

# Foundation for a Sustainable Northern Future

REPORT OF THE JOINT REVIEW PANEL FOR THE MACKENZIE GAS PROJECT

**VOLUME I — CHAPTERS 1 TO 10**

DECEMBER 2009

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For the purposes of identifying references, please consider the following examples:

**J-INAC-00177, p. 11**

<b>J</b>	Joint Review Panel
<b>INAC</b>	acronym assigned to each participant, group of participants or government department/regulatory agency (Other examples: OHP – Other Hearing Participants, LOC – Letter of Comment)
<b>00177</b>	number assigned to each filing on the public registry
<b>p. 11</b>	.pdf* page number

**HT V28, p. 2539**

<b>HT</b>	hearing transcript
<b>V28</b>	hearing transcript volume number
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**Joint Review Panel**  
for the Mackenzie Gas Project

**Foundation for a Sustainable Northern Future:**  
**Report of the Joint Review Panel for the Mackenzie Gas Project**

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The opinions and views outlined in this report are those of the Joint Review Panel appointed to review the environmental impacts of the proposed Mackenzie Gas Project (the Joint Review Panel for the Mackenzie Gas Project). They are not necessarily the opinion or views of the Government of Canada.

This report was written and transmitted in English. This report has been translated into French. Audio-Interpretation of the Executive Summary is available in Inuvialuktun, Gwich'in, North Dene, South Dene and Dene Tha'.

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December 30, 2009

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Mr. Richard Edjericon  
Chairperson, Mackenzie Valley Environmental Review Board

The Honourable Gail Shea  
Minister of Fisheries and Oceans

Mr. Frank Pokiak  
Chair, Inuvialuit Game Council

The Honourable John Baird  
Minister of Transport

Mr. Gaétan Caron  
Chair, National Energy Board

Dear Madam and Sirs:

In accordance with the Joint Review Panel Agreement issued on August 18, 2004, the Joint Review Panel has completed its environmental assessment of the Mackenzie Gas Project and the associated Northwest Alberta Facilities.

The Joint Review Panel is pleased to submit its report for your consideration. Subject to the full implementation of the Panel's recommendations, the Panel has concluded that the adverse impacts of the Mackenzie Gas Project and the Northwest Alberta Facilities would not likely be significant and that the Project and those Facilities would likely make a positive contribution towards sustainability.

The Panel is of the view that the Mackenzie Gas Project could provide a foundation for a sustainable northern future.

Yours truly,

A handwritten signature in black ink, appearing to read "Gina Dolphus".

Gina Dolphus

A handwritten signature in black ink, appearing to read "Barry Greenland".

Barry Greenland

A handwritten signature in black ink, appearing to read "Percy Hardisty".

Percy Hardisty

A handwritten signature in black ink, appearing to read "Rowland J. Harrison, Q. C.". The signature is written in a cursive style.

Rowland J. Harrison, Q. C.

A handwritten signature in black ink, appearing to read "Tyson Pertschy".

Tyson Pertschy

A handwritten signature in black ink, appearing to read "Peter J. Usher".

Peter J. Usher

A handwritten signature in black ink, appearing to read "Robert Hornal".

Robert Hornal

# ACKNOWLEDGEMENTS

The Joint Review Panel was fortunate to have been surrounded by a team of dedicated professionals during its review process and wishes to express its appreciation to the individuals and organizations that assisted it in various ways to carry out this important task.

The Panel would like to thank the Canadian Environmental Assessment Agency, the Mackenzie Valley Environmental Impact Review Board and the Inuvialuit Game Council for providing it with the necessary resources to conduct its review.

The Panel is grateful to its staff of Robin Beveridge, Sarah Devin, Scott Gedak, Susan Gudgeon, Guy C. Hamel, Kevin James, Linda Jones, Kent Lien, Bob Mahnic, John McCauley, Joe Ronzio, Nick Sanders and Nick Thomas, and to its legal counsel, Letha J. MacLachlan, Q.C., for their hard work and the excellent support they provided throughout the process. The Panel would particularly like to thank its Panel Manager, Paula Pacholek, for her coordination role and her dedication. The Panel would also like to acknowledge the contributions of the following specialist advisors: Dr. Peter N. Duinker, Dr. John Gale, Dr. Robert Gibson, Lorne Greig, Dr. Jean-Marie Konrad, Dr. Jack Kruse, Dr. David Lawrence, and especially Lindsay Staples, consultant to the Panel, for his overall and comprehensive involvement during the entire review process.

