Inuvik area facility and, in the case of the NGLs, from Inuvik to Norman Wells to enter the existing Enbridge Pipelines (NW) Inc. pipeline. The natural gas pipeline will start at the outlet of the Inuvik area facility and connect to an extension of the NOVA Gas Transmission Ltd. (NGTL) system in northwestern Alberta. The other two anchor fields, the Mackenzie gathering system and the Mackenzie Valley pipeline are the subjects of separate regulatory applications submitted by their respective operators.

P.1.6 NOTICE TO INVESTORS

Investors are directed to the Cautionary Note to Investors, at the front of this development plan application.

PREFACE

**APPLICATION FOR APPROVAL OF
THE DEVELOPMENT PLAN FOR
PARSONS LAKE FIELD
PROJECT DESCRIPTION****RELATIONSHIP TO MACKENZIE GAS PROJECT**

P.2.1 ENVIRONMENTAL IMPACT STATEMENT

This Parsons Lake field development plan is linked to the various applications and related submissions of the Mackenzie Gas Project. Although the operators of the individual Mackenzie Gas Project components are submitting separate primary regulatory applications for the components for which they are responsible, all the components of the Mackenzie Gas Project share a common Environmental Impact Statement (EIS). The EIS has been prepared as a consolidated document for the Mackenzie Gas Project, on a cooperative basis, by the project proponents in order to meet the intent of the *Cooperation Plan for the Environmental Impact Assessment and Regulatory Review of a Northern Gas Pipeline Project Through the Northwest Territories* (the Cooperation Plan). In August 2003, the federal Minister of the Environment, exercising his authority under the *Canadian Environmental Assessment Act* (CEAA), and in accordance with the Cooperation Plan, referred the Mackenzie Gas Project for environmental review to the Joint Review Panel established under the CEAA and the Cooperation Plan. In May 2004, the federal Minister of Indian and Northern Affairs Canada (INAC) approved, again in accordance with the Cooperation Plan, the Mackenzie Valley Environmental Impact Review Board's request to refer the Mackenzie Gas Project for review by the Joint Review Panel.

The Cooperation Plan contemplates a single environmental impact review for the entire Mackenzie Gas Project. The EIS has been prepared and assembled to facilitate a single environmental review. As a result, the Parsons Lake field development plan, as well as the other primary regulatory applications for the Mackenzie Gas Project, only summarizes the environmental impacts of the Parsons Lake field development plan.

P.2.2 RELATED REGULATORY SUBMISSIONS

Other regulatory applications being submitted by the Mackenzie Gas Project proponents provide information common to both the Parsons Lake field development plan application and other project components. Table P-1 shows the sections of this development plan that relate to those submissions.

Table P-1: Mackenzie Gas Project Submissions

Parsons Lake Field Development Plan Section	Mackenzie Gas Project Submission
8.0 Pipeline Transport Systems	NEB Application for the Mackenzie Gathering System NEB Application for the Mackenzie Valley Pipeline
9.0 Construction and Installation	EIS Volume 2: Project Description Mackenzie Valley Pipeline Volume 4: Construction and Operations Mackenzie Gathering System Volume 3: Construction and Operations
10.8 Abandonment and Reclamation	EIS Volume 7: Environmental Management
11.0 Safety Plan	EIS Volume 7: Environmental Management
11.5 Emergency Response Plan	EIS Volume 7: Environmental Management
12.0 Public Consultation	EIS Volume 1: Overview and Impact Summary EIS Volume 4: Socio-Economic Baseline Mackenzie Gas Project Public Consultation Volume 1: Consultation Program
13.0 Environmental and Socio-Economic Impacts	EIS Volume 5: Biophysical Impact Assessment EIS Volume 6: Socio-Economic Impact Assessment

