

Mackenzie Valley Environmental Impact Review Board

Report of Environmental Assessment

On the

Paramount Resources Ltd.

Liard East Drilling Project

September 5, 2001

Mackenzie Valley Environmental Impact Review Board
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Executive Summary

The Mackenzie Valley Environmental Impact Review Board (Review Board) has been guided by the principles outlined in Sections 114 and 115 of the *Mackenzie Valley Resource Management Act* (MVRMA or Act) throughout this environmental assessment (EA). These include the need to protect the environment from significant adverse impacts, and to protect the social, cultural and economic well being of residents and communities in the Mackenzie Valley.

Having considered the views and concerns of the participants in this process, and the evidence on the public registry, the Review Board made its decisions according to section 128 of the *Mackenzie Valley Resource Management Act*.

The Review Board concludes, based on the analysis provided, that the proposed development will not likely cause a significant adverse impact on the environment.

For the consideration of the Mackenzie Valley Land and Water Board, the Review Board recommends that:

1. Land use permit and water license conditions reflect the commitments made by Paramount in their Environmental Assessment Report as well as the other documentation that has been submitted.
2. The recommendations made by the Review Board and their technical reviewers in this report are also considered during the development of land use permit and water license conditions.

To make its decision, the Review Board has relied upon the information in Paramount's Environmental Assessment Report (EAR), the additional environmental reports submitted by Paramount, the technical reports provided by reviewers and all of the other information on the public registry. The Review Board fully expects Paramount to discharge all of the mitigative measures described in its EAR and other documentation. If these mitigative measures are not implemented, the Review Board's conclusions about impact significance will be affected.

Mackenzie Valley Environmental Impact Review Board
September 5, 2001

Table of Contents

1	Development Description.....	4
2	Physical Environment.....	6
3	Socio-Economic, Political And Regulatory Environment	7
4	Regulatory History of the Proposed Development.....	8
5	Summary of the Environmental Assessment Process.....	10
5.1	Scoping Process.....	10
5.1.1	Scope of the Development.....	10
5.1.2	Scope of the Assessment.....	12
5.2	Work Plan and Terms of Reference.....	14
5.3	Conformity Analysis.....	15
5.4	Technical Analysis.....	15
5.5	Development Impact Boundaries.....	16
5.6	Determining Significance	16
6	Review Board Conclusions and Recommendations	17
6.1	Public Consultation.....	17
6.1.1	Conclusions.....	18
6.1.2	Recommendations.....	18
6.2	Environmental Considerations in the Development Design.....	18
6.2.1	Conclusions.....	19
6.2.2	Recommendations.....	19
6.3	Accidents and Malfunctions	19
6.3.1	Conclusions.....	20
6.3.2	Recommendations.....	20
6.4	Alternatives.....	20
6.4.1	Conclusions.....	21
6.4.2	Recommendations.....	21
6.5	Air Quality and Climate.....	21
6.5.1	Conclusions.....	23
6.5.2	Recommendations.....	23
6.6	Water Quality and Quantity	23
6.6.1	Conclusions.....	24
6.6.2	Recommendations.....	24
6.7	Wildlife and Wildlife Habitat	24
6.7.1	Conclusions.....	25
6.7.2	Recommendations.....	25
6.8	Socio-Economics	25
6.8.1	Conclusions.....	26
6.8.2	Recommendations.....	26
6.9	Land and Resource Use	26
6.9.1	Conclusions.....	26
6.9.2	Recommendations.....	27
6.10	Cumulative Impacts	27
6.10.1	Conclusions.....	27
6.10.2	Recommendations.....	27
6.11	Abandonment and Restoration.....	27
6.11.1	Conclusions.....	28
6.11.2	Recommendations.....	28
6.12	Follow-up Programs.....	28
6.12.1	Conclusions.....	28
6.12.2	Recommendations.....	28
7	Review Board Environmental Assessment Decision.....	30

1 Development Description

The Liard East Drilling Project actually consists of three developments that have been combined for the purpose of completing the EA. These three developments are:

Arrowhead To access one of two wellsites in the Arrowhead area, (C-51 or G-51) in the winter, using existing cut-lines where possible. To set up a work camp and a drill rig, supported by about 20 people and equipment, for about 40 days, for the purposes of drilling an exploratory well. The subject well, if successful, to be production tested, and then, to cap the well and rehabilitate the site. The testing, if required, involves intermittent flaring of sour gas for a period of two weeks.

Bovie Lake North To access two wellsites (specific locations to be determined) in the Bovie Lake North area in the winter, using existing cut-lines where possible. To set up two camps and drilling operations supported by about 20 people and equipment each, for about 40 days, for the purposes of drilling two exploratory wells. The subject wells, if successful, to be production tested, and then, to cap the wells and rehabilitate the sites. The testing, if required, involves intermittent flaring of sour gas for a period of two weeks.

East Fort Liard/Bovie To access eight existing wellsites and wellbores, to access one new wellsite (J-54), and to access up to five future potential wellsites (specific locations to be determined), using existing cut-lines where possible. To set up a new camp and drilling operations supported by about 20 people and equipment for each new drilling site, for about 40 days per well, for the purposes of drilling exploratory wells. The subject wells, if successful, to be production tested, and then, to cap the wells and rehabilitate the sites. The testing, if required, involves intermittent flaring of sour gas for a period of two weeks.

On January 25, 2001, the Review Board decided that the wells with unknown locations would be excluded from this environmental assessment (see Reasons for Decision, issued January 26th, 2001). This decision meant that the two wells in the Bovie Lake North development and the 5 future potential wells in the East Fort Liard/Bovie developments were excluded from the Liard East EA.