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The Panel extends special thanks to the National Energy Board for its support of the Panel's work. The Board provided the Panel with six members of its staff, drafting services, research services, meeting rooms, and the use of its mailroom. The Panel appreciates the support of the NEB Information and Document

Services Group and the Canadian Environmental Assessment Agency's Language Services Branch for translation of their report into French.

The Panel would like to express its gratitude to the community field workers who travelled to various northern communities to explain the review process to everyone, and to the Aboriginal interpreters who had the difficult task of simultaneously translating daily proceedings, information sessions and home visits. The Gwich'in interpreters were Noel Andre, Ruth Carroll, Bertha Francis, Bella Greenland, Terry Remy-Sawyer, Emma Robert and Mary Teya. The Inuvialuktun interpreter team was composed of Barbara Alan, Rosie Albert, Jean Ekpakohak, Tony Green, Robert Kuptana, Frank Umaok, Agnes White and Fred Wolki. The North Dene language interpreters were Arsene Betsidea, Irene Betsidea, Douglas Dillon, Dora Grandjambe, Lucy Jackson, Edith Mackeinzo, Alphonsine McNeely, Laura Tutcho and Lucy Ann Yakeleya. The South Dene language interpreter team comprised Eleanor Bran, Philip Constant, Sarah Gargan, Elizabeth Hardisty, Alex Tambour and Joe Tambour. The Dene Tha' interpreters were Shirley Chambaud, Sidney Chambaud, Charlie Chissakay, Elizabeth Enfield, Baptiste Metchooyeah and John Natamnah. The community field workers were Irene Betsidea, Ernestine Chambaud, Sarah Gargan, Lillian Kanayok and Elizabeth Vittrekwa.

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The Panel would like to convey its appreciation to all community members, leaders and organizations who welcomed the Panel in their communities and who helped with aspects of the logistical effort necessary to host the hearings. Finally, the Panel would like to acknowledge members of the public, Interveners and the Proponents for their involvement in the hearing process.

# PREFACE

In undertaking its review of the Mackenzie Gas Project (MGP) and the associated Northwest Alberta Facilities, the Joint Review Panel set out to answer a core question. In doing so, the Panel recognized that key sustainability objectives are to ensure net gains without significant adverse impacts during the life of the Project and effective use of the Project and associated opportunities as a bridge to a desirable and durable future, especially in the Project Review Area. In light of these objectives, the core question asked by the Panel was:

**Can we be reasonably confident that the Project as Filed, if built and operated with full implementation of the Panel's recommendations, would deliver valuable and lasting overall benefits, and avoid significant adverse environmental impacts?**

In the Panel's view, the MGP offers a unique opportunity to build a sustainable future in the Mackenzie Valley and Beaufort Delta regions. The Project itself, as long-term infrastructure, provides a key basis for future economic development. This opportunity carries the risk of adverse impacts, however. The Proponents' mitigations and enhancements, the measures governments would put in place, and the Panel's recommendations would, in combination, mitigate adverse impacts, reduce the risk and enhance the opportunities. Together they would provide the foundation for a durable and sustainable future in the Mackenzie Valley and the Beaufort Delta regions. With these three elements in combination, the regions could benefit from the Project for a long time to come. Without them, the foundation for the future would be less secure, and the likelihood of significant adverse impacts much greater.

The MGP as filed in applications to the National Energy Board (NEB) would have an initial capacity of 1.2 Bcf/d, with an identified gas supply of 0.83 Bcf/d, or approximately 70 percent of the applied-for capacity. The Project as described in the NEB applications, together with an associated project in Northwest Alberta, is referred to by the Panel as the "Project as Filed" and is the central focus of the Panel's review.