CONTENTS

APPLICATION FOR APPROVAL OF
THE DEVELOPMENT PLAN FOR
PARSONS LAKE FIELD
PROJECT DESCRIPTION

TABLE OF CONTENTS

Letter of Transmittal	
The Application	
Application	
Cautionary Note to Investors	
Preface	
Executive Summary	P-i
Relationship to Mackenzie Gas Project	P-v
Contents	
Table of Contents	vii
List of Illustrations	xxi
1. Introduction	
1. Purpose of this Plan.....	1-1
1.1.1 Approval Requested	1-1
1.1.2 Scope of Application	1-2
1.1.3 Scope of Approval Requested	1-3
1.1.4 Canada Benefits Plan.....	1-4
2. Project Proponents and Principles.....	1-7
1.2.1 Project Proponents.....	1-7
1.2.1.1 ConocoPhillips Canada (North) Limited	1-7
1.2.1.2 ExxonMobil Canada Properties	1-7
1.2.2 Operator’s Corporate Principles and Policies.....	1-8
1.2.2.1 Sustainable Development.....	1-8
1.2.2.2 Spirit of Performance Values.....	1-8
1.2.2.3 Business Ethics	1-9
1.2.2.4 Relationships with Stakeholders	1-9
3. Project Management.....	1-11
1.3.1 Operating Agreement	1-11
1.3.2 Management Committee	1-11
1.3.3 Contracting Strategy	1-11
1.3.4 Project Management Team.....	1-11
4. Project Purpose and Need	1-13
1.4.1 Project Purpose.....	1-13
1.4.2 Project Need	1-13
5. Project Scope.....	1-15
1.5.1 History of the Parsons Lake Field	1-15
1.5.1.1 Discovery and Delineation.....	1-15
1.5.1.2 Declaration of Significant Discovery.....	1-15

1.5.1.3	Recent Work	1-15
1.5.2	Parsons Lake Field Development	1-16
1.5.2.1	General Approach to Development	1-16
1.5.2.2	Phase 1 Development	1-16
1.5.2.3	Phase 2 Development	1-17
1.5.2.4	Future Development at Parsons Lake	1-17
1.5.2.5	Phase 1 Construction	1-17
1.5.2.6	Phase 2 Construction	1-18
1.5.2.7	Wells	1-20
1.5.2.8	Processing Facilities	1-21
1.5.2.9	Transportation	1-22
1.5.2.10	Facilities Expansions	1-22
1.5.2.11	Project Life	1-23
1.5.2.12	Technical Data and Studies	1-23
1.5.2.13	Evaluation of Alternatives	1-23
1.5.3	General Development Schedule	1-23
1.5.4	Construction and Drilling Activities	1-24
6.	Regulatory Context	1-27
1.6.1	Cooperation Plan	1-27
1.6.2	Regulatory Process	1-27
2.	Geology, Geophysics and Petrophysics	
1.	Geological Description	2-1
2.1.1	Regional History and Description	2-1
2.1.2	Available Data	2-3
2.1.3	Reservoir Structure	2-3
2.1.4	Reservoir Stratigraphy	2-3
2.1.4.1	Kamik Formation	2-3
2.1.4.2	Kamik C2 and C3 Sands	2-5
2.1.4.3	Kamik C1 Sand	2-6
2.1.4.4	Kamik B Shale and B Sand	2-6
2.1.4.5	Kamik A1 Shale and Lower A1 Sand	2-7
2.1.4.6	Kamik Upper A1 Sand	2-7
2.1.4.7	Kamik A Shale and A Sand	2-7
2.1.5	Probable Gas and Natural Gas Liquid Sources	2-8
2.1.6	Sedimentology and Diagenesis	2-8
2.1.6.1	Upper Kamik Sands	2-8
2.1.6.2	Lower Kamik Sands	2-9
2.1.6.3	Porosity and Permeability	2-9
2.1.6.4	Hydrogeology	2-9
2.	Geophysics	2-11
2.2.1	Seismic Acquisition Program	2-11
2.2.1.1	Historical Seismic Coverage	2-11
2.2.1.2	Seismic Mapping	2-11
2.2.2	Seismic Analysis	2-13
2.2.2.1	Objective	2-13
2.2.2.2	Seismic Processing	2-13
2.2.2.3	Seismic Interpretation	2-13
2.2.2.4	Depth Conversion	2-14
3.	Petrophysical Analysis	2-15

2.3.1	Core Information	2-15
2.3.2	Wellbore Log Analysis.....	2-15
2.3.2.1	Fluid Identification and Saturation.....	2-17
2.3.2.2	Reservoir Parameters	2-17
2.3.2.3	Future Data Acquisition	2-17
3.	Reservoir Engineering	
1.	Reservoir Data.....	3-1
3.1.1	Data Sources	3-1
3.1.2	Reservoir Description.....	3-2
3.1.3	Well Test Data.....	3-3
3.1.3.1	Pressure Versus Depth	3-3
3.1.3.2	Temperature Versus Depth	3-3
3.1.3.3	Reservoir Assessment	3-6
3.1.4	Core Data.....	3-7
3.1.5	Reservoir Fluid Properties.....	3-8
3.1.6	Fluid Injection	3-8
2.	Resource Assessment.....	3-13
3.2.1	Model Evaluation of Original Gas-In-Place.....	3-13
4.	Reservoir Exploitation	
1.	Introduction.....	4-1
4.1.1	Development Plan Design Factors	4-1
4.1.1.1	Assurances of Safety	4-1
4.1.1.2	Technical Feasibility	4-1
4.1.1.3	Mitigation of Environmental Impacts	4-1
4.1.1.4	Community Considerations.....	4-1
4.1.1.5	Economic Viability and Optimization	4-2
2.	Reservoir Simulation.....	4-3
4.2.1	Objectives.....	4-3
4.2.2	Reservoir Models	4-3
4.2.2.1	Depletion Plan Model	4-3
4.2.3	Average Annual Rates.....	4-4
4.2.4	Commingled Production Strategy	4-5
3.	Development Plan.....	4-7
4.3.1	Start-Up.....	4-7
4.3.2	Maintaining Production.....	4-7
	4. (4.2.8)(Erodu)1pg(Pla)9.3	4-5