Therefore, the principal development activities were reduced to:

- A new well at C-51 or G-51;
- A new well at J-54; and
- Work at eight existing wells (P-57, M-23, N-65, N-60, C-02, O-15, C-76 and K-74).

In separate letters to the Review Board dated February 9th and February 12th, Paramount requested that the final Work Plan and Terms of Reference be amended to:

- Include the 2 wells in the Bovie Lake North Development. Paramount had determined exact locations for these two wells (F-66 and J-76).
- Exclude the existing well C-02. Paramount intended to complete work at C-02 under an existing land use permit.

The Review Board solicited comments from other parties in the EA and met on February 15th to discuss the requests and the comments that had been received. The Review Board decided to approve both amendment requests. Therefore, the principal development activities for this EA are:

Report of Environmental Assessment on the Paramount Resources Liard East Drilling Project

Mackenzie Valley Environmental Impact Review Board

- New wells at J-54, F-66, J-76 and either C-51 or G-51; and
- Work at seven existing wellsites and wellbores (P-57, M-23, N-65, N-60, O-15, C-76 and K-74).

2 Physical Environment¹

The development lies to the east and north of Fort Liard. The Liard River and Liard Highway No. 7 are west of the area. The Liard Valley and surrounding region falls within the geological sub-division known as Taiga Plains Ecozone and the ecological sub-division known as the Northern Alberta Uplands ecoregion.

The region surrounding Fort Liard is comprised of two major physiographic divisions, the Canadian Cordillera to the west and the Interior Plains to the east. The development is located in the Interior Plains, which are comprised of broad lowlands and plateaus shaped by major rivers.

The Liard Valley was filled with glacial deposits during the last continental glaciation comprised mainly of silty tills and boulders. The glacial till is overlaid with a thin silt deposit. Upland slopes are mainly loamy glacial till. Areas of low relief have poor surface drainage creating ponds and fens. Permafrost is discontinuous with low ice content.

A number of different forest cover types exist: white spruce and balsam poplar, with some white birch (alluvial flats); jack pine, lodgepole pine and trembling aspen (upland, sandy soils); black spruce and tamarack (lower, wetter sites). Between 25-50% of the ecoregion is covered by wetlands, which support open stands of stunted black spruce with some white birch and various shrub species.

Characteristic wildlife species include moose, black bear, beaver, red fox, wolf, lynx, marten, mink, snowshoe hare, red squirrel, bald eagle, chickadees, ravens, redpolls and Canada jays. Common fish species include northern pike, grayling, walleye, burbot, suckers, whitefish and minnow species. Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2000) species include wood bison (threatened), grizzly bear (special concern), woodland caribou (threatened), wolverine (special concern), peregrine falcon (threatened), short-eared owl (special concern) and yellow rail (special concern).

The Liard Valley area is characterized by short, warm and moist summers and long, cold winters. Cold arctic air influences the area for most of the year. The ecoregion is classified as having a subhumid high boreal ecoclimate. Spring break-up of the Liard River generally occurs in early May while freeze-up occurs in mid-November. The frost-free period averages 95 days.

¹ This description was obtained from the documentation provided by Paramount.

3 Socio-Economic, Political And Regulatory Environment²

The entire development is situated on Crown lands within the Deh Cho region of the Northwest Territories. The local and regional aboriginal and community organizations have a role in reviewing the development applications and providing advice to regulators. The Deh Cho First Nations and the Government of Canada have completed an Interim Measures Agreement (IMA), which defines the roles and responsibilities of the aboriginal organizations in regulating and planning development in the region. The IMA is recognition of the continuing consultations being undertaken on land, resources and governance issues in the region that will culminate with the Deh Cho Final Agreement.

Traditional land use, including hunting, fishing and trapping, occurs throughout the development area. The Bovie Lake Exclusion Area, which has several cabins adjacent to the lake, is located at the southern end of the area. The nearest cabin is approximately 5 km south of the Bovie wells.

Industrial activity in the area has primarily been related to oil and gas developments although some timber harvesting has occurred along the Liard Highway north of Fort Liard.

The development will require Land Use Permits and Water Licenses from the Mackenzie Valley Land and Water Board (MVLWB), authorizations from the National Energy Board (NEB) to drill or alter the wells and a benefit plan approved by Indian and Northern Affairs (INAC). Upon the completion of this environmental assessment by the Review Board, the development will re-enter the land use permitting and water licensing process at the MVLWB.

Other regulatory agencies involved in the development approvals process include Fisheries and Oceans Canada, the Government of the Northwest Territories and Environment Canada.

² This description was primarily obtained from the documentation provided by Paramount.

4 Regulatory History of the Proposed Development

Paramount Resources Ltd. submitted applications on August 10 and 11, 2000 for Type 'A' Land Use Permits (LUPs), and Type 'B' Water Licenses to the MVLWB to undertake three developments: Arrowhead, Bovie Lake North and East Fort Liard/Bovie.

On October 18, 2000, the MVLWB referred the Arrowhead and Bovie Lake North developments to the Review Board, in accordance with ss.126 (1) of the MVRMA, citing the following reasons for the referral,

Because of the potential for cumulative effects associated with the development including flaring and venting of gases during production testing and the proximity of the project to traditional hunting and fishing areas the applications are referred to the MVEIRB.

The Review Board was required by s.126 of the MVRMA to conduct an EA of the developments. The Review Board decided on October 30, 2000 to combine the Arrowhead and the Bovie Lake North developments into one EA.