While the initial capacity of the MGP would be 1.2 Bcf/d, the Mackenzie Valley Pipeline is being designed with the possibility of its future expansion to a capacity of 1.8 Bcf/d. Neither the Proponents nor other participants identified specific sources of the additional gas supply beyond 0.83 Bcf/d required to fill the pipeline at its initial capacity of 1.2 Bcf/d or at its expanded capacity of 1.8 Bcf/d. However, the Panel regards such developments as "reasonably foreseeable" with respect to reviewing the potential impacts of the Project in combination with future developments.

The Project would likely entrain many other developments, some implicit in the Project design and reasonably foreseeable, and others that might be induced by the Project but not necessarily directly related to it. The prospect of these additional developments was the basis of both the aspirations and the apprehensions the Panel heard with respect to the Project.

A decision to proceed with the Project would therefore be the occasion for major change throughout this important region of Canada. This change could be positive or negative depending on what others do with it. Such an occasion comes perhaps once in a generation, and presents an opportunity to build a sustainable future that should not be lost.

The Proponents have committed to provide certain mitigations and enhancements with respect to the Project, the most important of which include the establishment of the Aboriginal Pipeline Group, the negotiation of Access and Benefits Agreements with Aboriginal authorities, and their commitments to train and employ northern residents. Governments have also committed to providing important mitigations and enhancements, the most notable being the creation of the Mackenzie Gas Project Impacts Fund.

The Panel's recommendations are intended not only to ensure and enhance the benefits that the Proponents and governments would provide, but also to provide a firm foundation for avoiding or minimizing negative impacts and for anticipating and responding to the cumulative impacts that the Project, in combination with other developments, would almost certainly bring. Key Panel recommendations that would avoid or minimize adverse impacts on the biophysical environment addressed the need to: provide for offsets for habitat loss in the Kendall Island Bird Sanctuary and strengthen the regulatory regime there; fulfill the requirements of the *Species at Risk Act* (particularly with respect to the identification of critical habitat); implement the Protected Areas Strategy; complete and approve regional land use plans that incorporate development thresholds; and establish a special management area in the Mackenzie Delta.

To enhance socio-economic benefits, and also to promote equity among regions, communities and persons, the Panel has made recommendations to: enhance training programs; reduce barriers to employment relating to gender and diversity equity; minimize the impacts of rotational employment and in-migration, and the impacts of alcohol and drug abuse; ensure that vulnerable sectors of the population are not left without support; and provide for a resource revenue sharing agreement and for transition planning that would ensure a lasting beneficial legacy of the Project for the people of the North.

The Panel has recommended that there be a follow-up program for monitoring and managing Project impacts, and that the Cumulative Impacts Monitoring Program, required under the *Mackenzie Valley Resource Management Act*, be implemented to provide both for regional cumulative impacts monitoring and for direction to the follow-up program. Finally, to address public concerns about government preparedness and commitment, the Panel has recommended the establishment of an independent mechanism to monitor the performance of governments in implementing the Panel's recommendations.

Most of the Panel's recommendations to the Proponents are intended to ensure that, should the Project proceed, detailed Project designs, prevention or mitigation plans and baseline information not available at the time of the hearings are provided as needed to regulators, as for the most part the Proponents committed to do. Some Panel recommendations require monitoring and reporting during construction and operations. Some require best practice or best available technology, or higher standards during construction and operations. The Panel's recommendations do not require major Project rerouting.

There was a broad consensus among participants (although by no means unanimity) that the Project on its own could be acceptable and indeed beneficial, with few modifications to the Project itself, and with the appropriate responses from governments. The Panel has made numerous recommendations intended to improve or enhance the Proponents' designs, mitigations and enhancements, and the measures proposed by governments. These recommendations, if implemented, would provide greater certainty and assurance that the potential adverse effects of the Project would be minimized or avoided, and that the Project's benefits would be enhanced or made more likely.

For the Panel, answering the larger question of "What will the Project bring?" or "What will the Project mean for the future?" meant considering the cumulative impacts of the Project with other future developments as was required in the definition of "impact on the environment" in the Panel's Mandate.

The Panel's recommendations to governments address mainly the need to be prepared for cumulative impacts of the Project in combination with future developments. These recommendations provide a basis for managing future development and change, by establishing anticipatory and continued protection of

the biophysical environment, capturing the socio-economic opportunities and addressing associated risks and problems, ensuring equitable distribution of the benefits and challenges, and using the resources and other opportunities from the Project and related activities for a transition to a more sustainable future.