5.	Alternative Depletion Scenarios	4-15
4.5.1	Purpose	4-15
4.5.2	Simultaneous South Pool Development	4-15
4.5.3	Compression Timing	4-15
4.5.4	Plateau Rate	4-16
4.5.5	Drilling Alternatives	4-16
5.	Design Criteria	
1.	Design Philosophy	5-1
5.1.1	Approach	5-1
5.1.2	Design Codes and Standards	5-1
2.	Environmental Criteria	5-3
5.2.1	Site Description	5-3
5.2.2	Climate, Meteorology and Air Quality	5-3
5.2.3	Hydrology	5-4
5.2.3.1	Snowmelt and Surface Runoff	5-5
5.2.3.2	Stream Flow	5-5
5.2.3.3	Lake Hydrology	5-5
5.2.4	Hydrogeology	5-5
5.2.5	Terrain	5-6
5.2.6	Vegetation	5-6
5.2.7	Water Quality and Fisheries	5-7
5.2.8	Wildlife	5-7
3.	Geotechnical Criteria	5-9
5.3.1	Area and Facilities	5-9
5.3.2	Surficial Geology and Geomorphology	5-9
5.3.3	Foundation Design	5-9
5.3.3.1	Permafrost	5-9
5.3.3.2	Geotechnical Considerations	5-10
4.	Functional Criteria	5-11
5.4.1	Flow Streams and Design Rates	5-11
5.4.1.1	Design Rate	5-11
5.4.1.2	Wellhead Pressure	5-12
5.4.1.3	Flow Line	5-13
5.4.1.4	Waste Disposal Well	5-13
5.4.1.5	Satellite Wells	5-13
5.4.2	Production Stream Properties	5-13
5.4.2.1	Fluid Properties	5-13
5.4.2.2	Carbon Dioxide Content	5-13
5.4.2.3	Hydrogen Sulphide Content	5-14
5.4.2.4	Wax Content	5-14
5.4.2.5	Sand Production	5-14
5.4.3	Product and Delivery Specifications	5-14
5.4.4	Other Criteria	5-14
6.	Drilling and Completions	
1.	Drilling	6-1
6.1.1	Exploratory And Delineation Wells	6-1
6.1.2	Development Drilling Plan	6-1
6.1.3	Tentative Drilling Schedule	6-2

6.1.4	Directional Design.....	6-2
6.1.4.1	Wellbore and Casing Sizes.....	6-2
6.1.4.2	Cementing Program	6-4
6.1.5	Drilling Fluids Program.....	6-5
6.1.6	Formation Evaluation	6-5
6.1.7	Drilling Considerations	6-6
6.1.7.1	Access for Drilling Operations.....	6-6
6.1.7.2	Casing Designs.....	6-6
6.1.7.3	Pad Designs and Layout Issues	6-7
6.1.7.4	Drilling Schedule Alternatives	6-7
6.1.8	Permafrost Protection	6-8
6.1.8.1	Well Spacing.....	6-8
6.1.8.2	Insulated Conductors.....	6-8
6.1.8.3	Thermosiphons.....	6-9
6.1.8.4	Insulating Annular Fluids.....	6-9
6.1.8.5	Cuttings Injection	6-9
6.1.9	Potential Drilling Hazards	6-10
6.1.10	Well Control	6-11
6.1.11	Well Blowouts and Intervention.....	6-11
6.1.11.1	Blowout Preventer System.....	6-11
6.1.12	Drilling Equipment.....	6-12
6.1.12.1	Equipment Requirements	6-12
6.1.12.2	Transporting Drilling Equipment.....	6-12
2.	Completions	6-15
6.2.1	Completions Plan	6-15
6.2.1.1	Gas Production Wells.....	6-15
6.2.1.2	Waste Disposal Well.....	6-15
6.2.1.3	Cuttings Injection Well	6-15
6.2.2	Completions Plan Alternatives	6-15
6.2.2.1	Rigless Intervention Versus Rig Interventions.....	6-16
6.2.2.2	Downhole Equipment	6-16
6.2.2.3	Need for Stimulations	6-16
6.2.2.4	Completion Techniques	6-17
6.2.3	Tubular Program.....	6-17
6.2.4	Metallurgy	6-17
6.2.5	Fluids Handling	6-17
6.2.6	Completions Equipment	6-19
6.2.6.1	Coiled Tubing Units.....	6-19
6.2.6.2	Wireline Units	6-19
6.2.7	Downhole Equipment.....	6-19
6.2.7.1	Gas Production Wells.....	6-20
6.2.7.2	Waste Disposal Well.....	6-22
6.2.7.3	Cuttings Injection Well	6-22
6.2.8	Perforations	6-23
6.2.9	Wellhead Equipment	6-23
7.	Production Facilities	
1.	Introduction.....	7-1
7.1.1	Production Forecast.....	7-1
7.1.2	Flow Temperature	7-1