On November 30, 2000, the MVLWB referred the East Fort Liard/Bovie development to the Review Board, in accordance with ss.126 (1) of the MVRMA, citing the following reasons for the referral,

- *Exact quantities of H₂S and SO₂ that would be released into the environment as a result of incomplete combustion or venting of gases from this development proposal are unknown.*
- *The potential for deposition of waste from noncombusted gases released from flaring/venting operations in relation to the project area and proposed operations were not documented.*
- *The scope of the proposed development did not document when flaring or venting be required and with what frequency.*
- *The application did not outline what the maximum allowable limits of H₂S and SO₂ emissions would be as a result of flaring activities.*
- *Levels of all other contaminants that can be released into and potentially contaminate the environment from project flaring or venting operations are unknown.*

On December 8, 2000, the Review Board decided to combine the East Fort Liard/Bovie development with the other two developments and named the overall development the Liard East Drilling Project.

The Review Board is responsible for the assessment of the environmental, socio-economic and cultural impacts of the proposed development according to Part 5 of the *Mackenzie Valley Resource Management Act*. The Review Board is required by s.126 of the MVRMA to conduct an EA of the development proposal and must conduct the EA in accordance with subsection 117(2). The Review Board is also required to prepare and submit its report of environmental assessment in accordance with ss.128 (2), a decision under ss.128 (1), and written reasons, required by s.121, to the Federal Minister of INAC.

The Review Board has completed its environmental assessment of the development. The Board considered the benefits of the proposed development to the residents of the Mackenzie Valley and Canada in light of the possible environmental effects of the development and the public concerns expressed during the environmental assessment process.

Mackenzie Valley Environmental Impact Review Board

As part of the environmental assessment, the Review Board considered the following:

- The Environmental Assessment Report (EAR) for the development, submitted on May 28, 2001;
- Information Requests and responses; and
- All other information contained in the public registry established for this assessment.

A complete list of the contents of the public registry and the documents considered during the preparation of this report is available from the Mackenzie Valley Environmental Impact Review Board.

This report constitutes the reasons for decision of the Review Board and the report of environmental assessment and recommendations required by the Act.

5 Summary of the Environmental Assessment Process

This section of the report explains the methodology used during the environmental assessment process.

5.1 Scoping Process

The Review Board must determine the scope of the development pursuant to ss. 117(1) as well as the scope of the environmental assessment. The Review Board makes these determinations on the basis of documents and comments submitted during the development of the Work Plan and Terms of Reference for the EA.

5.1.1 Scope of the Development

The scope of the development includes those components of the proposed development that will be included for consideration in the environmental assessment. The scope of development takes into account the principal and accessory development activities.

Principal Development

The principal development activities are:

- Drill 4 new wells at known locations (J-54, F-66, J-76 and either C-51 or G-51).
- Continued access to seven existing well sites (P-57, M-23, N-65, N-60, O-15, C-76 and K-74).

The new (if drilling is successful) and existing wells will be production tested and capped. The testing, if required, will involve the intermittent flaring of gas for a period of two weeks. The drilling, completing and testing of wells involves the tasks listed in Table 1.

Table 1 – Well Drilling, Completing and Testing Activities

Move in and set up drilling equipment
Drill well
Move out drilling equipment
Wait for service rig to be available
Move in service rig
Conduct wellbore operations to prepare it for perforation
Perforate the zone of interest
Run a static gradient to acquire initial parameters
Stimulate the zone
Move out service rig
Initial flow back of gas and stimulation fluids to clean up the zone to allow for accurate evaluation of the zone
Run electronic recorders into the well to conduct an evaluation of the reservoir through production testing of the well
Flow test the well to determine economics of project development by evaluating reservoir parameters including: <ul style="list-style-type: none"> - Permeability - Effectiveness of wellbore stimulation - Well deliverability - Potential reservoir size
The length of the production test is determined by: <ul style="list-style-type: none"> - Threshold reserves required for the project development; and - Any declining performance seen during production testing.
Intermittent flaring
Shut in the well to acquire pressure build-up information
Pull recorders and install suspension plug

The list of activities in Table 1 was compiled with the assistance of, and with information provided by, Paramount Resources Ltd.

Accessory Developments and Activities

The completion of the principal activities requires additional developments and activities to be undertaken. They include the following:

- Prepare winter roads to the well sites, including required ice crossings. Existing cut-lines will be used where possible;
- Clear and prepare well and camp sites;
- Set up a work camp and a drill rig, supported by about 20 people and equipment, for about 40 days for each well; and
- Any other use of the environment in support of or in conjunction with the principal developments or other accessory developments and activities.

5.1.2 Scope of the Assessment

The scope of the assessment is the determination of which items will be examined during the environmental assessment. In determining the scope of assessment, the Review Board was conscious of its obligation under ss.117(2) of the MVRMA to consider:

- the impact of the development on the environment, including the impacts of malfunctions or accidents that may occur in connection with the development and any cumulative impact that is likely to result from the development in combination with other developments;
- any comments submitted by members of the public;
- any other matter determined to be relevant.

After considering the information placed on the public registry, the Review Board decided on the following scope of assessment:

Physical and Biological Environment

Air Quality and Climate

air quality

release of air contaminants (dust, particulate exhaust fumes and other air contaminants)

Terrain

surficial geology

bedrock or soils

Vegetation and Plant Communities

local plant communities

rare or highly valued species

long-term, direct and indirect, habitat loss or alteration

Water Quality and Quantity

water quality impacts including contaminant loading and dispersion (including surface runoff and airborne contaminants)

water quantity impacts

Aquatic Resources and Habitat

aquatic organisms and their habitat

Wildlife and Wildlife Habitat

wildlife

wildlife habitats

migratory birds

vulnerable or endangered Wildlife in Canada, (COSEWIC) list

Noise

Changes to ambient noise levels

Continuous exposure versus acute noise

Human Environment

Cultural and Heritage Resources

Places of cultural, spiritual and/or archaeological significance

Socio-Economics

Income

Employment

Local Business Opportunities

Community Quality of Life

Land and Resource Use

Traditional land use and occupation

Existing land use and occupation

Wilderness outfitting including commercial and sport fishing

Availability, abundance and quality of wildlife, fish and vegetation for harvesting

Recreational activities

Mackenzie Valley Environmental Impact Review Board

Protected areas
Visual and Aesthetic Resources
Visual and aesthetic
Design components that mitigate visual and aesthetic impacts.