The Panel has recommended that the Government of Canada engage in the activities and commit the funding required to implement things it has already committed to do, such as fulfilling its obligations under the *Species at Risk Act*, the *Mackenzie Valley Resource Management Act*, and the Protected Areas Strategy. The Panel has also recommended that the Government of the Northwest Territories fully meet the needs of existing programs and services, ensure that Project demands during the construction phase do not impair these programs and services, and mitigate Project impacts as it has committed to do under the Socio-Economic Agreement. In recognition of the limited fiscal capacity of the Government of the Northwest Territories, the Panel has recommended a revenue sharing agreement with the Government of Canada. In the Panel's view, there is an obligation on the part of Canada, which would be the chief beneficiary of Project revenues to governments, to ensure that those jurisdictions that must bear the costs of the Project are able to do so.

In answer to its core question, the Panel is confident that the Project as Filed, if built and operated with full implementation of the Panel's recommendations, would deliver valuable and lasting overall benefits, and avoid significant adverse environmental impacts, recognizing that the sustainability objective is to ensure not just net gains without significant adverse effects during the life of the Project, but also effective use of the Project and associated opportunities as a bridge to a desirable and durable future, especially in the Project Review Area but also beyond.

The Panel adds that this future would be a better one than a future without the Project. Without the Project, the opportunities for economic and social improvement would be missed, without any corresponding improvement in the prospects for environmental sustainability.

In the Panel's view, the Mackenzie Gas Project and the associated Northwest Alberta Facilities would provide the foundation for a sustainable northern future. The challenge to all will be to build on that foundation.



# DEFINED TERMS

**abandonment** — The permanent relinquishment of control over or responsibility for a facility, subject to any ongoing monitoring requirements and potential financial liability.

**Anchor Fields** — The three natural gas fields in the Mackenzie Delta namely: Taglu, Parsons Lake, and Niglintgak.

**Commencement of Construction** — To include the clearing of vegetation, ground-breaking and other forms of right-of-way and station site preparation that may have an effect on the environment, but does not include activities associated with normal surveying operations or data collection activities.

**Decision to Construct** — With respect to each portion of the Facilities, the earliest of the date on which (i) the Owners make an unconditional decision to proceed with construction of such portion; or (ii) all conditions of a decision by the Owners to proceed with construction have been satisfied or waived for such portion; or (iii) all necessary Regulatory Authorizations for the commencement of construction of such portion have been received and physical construction activities thereon have actually commenced. For purposes of this definition, physical construction activities do not include surveying activities, environmental, archaeological and geotechnical investigations, data gathering and other activities of a similar investigative nature, and preparation of staging areas.

**decommissioning** — The steps that would be taken at the end of the operating life of any specific facility to permanently remove that facility from service, including steps to ensure the safety of the facility, to mitigate any anticipated environmental impacts, and to reclaim the biophysical environment. **Expansion Capacity Scenario** — The pipeline is being designed with the potential, with the installation of 11 additional compressor stations and other facilities, to expand from an initial capacity of 1.2 Bcf/d to an expansion capacity of 1.8 Bcf/d. This Expansion Capacity Scenario would proceed only if additional natural gas fields, other than that of the Anchor Fields, were discovered, developed and put into production, probably involving parties other than, or at least in addition to, any of the Proponents.

**Government Response** — The response to the Panel's Report by the Government of Canada that is required under the provisions of the *Canadian Environmental Assessment Act* and for which there is provision in the *Mackenzie Valley Resource Management Act*.

**Leave to Open** — The date of the granting of leave by the National Energy Board to open the Mackenzie Valley Pipeline, as required under the provisions of the *National Energy Board Act* (or the issuance of an order by the NEB exempting the MVP from that requirement).

**Mackenzie Gathering System** — That portion of the Facilities comprised of the proposed natural gas gathering system consisting of gathering lines from the outlet of the gas conditioning facilities at each of the Anchor Fields to and including a gas processing facility in the vicinity of the Town of Inuvik and including the Natural Gas Liquids Pipeline, together with all related temporary and permanent infrastructure located in the Northwest Territories, as any of them may be modified (including through the addition of compression), replaced, repaired, expanded or improved from time to time.