7.1.3	Gas Composition	7-1
7.1.4	Gas Conditioning.....	7-2
7.1.4.1	North Pad	7-2
7.1.4.2	South Pad	7-2
7.1.5	Plot Plans.....	7-3
2.	Development Plan.....	7-9
7.2.1	Development Plan Philosophy	7-9
7.2.1.1	Facility Design	7-9
7.2.1.2	Drilling Operations	7-9
7.2.2	Facility Expansion.....	7-9
7.2.3	Third-Party Access to Facilities	7-10
7.2.4	Measurement Requirements	7-10
7.2.5	Current Engineering Phase.....	7-10
3.	Well-Site Facilities.....	7-11
7.3.1	Wellhead and Manifold Facilities	7-11
7.3.1.1	North Pad	7-11
7.3.1.2	South Pad and Satellite Wells	7-11
7.3.2	Gathering Flow Lines.....	7-11
7.3.2.1	North Pad	7-11
7.3.2.2	South Pad and Satellite Wells	7-12
7.3.3	Hydrate Control.....	7-12
7.3.3.1	North Pad	7-12
7.3.3.2	South Pad and Satellite Wells	7-12
4.	Facility Processes.....	7-15
7.4.1	Inlet Separation.....	7-15
7.4.2	Dehydration.....	7-15
7.4.2.1	Gas Dehydration	7-15
7.4.2.2	Natural Gas Liquid Dehydration.....	7-16
7.4.3	Fluid Measurement.....	7-17
7.4.3.1	Wells	7-17
7.4.3.2	North Pad to Gathering System.....	7-17
7.4.4	Compression.....	7-17
7.4.5	Refrigeration.....	7-18
7.4.6	Waste System	7-19
7.4.7	Relief and Blowdown System	7-19
5.	Process Utilities.....	7-21
7.5.1	Electrical Power Generation.....	7-21
7.5.2	Emergency Power.....	7-21
7.5.3	Instrument and Utility Air	7-21
7.5.4	Utility Heating System	7-21
7.5.5	Fuel Systems.....	7-22
7.5.6	Closed and Open Drain Systems	7-23
7.5.7	Chemical Inhibition Systems.....	7-23
7.5.8	Fire Protection and Safety Systems	7-23
6.	Civil and Infrastructure Facilities.....	7-25
7.6.1	Pads and Foundations	7-25
7.6.2	Transportation Infrastructure.....	7-25
7.6.2.1	Helicopter Pad.....	7-25
7.6.2.2	Roads.....	7-25
7.6.2.3	Dock.....	7-25

7.6.2.4	Airstrip	7-26
7.6.3	Accommodation Facilities	7-26
7.6.4	Potable Water	7-26
7.6.5	Sewage Treatment	7-26
7.6.6	Storage Areas	7-26
7.6.7	Telecommunication Facilities	7-26
7.	Development Alternatives.....	7-29
7.7.1	Selected Configuration	7-29
7.7.2	Alternative Configurations	7-29
7.7.2.1	Gas Conditioning Facility at the South Pad	7-30
7.7.2.2	Gas Conditioning Facilities at Both Pads.....	7-30
8.	Pipeline Transport Systems	
1.	Gathering System.....	8-1
8.1.1	Natural Gas and NGL Transportation Proposals.....	8-1
8.1.2	Components.....	8-1
2.	Gas Pipeline	8-3
8.2.1	Gas Transportation Proposal	8-3
8.2.2	Compression Facilities	8-3
9.	Construction and Installation	
1.	Construction Execution Plan.....	9-1
9.1.1	Scope	9-1
9.1.2	Construction Management Philosophy.....	9-1
9.1.3	Construction Schedule.....	9-2
9.1.4	Major Materials and Services.....	9-3
9.1.5	Construction Activities.....	9-3
9.1.6	Construction Stages	9-4
9.1.6.1	Module Fabrication	9-4
9.1.6.2	Infrastructure and Logistics.....	9-5
9.1.6.3	Site Preparation	9-5
9.1.6.4	Pile Installation	9-5
9.1.6.5	Module Installation	9-5
9.1.6.6	Site Installation and Precommissioning	9-5
9.1.7	Personnel Transport and Rotation	9-5
9.1.8	Drilling Pad	9-6
9.1.9	Quality Assurance	9-6
2.	Construction Infrastructure	9-7
9.2.1	Camps.....	9-7
9.2.1.1	Construction Requirements.....	9-7
9.2.1.2	Drilling Requirements.....	9-7
9.2.2	Sewage Treatment Systems	9-8
9.2.3	Staging and Stockpile Sites	9-8
9.2.4	Granular Resources	9-8
10.	Operations and Maintenance	
1.	Operating Procedures	10-1
10.1.1	Operating Procedure Program	10-1
10.1.2	Site-Specific Operating Procedures.....	10-1
10.1.3	Responsibilities	10-1