Cumulative Impacts

Natural environment
Socio-economic and cultural environment

Other Relevant Matters

Developer Identification and Performance Record
Tenure
Regulatory Regime
Environmental Assessment Methodology
Public Consultation
Environmental Considerations in the Development Design
Accidents and Malfunctions
Alternatives
Abandonment and Restoration
Follow-up Programs

Using information already on the Public Registry concerning the development, the Review Board undertook an evaluation to determine which items in the scope had already been adequately addressed by the developer and which items needed to be addressed.

The information used for this evaluation consisted of the following:

- The water license and land use applications for the development;
- The MVLWB's preliminary screening reports and the reasons for referral;
- *Environmental Report for the Fort Liard East Drilling Program 2000/2001* by Golder Associates dated August 2000;
- *Environmental Report for the C-51 or G-51 Drilling Program 2000/2001* by Golder Associates dated August 2000;
- *Environmental Impact Assessment for the 1998/99 Fort Liard Exploratory Drilling Project* by Golder Associates dated December 1998;
- *Environmental Impact Assessment for the Fort Liard Exploratory Drilling Project* by Golder Associates dated December 1997;
- Preliminary screening report for well C-76 by DIAND dated December 17, 1996; and
- Preliminary screening report for well N-60 by DIAND dated October 27, 1997.

Table 2 summarizes the Review Board's evaluation of the available environmental information. A "Yes" indicates that the Review Board adopted the available environmental information to satisfy its requirements. A "No" indicates that Paramount had to address the requirement in its submission to the Review Board.

The Review Board provided the other EA participants the opportunity to comment on this approach during the consultation period on the draft Terms of Reference.

Table 2 – Summary Evaluation of Available Environmental Information

Scope of the Assessment	Existing Information Acceptable?
Environmental Assessment Methodology	Yes
Public Consultation	No
Environmental Considerations in the Development Design	No
Accidents and Malfunctions	No
Alternatives	No
Existing Environment	
- Air Quality and Climate	No
- Terrain including Soil and Bedrock	Yes
- Vegetation and Plant Communities	Yes
- Water Quality and Quantity	No
- Aquatic Resources and Habitat	Yes
- Wildlife and Wildlife Habitat	Yes
- Cultural and Heritage Resources	Yes
- Socio-Economics	No
- Land and Resource Use	Yes
- Noise	Yes
- Visual and Aesthetic	No
Potential Impacts and Predicted Residual Impacts after Mitigation	
- Air Quality and Climate	No
- Terrain including Soil and Bedrock	Yes
- Vegetation and Plant Communities	No
- Water Quality and Quantity	No
- Aquatic Resources and Habitat	No
- Wildlife and Wildlife Habitat	No
- Cultural and Heritage Resources	Yes
- Socio-Economics	No
- Land and Resource Use	No
- Visual and Aesthetic	No
Cumulative Impacts	
- Natural Environment	No
- Socio-Economic and Cultural Environment	No
Abandonment And Restoration	Yes
Follow-Up Programs	No

On May 28, 2001, Paramount submitted an EA report that addressed each item with a “No” in Table 2. This report also included an Executive Summary that encompassed the previous environmental information accepted by the Review Board as well as the new information included in the EA report.

5.2 Work Plan and Terms of Reference

The Work Plan established the milestone dates and identified the Review Board’s expectations for the completion of the environmental assessment. The Terms of Reference detailed the scope of development and scope of assessment and provided directions to Paramount and others regarding their roles, responsibilities and deliverables in the EA process.

Upon receiving the EA referral for the Arrowhead and Bovie Lake North developments, the Review Board initiated consultations for the preparation of the Work Plan and Terms of Reference. On Nov. 23, 2000, draft versions of both documents were released for public comment on the documents as a whole but specifically on the timeline, scope of development, scope of assessment and directions to Paramount. The documents

Mackenzie Valley Environmental Impact Review Board

were placed on the Review Board's public registry and web site and were distributed to government, First Nations and others.

On November 30, 2000, the MVLWB referred the East Fort Liard/Bovie development to the Review Board. On December 8, 2000, the Review Board decided to combine the East Fort Liard/Bovie development with the other two developments and named the overall development the Liard East Drilling Project.

On January 9, 2001, revised drafts of the Work Plan and Terms of Reference for the overall development were released with comments requested by January 19th.

The Review Board considered all comments received and other available information, finalized the Work Plan and Terms of Reference on January 31st and distributed them on February 1st. As a result of amendment requests by Paramount and a 3-month delay by Paramount in submitting their EA report, the Review Board had to issue amended final versions of the Work Plan and Terms of Reference on June 1, 2001.

5.3 Conformity Analysis

Paramount completed its EA Report (EAR) on the basis of the ToR and submitted the report to the Review Board on May 28, 2001. The Review Board undertook a conformity analysis to ensure that Paramount had provided the information requested in the Terms of Reference. The Government of the Northwest Territories (GNWT), Environment Canada (EC) and Indian and Northern Affairs Canada (INAC) submitted conformity comments. On June 15th, Paramount submitted responses to the conformity comments that were submitted by the government departments. They also responded to the Review Board's concern that the issue of alternatives to well site sizes was not addressed in the EA report.