**Mackenzie Valley Pipeline** — That portion of the Facilities comprised of the proposed natural gas transmission pipeline or pipelines from the outlet of the gas processing facility in the vicinity of the Town of Inuvik to northwestern Alberta, together with all related temporary and permanent infrastructure located in the Northwest Territories, as they may be constructed, modified (including through the addition of compression), replaced, repaired, expanded or improved from time to time.

**Natural Gas Liquids Pipeline** — That portion of the Mackenzie Gathering System comprised of the proposed liquids line from the outlet of the gas processing facility in the vicinity of the Town of Inuvik to an interconnection with an existing pipeline at Norman Wells, together with all related temporary and permanent infrastructure located in the Northwest Territories, as they may be constructed, modified, replaced, repaired, expanded or improved from time to time.

**Northwest Alberta Facilities** — Facilities to be constructed in northwest Alberta to connect the Mackenzie Valley Pipeline to the existing pipeline system operated by NOVA Gas Transmission Ltd.

**Other Future Scenarios** — Scenarios going beyond the Expansion Capacity Scenario of the Mackenzie Valley Pipeline.

**Project as Filed** — The Project as defined by the Joint Review Panel for the purposes of its review. It comprises the following elements:

- development of and production from the three Anchor Fields at a rate of 830 Mcf/d (0.83 Bcf/d), together with the other components of the Mackenzie Gathering System;
- the Mackenzie Valley Pipeline, with three compressor stations, one heater station and associated facilities, with a capacity of 1.2 Bcf/d; and
- the Northwest Alberta Facilities.

The Project as Filed also provides for the possibility of future expansion as it includes, among other things, installing block valves at the locations of the 11 additional compressor stations.

**Project Review Area** — The term “Project Review Area” is a generic term established by the Panel for use in this report to describe the area that encompasses the subject matter referred to in comments and submissions from participants in the Panel’s proceedings. While it may overlap areas covered by the terms ‘Project Area’, ‘Project Study Area’, ‘Regional Study Area’ and ‘Local Study Area’ that were developed and used by the Proponents in their EIS, “Project Review Area” is not to be confused with those terms. Although the focus is primarily related to the western NWT, Yukon and northwest Alberta, the subject matter considered during the Panel’s review, in some cases extended beyond that area. As such the Project Review Area is not a single geographic area with a fixed geographical boundary. It is a term of convenience that is context sensitive and has no legal status.

**Proponents** — The proponents of the Mackenzie Gas Project are: Imperial Oil Resources Limited, Imperial Oil Resources Ventures Limited, ConocoPhillips Canada (North) Limited and ConocoPhillips Northern Partnership, ExxonMobil Canada Properties, Shell Canada Limited and Mackenzie Valley Aboriginal Pipeline Limited Partnership (generally referred to as the Aboriginal Pipeline Group, or APG).