10.1.3.1	Parsons Lake Operation Team	10-1
10.1.3.2	First Level Supervisor	10-2
10.1.3.3	Production or Facility Engineer	10-2
10.1.3.4	Operator or Maintenance Technician	10-2
10.1.3.5	Business Unit Managers	10-2
10.1.4	Principles of Operating Procedures	10-3
10.1.5	Developing Operating Procedures	10-3
10.1.6	Content for Each Operating Phase	10-4
10.1.6.1	Start-Up Operations	10-4
10.1.6.2	Normal Operations	10-5
10.1.6.3	Temporary Emergency Operations	10-5
10.1.6.4	Shutdown Operations	10-5
10.1.7	Safe Operating Limits	10-5
10.1.8	Safety and Health Considerations	10-5
10.1.9	Safety Systems and Functions	10-6
10.1.10	Safe Operating Practices	10-6
10.1.11	Maximum Intended Inventory	10-6
10.1.12	Environmental Considerations	10-6
10.1.13	Procedure Authorization Process	10-7
10.1.14	Procedure Change Management	10-7
2.	Production Downtime	10-9
10.2.1	Location Factors	10-9
10.2.2	Supply Logistic Factors	10-9
3.	Logistics	10-11
10.3.1	Scope	10-11
10.3.2	Infrastructure	10-11
10.3.3	O&M Organizations	10-12
10.3.3.1	Functions and Roles	10-12
10.3.3.2	Front Line O&M Personnel	10-12
10.3.3.3	Management, Administrative and Specialist Personnel	10-12
10.3.3.4	Technical Support	10-13
10.3.3.5	Technical Service Providers	10-13
10.3.3.6	Business Services	10-13
4.	Communications	10-15
10.4.1	Links to Corporate Offices	10-15
10.4.2	Local Communication	10-15
10.4.3	Remote Well Monitoring and Control	10-15
5.	Control, Monitoring and Safety Systems	10-17
10.5.1	Systems Design	10-17
10.5.2	Safety Systems	10-18
10.5.2.1	Fire and Gas Detection	10-18
10.5.2.2	Alarm System	10-19
10.5.2.3	Emergency Shutdown Devices	10-19
6.	Flow Line Control and Leak Detection	10-21
10.6.1	Worker Qualifications	10-21
10.6.2	Flow Line Operation	10-21
10.6.2.1	Responsibilities	10-21
10.6.2.2	Above-Ground Facilities	10-22
10.6.2.3	Overpressure Equipment	10-22
10.6.2.4	Detecting Leaks and Breaks	10-22

10.6.3	Flow Line Corrosion, Inspection and Repair	10-23
10.6.3.1	External Inspection	10-23
10.6.3.2	Internal Inspection.....	10-23
10.6.3.3	Flow Line Repair	10-23
10.6.3.4	Right-of-Way Inspections	10-23
7.	Site Security	10-25
10.7.1	Scope	10-25
10.7.2	Security Process	10-25
10.7.3	Physical Security	10-26
10.7.3.1	Perimeter	10-26
10.7.3.2	Buildings	10-26
10.7.3.3	Intrusion Detection Systems	10-26
8.	Abandonment and Reclamation	10-27
10.8.1	Philosophy	10-27
10.8.2	Approvals	10-27
10.8.3	Downhole Well Abandonment	10-27
10.8.4	Surface Abandonment	10-27
10.8.5	Decommissioning	10-28
10.8.6	Reclamation.....	10-28
11.	Safety Plan	
1.	Health, Safety and Environment	11-1
11.1.1	Health, Safety and Environmental Management Plan.....	11-1
11.1.2	Policy and Leadership	11-2
11.1.2.1	Background	11-2
11.1.2.2	Health, Safety and Environment Policy	11-2
11.1.2.3	Roles and Responsibilities	11-3
11.1.2.4	HSE Committees and Meetings	11-4
11.1.2.5	HSE Advisory Committee	11-4
11.1.2.6	Training.....	11-5
11.1.3	Parsons Lake Field Safety Requirements	11-5
11.1.4	Contractor HSE Management Program	11-6
2.	Safety Program.....	11-9
11.2.1	Substance Abuse.....	11-9
11.2.2	Personal Protective Equipment.....	11-10
11.2.3	Working in Isolated Areas.....	11-10
11.2.4	Preventive Maintenance	11-10
3.	HSE Measuring and Monitoring	11-11
11.3.1	Incident Investigation and Reporting	11-11
11.3.1.1	Near Misses.....	11-11
11.3.1.2	Incidents	11-11
11.3.1.3	Investigation and Reports.....	11-11
11.3.2	Records and Statistics.....	11-12
4.	Emergency Response Plan	11-15
11.4.1	Emergency Preparedness.....	11-15
11.4.1.1	Corporate Standard	11-15
11.4.1.2	Corporate System	11-15
11.4.1.3	Roles and Responsibilities	11-16
11.4.1.4	Training.....	11-16