After considering the comments received from government and the responses from Paramount, the Review Board decided that the EA submission by Paramount was not in conformity in three areas: baseline air quality data was not provided, baseline water quality and quantity data was not provided and baseline socio-economic data was not provided. The Review Board issued a deficiency statement on July 2nd that noted that the air and water data would be obtained through Paramount's responses to a couple of the Information Requests submitted by the GNWT. The deficiency statement instructed Paramount to provide the baseline socio-economic data that was missing.

The requested socio-economic information and the IR responses on the air and water quality issues were supplied by Paramount in a July 9th letter to the Review Board. With that submission, the Review Board determined that Paramount conformed to the requirements of the Terms of Reference and closed the conformity analysis.

5.4 Technical Analysis

A technical analysis of Paramount's EA report was initiated concurrent with the conformity analysis and was co-ordinated by the Review Board staff. The analysis included opportunities for regulatory authorities (RA's), expert advisors, First Nations, communities, the public and other interested parties to ask questions of the developer and present their information to the Review Board. The objective of this phase of the EA was to find and focus on unresolved or unclear issues, and to provide the Review Board with the additional information that would contribute to its decision.

Information exchange during the technical analysis occurred primarily through the use of Information Requests (IRs)³. The IRs helped to facilitate the technical analysis of the proposed development by allowing parties to formally request additional or clarifying information of any other party. Ten IRs were approved and

³ Information requests are an interrogatory in the form of written questions and answers.

Mackenzie Valley Environmental Impact Review Board

issued by the Review Board and directed to Paramount. Three of the IRs originated with the GNWT, 4 were from Environment Canada and 3 were from the Review Board itself. Paramount responded to each IR in a July 9th letter to the Review Board.

Technical analysis reports were submitted to the Review Board by each of INAC, EC and the GNWT.

5.5 Development Impact Boundaries

The ToR did not specify the spatial or temporal boundaries to be used when considering the maximum zone of influence or the duration and occurrence of impacts of the proposed development. The Review Board expects this determination of appropriate boundaries to be made by the proponent.

Paramount described the spatial and temporal boundaries that they used for their cumulative effects assessment in Section 17.1 of their EA report. Paramount selected an area of over 350,000 hectares that they considered was appropriate to encompass all of the potential impacts resulting from this development as well as any potential future developments. Paramount selected their temporal boundaries to include the impacts of past and current developments, developments that have been approved and developments that could potentially occur in the near future.

The Review Board is of the opinion that the boundaries established by Paramount are appropriate. The Review Board also notes the lack of any critical comments from reviewers on the selection of the boundaries and concludes that the reviewers were satisfied.

5.6 Determining Significance

Section 128 of the MVRMA requires the Review Board to decide, based on the evidence provided, whether or not a development will have a significant adverse impact or significant public concern and report their conclusion to the federal Minister and the designated regulatory agency. Where a secondary source of evidence is provided, the sources should be appropriately referenced. In this process, the Review Board has no objection to the proponent or others applying professional judgement or to the use of previously completed reports. In fact, these process efficiencies are encouraged as long as the basis for the conclusion is documented, the expertise applied is identified and, if possible, the person and/or source of information responsible for the conclusion is also identified.

For the Review Board to make the decision required by Section 128, submissions to the Review Board that propose a mitigation measure should detail the effect that the mitigation measure will have on the impact that it is meant to mitigate. In other words, it is the Review Board's view that it should, under ss.117 (2) of the MVRMA, be advised of the significance of an impact without mitigation and then receive a careful explanation of the effect mitigation will have in reducing that impact.

In determining impact significance, the Review Board considers the following factors:

- magnitude
- geographic extent
- timing
- duration
- frequency
- irreversibility of impacts; and
- probability of occurrence and confidence level.

The Review Board notes that Paramount considered similar significance factors in the preparation of their EA report. The Review Board also notes the lack of any comments from reviewers on the process of determining significance.

6 Review Board Conclusions and Recommendations

Section 4 of the Terms of Reference provided instructions to Paramount on the issues/items that should be included in the EA Report. However, as noted in Section 3 of the ToR, the information requested in the ToR was meant to address issues/items that had not been addressed in the existing environmental documentation that was adopted by the Review Board as constituting a portion of Paramount's total EA submission.

All of the information submitted concerning the items in the scope of the assessment are on the Public Registry and is available for public access. This report discusses only those issues/items that generated comments from reviewers or are deemed by the Review Board to warrant explanation in this report.

Each of the following sections includes:

- the instructions provided in the Terms of Reference, if any;
- a summary of Paramount's submission;
- a summary of comments received from technical reviewers;
- Review Board conclusions; and
- Review Board recommendations, if any.

The Review Board's conclusions and recommendations are based upon a consideration of all of the information listed on the public registry.

6.1 Public Consultation

Paramount shall summarize consultations undertaken with the municipal governments and aboriginal groups in the region, listing any concerns that were raised and detailing how these concerns were addressed.

Paramount states that their consultations with the community of Fort Liard have been on-going for several years. Paramount has participated in meetings with the band Chief and the band council and has established a pre-determined weekly contact time with the Chief's designated representative to review any issues and/or comments. Other activities have included hosting an Elder's luncheon and an Open House, meetings with the local Metis leadership and flights of the development area with community members.

Some issues that were raised by the community members were possible impacts on trappers and campers in the area of the development. Paramount has agreed to communicate with trappers and campers to ensure that impacts on their activities are minimized.

Possible impacts on water quality were raised as a concern. Paramount discussed the mitigation measures that would be used to prevent water contamination and also explained how the spill contingency plan would be employed in the event of a spill.

Paramount has provided community members with information on goods and services that will be required during the life of the development and also discussed education, employment and training initiatives.