# ABBREVIATIONS AND ACRONYMS

AB	Alberta	DFN	Dehcho First Nations
ACIA	Arctic Climate Impact Assessment	DFO	Fisheries and Oceans Canada
AEUB	Alberta Energy and Utilities Board	DGGDC	Deh Gah Go'tie Dene Council
ANC	Alternatives North Coalition	DHC	Dehcho Harvesters Council
APG	Aboriginal Pipeline Group	DPA	Development Plan Approval
ARD	Acid Rock Drainage	DTFN	Dene Tha' First Nation
ASEP	Aboriginal Skills and Employment Partnership	EC	Environment Canada
BACI	Before-After-Control-Impact Approach	ECNO	Ecology North
BDR	Beaufort Delta Region	ECO <sub>2</sub>	Equivalent CO <sub>2</sub> units
BTEX	benzene, toluene, ethylbenzene and xylene	EIA	environmental impact assessment
CAC	criteria air contaminant	EIS	Environmental Impact Statement
CAN	Canada	EL	Exploration Licence
CAPP	Canadian Association of Petroleum Producers	EMAB	Environmental Monitoring Advisory Board
CARC	Canadian Arctic Resources Committee	ENR	Department of Environment and Natural Resources, GNWT
CBC	Canadian Broadcasting Corporation	EPP	environmental protection plan
CCME	Canadian Council of Ministers of the Environment	EPR	emergency preparedness and response
CEAA	Canadian Environmental Assessment Agency	ERCB	Alberta Energy Resources Conservation Board
CEAA, CEA Act	<i>Canadian Environmental Assessment Act</i>	EUB	Alberta Energy and Utilities Board
CEAM	Cumulative Effects Assessment and Management	FJMC	Fisheries Joint Management Committee
CEAMF	Cumulative Effects Assessment and Management Framework	GCF	Gas Conditioning Facility
CH	Community Hearing	GDP	Gross Domestic Product
CIMP	Cumulative Impacts Monitoring Program	GEN	General Letter of Comment
CN Rail	Canadian National Railway Company	GH	General Hearing
CO	carbon monoxide	GHG	greenhouse gas
CO <sub>2</sub>	carbon dioxide	GLJ	Gilbert Laustsen Jung Associates Ltd.
COGOA	<i>Canada Oil and Gas Operations Act</i>	GLWB	Gwich'in Land and Water Board
COSEWIC	Committee on the Status of Endangered Wildlife in Canada	GNWT	Government of the Northwest Territories
CPAWS	Canadian Parks and Wilderness Society	GRRB	Gwich'in Renewable Resources Board
CPCN	Certificate of Public Convenience and Necessity	GSA	Gwich'in Settlement Area
CPCNL	ConocoPhillips Canada (North) Limited	GTC	Gwich'in Tribal Council
CSA	Canadian Standards Association	H <sub>2</sub> S	hydrogen sulphide
DAS	Dehghah Alliance Society	HADD	harmful alteration, disruption or destruction of fish habitat
DCR	Dehcho Region	HC	Health Canada
		HCVA	High Conservation Value Area
		HDD	horizontal directional drilling.

HT	Hearing Transcript	N <sub>2</sub> O	nitrous oxide
HTC	Hunters and Trappers Committee	NC	Nature Canada
IAF	Inuvik Area Facility	NEB	National Energy Board
IBA	Important Bird Area	NEB Act	<i>National Energy Board Act</i>
ICC	Inuvik Community Corporation	NGL	natural gas liquid
ICC	industrial and commercial centre	NGO	Non-Governmental Organization
IEMA	Independent Environmental Monitoring Agency	NGPS	Northern Gas Project Secretariat
IFA	<i>Inuvialuit Final Agreement</i>	NGTL	NOVA Gas Transmission Ltd.
IGC	Inuvialuit Game Council	No.	number
ILA	Inuvialuit Land Administration	NO <sub>2</sub>	nitrogen oxide
INAC	Indian and Northern Affairs Canada	NO <sub>x</sub>	oxides of nitrogen
IORL	Imperial Oil Resources Limited	NPPL	Northern Pipeline Projects Ltd.
IORVL	Imperial Oil Resources Ventures Limited	NPS	nominal pipe size
IRC	Inuvialuit Regional Corporation	NRCan	Natural Resources Canada
ISDM	Integrated Service Delivery Model	NOTAM	Notice to Airmen
ISO	International Standards Organization	NRTEE	National Roundtable on the Environment and the Economy
ISR	Inuvialuit Settlement Region	NSMA	North Slave Métis Alliance
ITI	Industry Trade and Investment, department of GNWT	NT	Northwest Territories
JRP	Joint Review Panel for the Mackenzie Gas Project	NTCL	Northern Transportation Company Limited
JRPA	Joint Review Panel Agreement	NW	Northwest
KCAC	Keeping Clean Areas Clean	NWML	Northwest Mainline
KIBS	Kendall Island Bird Sanctuary	NWT	Northwest Territories
KPIA	<i>Kyoto Protocol Implementation Act</i>	NWTCC	Northwest Territories Chamber of Commerce
LMCI	Land Matters Consultation Initiative	NWT-PAS	Northwest Territories Protected Areas Strategy
LNG	liquefied natural gas	NWTWB	Northwest Territories Water Board
LSA	Local Study Area	OPS	Operational Policy Statement issued by the Canadian Environmental Assessment Agency
Mac	Mackenzie	PAI	Pacific Analytics Inc
MACA	Department of Municipal and Community Affairs, GNWT	PFOTP	Pipeline Facilities Operations Training Program
Mack	Mackenzie	PM	particulate material
MGP	Mackenzie Gas Project	PWNHC	Prince of Wales Northern Heritage Centre
MGPIF	Mackenzie Gas Project Impacts Fund	Q.C.	Queen's Counsel
MGS	Mackenzie Gathering System	RCMP	Royal Canadian Mounted Police
MOU	Memorandum of Understanding	RLE	Regional Legal Entity
MVEIRB	Mackenzie Valley Environmental Impact Review Board	ROW	right-of-way
MVLWB	Mackenzie Valley Land and Water Board	RRC	Renewable Resources Council
MVP	Mackenzie Valley Pipeline	RSA	Regional Study Area
MVRMA	<i>Mackenzie Valley Resources Management Act</i>	RWED	Department of Resources, Wildlife and Economic Development, GNWT
		RWG	Regional Working Group
		SARA	<i>Species at Risk Act</i>