12. Public Consultation	
1. Introduction.....	12-1
12.1.1 Scope	12-1
12.1.2 Building on the Past	12-1
12.1.3 Working Together	12-1
12.1.4 Sustainable Development	12-2
12.1.5 Stakeholder Relations.....	12-3
12.1.5.1 Corporate Policy	12-3
12.1.5.2 Principles.....	12-4
2. Project Consultation.....	12-5
12.2.1 Purpose	12-5
12.2.2 Objectives.....	12-5
12.2.3 Approach	12-5
12.2.4 Stakeholder Engagement.....	12-6
12.2.5 Methods and Tools	12-6
12.2.6 Formal Community Consultation.....	12-8
12.2.6.1 Stage 1.....	12-9
12.2.6.2 Stage 2.....	12-10
12.2.6.3 Stage 3.....	12-11
12.2.6.4 Stage 4.....	12-14
12.2.6.5 Stages 5 through 7.....	12-14
3. Concerns.....	12-15
12.3.1 Stakeholder Interests and Concerns.....	12-15
12.3.2 Community Interests and Concerns in Project Planning.....	12-16
4. Public Consultation Record.....	12-19
12.4.1 Scope	12-19
13. Environmental and Socio Economic Impacts	
1. Introduction.....	13-1
13.1.1 Scope	13-1
13.1.2 Key Issues.....	13-1
13.1.3 Objectives.....	13-1
13.1.4 Approach	13-2
13.1.4.1 Methods.....	13-2
13.1.4.2 Stage 1.....	13-2
13.1.4.3 Stage 2.....	13-2
13.1.4.4 Stage 3.....	13-2
13.1.4.5 Stage 4.....	13-2
13.1.4.6 Stage 5.....	13-3
13.1.4.7 Public Participation	13-3
2. Biophysical Impacts.....	13-5
13.2.1 Scope	13-5
13.2.2 Air Quality.....	13-5
13.2.3 Noise.....	13-6
13.2.4 Groundwater.....	13-7
13.2.5 Hydrology.....	13-8
13.2.6 Water Quality	13-8
13.2.7 Fish and Fish Habitat.....	13-10
13.2.8 Soils, Landforms and Permafrost	13-10
13.2.9 Vegetation	13-11

13.2.10	Wildlife.....	13-12
13.2.11	Cumulative Effects	13-15
3.	Socio-Economic Impacts	13-17
13.3.1	Scope	13-17
13.3.2	Regional Economic Effects	13-17
13.3.2.1	Capital and Operating Expenditures	13-18
13.3.2.2	Employment	13-20
13.3.2.3	Labour Income	13-20
13.3.2.4	Demography and Population Mobility.....	13-25
13.3.3	Infrastructure	13-25
13.3.3.1	Transportation	13-25
13.3.3.2	Energy and Utilities	13-26
13.3.3.3	Housing	13-27
13.3.3.4	Recreation Resources	13-27
13.3.3.5	Governance	13-28
13.3.4	Individual, Family and Community Wellness.....	13-28
13.3.4.1	Community Well-Being and Delivery of Social Services	13-29
13.3.4.2	Health Conditions and Health Care Services	13-30
13.3.4.3	Human Health Risks	13-31
13.3.4.4	Public Safety and Protection Services.....	13-32
13.3.4.5	Education Attainment and Services	13-32
13.3.5	Traditional Culture	13-33
13.3.5.1	Traditional Harvesting and Land Use	13-33
13.3.5.2	Preserving Traditional Language and Culture	13-34
13.3.6	Non-Traditional Land and Resource Use	13-35
13.3.6.1	Protected Areas	13-35
13.3.6.2	Visual and Aesthetic Resources	13-35
13.3.7	Heritage Resources.....	13-37
13.3.7.1	Archaeological Investigations.....	13-37
13.3.7.2	Infrastructure Investigations.....	13-37
13.3.7.3	Borrow Site Investigations.....	13-37
13.3.8	Traditional Knowledge.....	13-38
14.	Capital and Operating Costs	
1.	Introduction	14-1
14.1.1	Scope	14-1
14.1.2	Historical Expenditures	14-1
14.1.2.1	Expenditures By Category	14-1
2.	Development Cost Estimates	14-3
14.2.1	Development Estimate Scope.....	14-3
14.2.2	Assumptions for Capital Cost Estimates	14-3
14.2.3	Basis of Capital Cost Estimate	14-4
14.2.4	Preliminary Capital Cost Estimate	14-4
3.	Annual Operating Costs	14-7
14.3.1	Assumptions for Operating and Maintenance Cost Estimate	14-7
14.3.2	Basis of Operating Cost Estimate.....	14-7
14.3.3	Preliminary Operating Cost Estimate	14-8
15.	Liability and Compensation	
1.	Liability.....	15-1