Information from the community regarding traditional sites has been incorporated by Paramount into the project design when selecting access road and well site locations to ensure that these sites are not disturbed.

Paramount's consultations with the Nahanni Butte band and the Deh Cho First nation have been non-project specific.

Mackenzie Valley Environmental Impact Review Board

None of the comments submitted by reviewers provided any analysis of the public consultation efforts undertaken by Paramount.

6.1.1 Conclusions

The Review Board accepts the communication and consultation effort undertaken by the proponent. In the Review Board's view, the efforts made by Paramount were sufficient to ensure that the potentially impacted communities have had the opportunity to make known any concerns regarding the development.

6.1.2 Recommendations

The Review Board does not have any recommendations.

6.2 Environmental Considerations in the Development Design

Paramount shall describe how environmental considerations were incorporated into the design of the development.

Paramount stated in their EA report that environmental factors were considered during the selection of preferred access routes, drilling locations and techniques. Environmental factors that were considered included identifying sensitive areas related to air quality, hydrology, terrain, soils, vegetation, wildlife, fisheries, heritage resources and land use. The project planning involved identifying the sensitivities through community consultations and environmental assessments. Mitigation criteria (listed in the EA report) were developed during the finalizing of the project design to minimize or avoid disturbances. The environmental conditions of the general region as well as the site-specific conditions were a key consideration during the planning process to limit disturbance.

INAC commented that they were pleased with the fairly comprehensive list of criteria employed by Paramount to minimize environmental disturbance. They recommended that consideration also be given to climate change issues, in the context of flaring.

The GNWT noted that there was some uncertainty over Paramount's ability to complete the project under frozen ground conditions as one of the criteria listed by Paramount states "*Complete the Project during winter, under frozen ground conditions, to the extent practical.*" The GNWT states that a winter program would reduce impacts on terrain, wildlife and water quality.

The GNWT expressed concern that Fort Liard community solid waste facility may not be large enough to accommodate the volume of non-combustible waste that Paramount would be sending to the landfill. They recommend that Paramount should seek permission from the community to dispose of non-combustible waste at the community's solid waste site.

The GNWT notes that in Paramount's response to the Review Board's Information Request #1, Paramount states that "*Depending upon the topography, and the potential for off-lease migration of spilled and/or leaked material, a berm of snow or subsoil may have to be constructed on the low-side of the lease.*" The GNWT believes that the most effective way to mitigate issues concerning contaminated runoff water is to construct a diversion berm around the entire lease to prevent runoff water from entering the facility and thereby effectively preventing degradation of habitat adjacent to the lease as a result of contaminated runoff water. The GNWT recommends that Paramount construct berms around the entire leases.

6.2.1 Conclusions

The Review Board believes that the proponent has sufficiently considered environmental factors during the development design.

6.2.2 Recommendations

The Review Board recommends that the Mackenzie Valley Land and Water Board (MVLWB) take under consideration the recommendations made by the GNWT when the MVLWB is developing the land use permit and water license conditions for this development.

6.3 *Accidents and Malfunctions*

Paramount shall report on the probability, potential magnitude, potential environmental impacts and contingencies to deal with possible development accidents and malfunctions.

Paramount describes the company policies that are in place to prevent the occurrence of accidents and malfunctions. However, they acknowledge that there is an inherent potential for accidents or malfunctions to occur during drilling and well evaluations, either from mechanical failure or human error.

Paramount made inquiries into incident rates with the Alberta Energy and Utilities Board (AEUB) and determined that, in 1999-2000, there was a 0.05% incident rate for a blow-out or gas blow during well drilling and a 0.08% incident rate for blow-outs and gas blows during well completions. Based on this data, Paramount concludes that the potential for accidents or malfunctions during drilling and well evaluations for the Liard East development is very low.

Paramount inquired with the AEUB, Alberta Workplace Health and Safety, Canadian Association of Petroleum Producers (CAPP), PSAC and the Alberta government regarding accidents and malfunctions related to flaring during well evaluations. No information was available. Paramount continues to state that most impacts related to accidents or malfunctions during flaring would typically be expected to be negative in direction, local in extent, of low magnitude, short in duration and could be reversed in the short term. Although there is the potential of a high magnitude impact such as human injury or forest fire, Paramount believes that the procedures in place minimize the potential of an event occurring to a point where it is considered to be not significant.

Paramount states that an emergency response plan, including spill contingencies, will be in place and rigorously enforced. All contractors will have safety training and certification along with health and safety plans and procedures. The equipment and set-up will be checked for safety on a routine basis by the safety supervisor.

Environment Canada is satisfied that Paramount has suitable spill contingency plans filed with the MVLWB and the National Energy Board (NEB). EC recommends that the plans be regularly updated to guarantee that any new operations or materials on site are adequately covered by the plans.

The GNWT recommends that a site-specific spill contingency plan be supplied to itself and the MVLWB for review prior to the commencement of operations. The GNWT states that the plan should include the items listed in Section 4(2) of the Spill Contingency and Reporting Regulations.

INAC agrees with Paramount that accidents and malfunctions are inherent to and occur during operations such as drilling, well evaluation and flaring. INAC states that the implementation of standard terms and conditions for drilling operations may be sufficient to mitigate such events. INAC also recommends that appropriate contingencies plans be maintained.

6.3.1 Conclusions

The Review Board concludes, based on the analysis provided, that the preventive mitigation measures proposed by Paramount are sufficient to ensure that the proposed development will not likely have a significant adverse impact due to accidents and malfunctions.

6.3.2 Recommendations

The Review Board recommends that the MVLWB ensure to the extent of its jurisdiction, through the use of permit and license conditions, that Paramount fulfils the commitments made in the EA report, including the imposition of safety training and adherence to established procedures to ensure a safe work environment. The MVLWB should also consider the recommendations made by the GNWT, EC and INAC concerning spill contingency plans.