SCC	Sierra Club of Canada	TDLC	Tulita District Land Corporation
SCL	Shell Canada Limited	TFF	Territorial Formula Financing
SDL	significant discovery license	TH	Technical Hearing
SEA	Socio-Economic Agreement between the GNWT and the Mackenzie Gas Project	TK	Traditional Knowledge
SEAB	NWT Oil and Gas Socio-Economic Advisory Board	TOR	Terms of Reference
SEIA	socio-economic impact assessment	TS/GH	Topic Specific General Hearing
SEIF	Socio-Economic Impact Fund	TSS	Total Suspended Solids
SKDB	Sambaa K'e Dene Band	V	Volume
SLWB	Sahtu Land and Water Board	VC	valued component
SRD	Department of Sustainable Resource Development, Alberta	VEC	valued ecosystem component
SSA	Sahtu Settlement Area	VLM	very large modules
STI	sexually transmitted infection	WMAC(NWT)	Wildlife Management Advisory Council (Northwest Territories)
SWC	Status of Women Council of the NWT	WMR	Wright Mansell Research Ltd.
TC	Transport Canada	WWF	World Wildlife Fund Canada
TCPL	TransCanada PipeLines Limited	YHR	Yellowknife/Hay River

## SYMBOLS, WEIGHTS AND MEASURES

\$	dollar(s)	kHz	kilohertz
%	percent	km	kilometre(s)
<	less than	kt	kilotonne(s)
>	greater than	km <sup>2</sup>	square kilometers
°C	degree(s) Centigrade	kt/a	kilotonnes per annum
µg/m <sup>3</sup>	micrograms per cubic metre	L	litre(s)
Bcf/d	billion cubic feet per day	L/d	litres/day
Btu	British thermal unit	L <sub>eq</sub>	energy-equivalent sound level
cf	cubic feet	m	metre(s)
cf/d	cubic feet per day	M	million(s)
cf/s	cubic feet per second	m <sup>3</sup>	cubic metres
cm	centimetre(s)	m <sup>3</sup> /d	cubic metres per day
dB	decibel(s)	m <sup>3</sup> /s	cubic metres per second
dba	A-weighted decibel(s)	MBtu/d	million British thermal units per day
G	Giga (= billion or 10 <sup>9</sup> )	mcf	thousand cubic feet
g/GJ	grams per gigajoule	mcf/d	thousand cubic feet per day
GJ	gigajoule	Mcf/d	million cubic feet per day
GJ/a	Gigajoules per annum	mg/L	milligrams per litre
Gm <sup>3</sup>	billion cubic metres	ML	million litres
ha	hectare	mm	millimetre
kg	kilogram(s)	Mm <sup>3</sup>	million cubic metres

Mm <sup>3</sup> /d	million cubic metres per day	PM <sub>2.5</sub>	respirable particulate matter smaller than 2.5 microns in diameter
Mpa	megapascal(s)	t	tonne(s)
Mt	million tonne(s)	T	trillion(s)
MW	million watt(s)	t/a	tonnes per annum (tonnes per year)
pH	measure of acidity/alkalinity	Tcf	trillion cubic feet
PM <sub>10</sub>	particulate matter less than or equal to 10 microns		