15.1.1	Scope	15-1
15.1.2	Inuvialuit Final Agreement	15-1
15.1.2.1	Wildlife Harvester Provisions	15-1
15.1.2.2	Worst Case Scenario Assessment	15-2
15.1.3	Canada Oil and Gas Operations Act.....	15-2
2.	Compensation.....	15-3
15.2.1	Scope	15-3
15.2.2	Harvesters' Compensation Agreement.....	15-3
15.2.3	Environmental Agreement	15-3
15.2.4	Proof of Financial Capability	15-3

Appendices

A.	ConocoPhillips 2003 Annual Report	A-1
B.	Newsletters.....	B-1
C.	Flyers and Posters	C-1
D.	Gas Processing and Facility Pad Diagrams.....	D-1
E.	Noise Levels.....	E-1
F.	Artist's Interpretations	F-1

Glossary

CONTENTS

APPLICATION FOR APPROVAL OF
THE DEVELOPMENT PLAN FOR
PARSONS LAKE FIELD
PROJECT DESCRIPTION

LIST OF ILLUSTRATIONS

LIST OF FIGURES

Figure 1-1	Location of Parsons Lake Field.....	1-1
Figure 1-2	Sustainable Development Model	1-8
Figure 1-3	Parsons Lake Overview.....	1-19
Figure 1-4	Directional Drilling	1-21
Figure 1-5	Parsons Lake Field Development Schedule	1-25
Figure 2-1	Stratigraphic Column	2-2
Figure 2-2	Schematic Cross-Section through the North Pool.....	2-4
Figure 2-3	Lower Cretaceous–Jurassic Stratigraphic Column.....	2-5
Figure 2-4	Parsons Lake Stratigraphy.....	2-6
Figure 2-5	Parsons Lake Seismic Coverage	2-12
Figure 3-1	SDL 30 and SDL 32 Wells Drilled Between 1971 and 1986.....	3-2
Figure 3-2	Plot of Reservoir Pressure Versus Depth	3-3
Figure 3-3	Reservoir Temperature Versus Depth	3-6
Figure 3-4	Porosity Versus Permeability	3-7
Figure 3-5	PVT Properties	3-11
Figure 4-1	Average Annual Rates.....	4-4
Figure 4-2	Proposed Buffer Zone	4-12
Figure 5-1	Wellhead Pressure	5-12
Figure 6-1	Planned Bottomhole Well Locations.....	6-4
Figure 6-2	Thermosiphon Configuration	6-9
Figure 6-3	Low-Ground-Pressure Vehicle.....	6-13
Figure 6-4	Proposed Monobore Completion for Gas Production Well	6-18
Figure 6-5	Proposed Completion for Waste Disposal Well.....	6-20
Figure 6-6	Proposed Completion for Cuttings Injection Well.....	6-21
Figure 6-7	Proposed Wellhead for Gas Production Wells.....	6-24
Figure 6-8	Proposed Wellhead for Waste Disposal Wells.....	6-25
Figure 6-9	Proposed Wellhead for Cuttings Injection Wells	6-26
Figure 7-1	North Pad Gas Conditioning Schematic.....	7-2
Figure 7-2	South Pad and Satellite Well Schematic	7-3
Figure 7-3	North Pad Preferred Plot Plan	7-5
Figure 7-4	North Pad Alternative Plot Plan	7-6
Figure 7-5	South Pad Site Plan	7-7
Figure 7-6	South Pad and Satellite Well Pad Plan.....	7-8
Figure 12-1	ConocoPhillips Canada Stakeholders.....	12-3
Figure 12-2	Consultation on Parsons Lake Field Development – Inuvik, 2002	12-10
Figure 12-3	Three-Dimensional Model of Parsons Lake Natural Gas Field Development.....	12-11
Figure 12-4	Three-Dimensional Model of Parsons Lake North Pad	12-13
Figure 12-5	Community Representatives Visiting Lucas Point Staging Site	12-13