6.4 Alternatives

Paramount shall provide an explanation of the alternatives to the principal and accessory parts of the development, such as an explanation of the alternatives to flaring during flow testing and options to reduce well site clearing sizes.

In their EA report, Paramount discussed alternatives to flaring during well evaluations and alternatives to the selected wellsite size.

In discussing alternatives to flaring, Paramount discussed in-line testing, venting, incineration and flaring. Paramount asserts that flaring is the superior alternative for the situation of completing well evaluations in a remote area away from any pipelines. Flaring maximizes the environmental protection while at the same time allowing flexibility for flow rates during the evaluation.

INAC notes that each alternative is suitable for specific circumstances. They state that since flaring can be both an environmental and safety concern, they recommend that the best alternatives be implemented. However, they fail to state what they feel is the best alternative.

In their discussion on well site size alternatives, Paramount listed the factors that they considered when selecting the sizes and stated that to safely complete the project, each well site had to be a minimum size of 110 meters x 110 meters. The Review Board found that Paramount's discussion on well site size alternatives was too brief. Paramount supplied additional information on June 15th but the Review Board did not feel that the submission provided the level of detail that the Board wanted and did not provide the quantitative justification that the Board wanted to see. The Review Board issued an Information Request to Paramount to acquire a more substantial response. Paramount replied with a much more detailed response on July 9th.

The Review Board was satisfied that Paramount's July 9th submission provided substantial justification for their requested well site sizes. The overriding factor cited by Paramount that prevented size reductions was the requirement to comply with regulations that specify minimum distances between equipment, the well, the flare, combustible material and other items contained on the well site. These regulations are in place to ensure a safe work environment and to prevent accidents. While the Review Board agrees with these considerations, the Review Board is also of the opinion that minimizing environmental impacts and efficiency of land use should be factors that are considered when selecting well site sizes.

The Review Board notes that Paramount has conceded that, depending upon the circumstances encountered, it may be possible to support a lease size of 110 m x 90 m. The Review Board also notes that Paramount will evaluate the use of non-square (i.e. rounded corners) sites.

The Review Board contacted the National Energy Board, the Alberta Energy and Utilities Board, Alberta Environment and the British Columbia Oil and Gas Commission regarding the selection of well site sizes. None of these bodies have regulations or guidelines that require developers to look at ways to reduce well site sizes in forested areas. The primary focus of each of them is to ensure that well sites are large enough to permit a safe work environment.

6.4.1 Conclusions

The Review Board is satisfied with the information presented by Paramount to justify their use of flaring and the selection of their well site sizes.

6.4.2 Recommendations

The Review Board recommends that the MVLWB require a well site layout for each well prior to Paramount clearing any land for the well drilling activities. This layout should demonstrate how Paramount is complying with applicable safety regulations and should also demonstrate how Paramount is taking into consideration the principles of minimizing environmental impacts and employing land use efficiency.

6.5 Air Quality and Climate

Paramount shall report the impacts of the proposed development on air quality. All well test flaring must comply with the NWT one-hour air quality standard for sulphur dioxide (450 µg/m³). The analysis shall include a discussion of efforts taken to minimize the release of any air contaminants and to mitigate the impacts of any emissions. This analysis should include:

- I. Provide reports from preliminary sampling that estimate gas composition. What is the hydrogen sulphide and the carbon dioxide content of the gas? Provide an estimate of the emission rates of hydrogen sulphide, sulphur dioxide, carbon dioxide and volatile organics.*
- II. Provide details about the equipment that will be used for the test burn including the flare stack size, stack combustion efficiency and the anticipated gas flow rates during tests including the maximum rates. Describe the efficiency of flare combustion under various stable and unstable meteorological conditions*
- III. Discuss the potential accidental releases or venting of unburned gases and describe steps that will be used to prevent these releases.*
- IV. Discuss the meteorology and climatology of the area including parameters that would affect the dispersal of pollutants such as wind speed, wind direction and atmospheric stability. Describe efforts to obtain the representative meteorological data that would be needed for dispersion modeling of air emissions in a complex terrain.*
- V. Conduct dispersion modeling in compliance with recognized guidelines such as the Alberta Energy and Utilities Board Guide 60.*
- VI. Discuss baseline air quality conditions including a discussion of emissions from other existing and proposed sources within the region.*
- VII. Discuss ambient ground-level concentrations of sulphur dioxide and hydrogen sulphide that could results during the well tests.*

Mackenzie Valley Environmental Impact Review Board

Paramount provided a significant level of detail in their EA report describing the baseline weather conditions in the area, flare efficiencies, air quality criteria, dispersion modelling and predicted air quality impacts, however, only the predicted air quality impacts will be discussed here.

Paramount predicted the maximum ground level sulphur dioxide (SO₂) concentrations from any of the individual wells under various atmospheric stability situations and for each of the four seasons. The maximum value was obtained for well M-23 and was 260.3 µg/m₃, which is approximately 58% of the Northwest Territories' maximum allowable 1-hour SO₂ concentration of 450 µg/m₃.

Paramount also predicted the maximum ground level hydrogen sulphide (H₂S) and nitrogen dioxide (NO₂) concentrations to be 2.8 µg/m₃ (well M-23) and 5.7 µg/m₃ (well M-23), respectively. These values are well within their respective maximum allowable 1-hour concentrations of 14 µg/m₃ and 400 µg/m₃, respectively.