LIST OF TABLES

Table 1-1	Parsons Lake Construction and Drilling Activities	1-24
Table 2-1	Parsons Lake Wells Cored	2-16
Table 2-2	Parsons Lake Gas–Water and Oil–Water Contacts	2-17
Table 3-1	Parsons Lake Area Wells Used in Reservoir Evaluation	3-1
Table 3-2	Well Test Results Summary	3-4
Table 3-3	Analyzed Samples	3-9
Table 3-4	Average PVT Data	3-11
Table 3-5	Representative Water Composition of Parsons Lake Reservoir	3-11
Table 5-1	Wellhead Temperature Profile	5-11
Table 5-2	Parsons Lake Design Gas Flow Rates.....	5-12
Table 5-3	Product and Delivery Specifications	5-14
Table 6-1	Parsons Lake Preliminary Drilling Schedule and Directional Information.....	6-3
Table 12-1	Consultation Methods and Tools.....	12-7
Table 12-2	Stakeholder Consultation Schedule.....	12-8
Table 12-3	Stakeholder Interests Addressed in Project Planning.....	12-17
Table 12-4	Parsons Lake Consultation Record	12-19
Table 13-1	Potential Effects of Parsons Lake Activities on Air Quality	13-6
Table 13-2	Potential Effects of Parsons Lake Activities on Noise.....	13-7
Table 13-3	Potential Effects of Parsons Lake Activities on Groundwater	13-8
Table 13-4	Potential Effects of Parsons Lake Activities on Hydrology	13-9
Table 13-5	Potential Effects of Parsons Lake Activity on Water Quality.....	13-9
Table 13-6	Potential Effect of Parsons Lake Activities on Fish.....	13-10
Table 13-7	Potential Effects of Parsons Lake Activities on Soils and Landforms	13-11
Table 13-8	Potential Effects of Parsons Lake Activities on Vegetation Abundance and Distribution	13-12
Table 13-9	Potential Effects of Parsons Lake Activities on Vegetation Health	13-13
Table 13-10	Potential Effects of Parsons Lake Activities on Wildlife Habitat Availability	13-14
Table 13-11	Potential Effects of Parsons Lake Activity on Wildlife Movement	13-15
Table 13-12	Potential Effects of Parsons Lake Activity on Wildlife Mortality	13-15
Table 13-13	Mackenzie Gas Project Capital Expenditures	13-18
Table 13-14	Project Capital Investment by Area	13-19
Table 13-15	Capital Expenditures for Parsons Lake Field.....	13-19
Table 13-16	Estimated Labour Pool Available in ISR and GSA for Project-Related Work.....	13-20
Table 13-17	Project Employment Demand in the ISR and GSA	13-21
Table 13-18	Estimated Project-Related Labour Income in the ISR and GSA – 2006 to 2010.....	13-21
Table 13-19	Estimated Project-Related Annual Average Employment (2009 to 2030)	13-22
Table 13-20	Annual Average Labour Income in the ISR and GSA	13-22
Table 13-21	Parsons Lake Field Peak Construction Employment	13-23
Table 13-22	Labour Force Required for Parsons Lake Drilling, Completions and Related Employment	13-23
Table 13-23	Parsons Lake Operations Labour Force Requirements	13-24
Table 13-24	Economic Effects of the Project and Parsons Lake Field	13-24
Table 13-25	Potential Construction Effects on Population Mobility	13-25
Table 13-26	Potential Operations Effects on Population Mobility.....	13-25
Table 13-27	Potential Effects on Transportation Infrastructure	13-26
Table 13-28	Potential Project Effects on Housing	13-27
Table 13-29	Potential Project Effects on Well-Being Conditions.....	13-30
Table 13-30	Potential Project Effects on Delivery of Social Services	13-30

CONTENTS

LIST OF ILLUSTRATIONS

Table 13-31	Potential Project Effects on Health Conditions.....	13-31
Table 13-32	Potential Project Effects on Health Care Services	13-31
Table 13-33	Potential Project Effects on Traditional Harvesting.....	13-34
Table 13-34	Potential Project Effects on Language and Culture Preservation.....	13-35
Table 13-35	Potential Project Effects on Non-Traditional Land and Resource Use	13-36
Table 14-1	Parsons Lake Field Historical Costs.....	14-2
Table 14-2	Preliminary Capital Cost Estimate (2003\$)	14-5
Table 14-3	Preliminary Operating Cost Estimate (\$Million 2003)	14-8