To assess potential cumulative impacts, Paramount estimated the SO₂ emissions from other regional sources combined with the simultaneous output from its two wells (N-60 and K-74) that are closest to the other regional sources. The combined maximum ground level concentration that would result from the regional sources was predicted to be 227.7 µg/m₃, approximately 51% of the maximum allowable concentration of 450 µg/m₃.

In a response to an Information Request from the GNWT, Paramount presented the modelling results for comparison with the 24-hour maximum concentrations for SO₂ and H₂S. All of the wells were below the 24-hour maximum for H₂S. M-23 was the only well that was above the 24-hour maximum for SO₂. Paramount notes that the 24-hour predictions are a function of the volume of gas flared at the site. They state that maintaining the volumes flared at less than 75% of maximum would ensure that the 24-hour maximum concentration of SO₂ would not be exceeded.

The GNWT reviewed the information provided by Paramount and was satisfied that the air quality impacts were properly modelled. The GNWT notes that conservative assumptions were employed and that the GNWT agrees with Paramount that no significant impacts on air quality will result provided that the commitments made by Paramount are employed. The GNWT notes that in Paramount's July 9th Information Request responses, they state that the stacks used will be 25 m in height. The GNWT states that this stack height should be used in order to meet air quality standards. The GNWT also notes that flare gas volumes should be controlled to ensure that the standards are met.

The GNWT recommends that a recent gas analysis should be obtained to verify the amount of SO₂ that will be flared. The GNWT also recommends that if the H₂S content of the gas is found to exceed 50 moles of H₂S per kilomole of gas, then Paramount should be required to suspend operations and revise the air quality modelling. The analysis conducted should be supplied to the MVLWB and the GNWT.

The GNWT recommends that if the flaring activities are demonstrated to be having an impact on the environment or if a concern with flaring is raised, Paramount should install air monitoring equipment to record contaminant deposition rates and ambient air quality.

INAC states that Paramount has provided sufficient documentation for the assessment of air quality during operation but that the impact of flaring on climate change should also be considered.

EC is satisfied that the air quality modelling and the environmental impact predictions provided by Paramount are realistic. EC agrees with Paramount that these predictions indicate that the impacts of flaring will be minor and short-lived.

6.5.1 Conclusions

The Review Board concludes, based on the analysis provided, that the preventive mitigation measures proposed by Paramount are sufficient to ensure that the proposed development will not likely have a significant adverse impact on air quality.

6.5.2 Recommendations

The Review Board recommends that the MVLWB ensure, through the use of permit and license conditions, that Paramount fulfils the commitments made in the EA report, including the use of a 25 meter minimum flare stack height and controlling flare gas volumes, to keep air emissions below the air quality standards. The MVLWB should also consider the recommendations made by the GNWT.

6.6 Water Quality and Quantity

Paramount shall provide baseline water quality and quantity data and discuss possible development impacts, including potential impacts on water quality due to flaring/venting. Paramount shall also discuss mitigation methods and predicted residual impacts.

Paramount notes in their EA report that baseline water quality data is typically not collected as this water is used for drilling and road construction/maintenance only. Potable water will be trucked into the camps. However, Paramount does note that, typically, these smaller lakes are slightly acidic in their natural condition.

Paramount notes that potential impacts to water quality would be related to a potential increase in siltation during pumping and contamination from spills and/or leaks. These potential impacts would be mitigated by using mechanically sound equipment and drilling a hole in the ice that is in deep enough water to ensure that the suction from the hose does not disturb the lake or streambed.

Paramount notes that the deposition of acidic compounds such as SO₂ and NO₂ can have an effect on water bodies that are highly sensitive to acidic inputs, resulting in a lower pH. However, the results of the air quality modelling indicate that no acid deposition impacts are predicted to occur.

Paramount notes that there is a potential for spills and/or leaks to occur during drilling of the wells and, depending upon the location, there is a potential for off-site migration. To limit the potential of this occurring, the well site will be at least 100 m away from water bodies and snow berms will be constructed as appropriate. They note that the cold winter temperatures will also help to contain any spilled or leaked material. They also note that they will have waste disposal and spill contingency plans in place prior to project initiation. The predicted residual impact related to spill contamination of water bodies is negative, local, short- to medium-term in duration, low in magnitude, reversible in the short- to medium-term, unlikely to happen, and considered to be not significant.

In response to an Information Request from the GNWT that requested water quality data, Paramount responded that the data is not currently available, as the water source locations have not been finalized. The final water source for a given well will be determined immediately prior to the well being drilled. To acquire the requested data, Paramount commits to collecting water samples from the final water sources immediately before use and again immediately after ice-out.

The water quantity impacts will be related to the amount of water in the water body selected and the amount of water required for the drilling and road construction/maintenance. The water sources will be selected based on ease of access and proximity to the drilling site and the determination that the water source holds

Mackenzie Valley Environmental Impact Review Board

adequate water volumes so that the extraction of the required volumes will not result in impacts to fish habitat. Paramount will calculate the projected drawdown of water bodies and ensure that the drawdown is minimized to protect aquatic habitat. In the event that a suitable water body is not available or the drawdown effect could jeopardize aquatic habitat, a well will be drilled for the water supply. Paramount notes that the proposed water source lakes have been used in the past with no impacts noted. The predicted residual impacts are predicted to be local, short-term in duration, low in magnitude and reversible in the short- to medium-term. The predicted residual impacts are predicted to be not significant.

The GNWT is satisfied with the submission and commitments by Paramount. The GNWT recommends that approval of the water source locations should be obtained from the Land Use or Water License Inspector prior to any water being removed.

INAC notes that spills and leaks can be adequately mitigated by an approved contingency plan and standard permit and license terms and conditions. They also note that it would be in Paramount's best interests to initiate a water quality data collection program in the area in preparation for future development.

EC notes that Paramount has committed to carrying out background water quality monitoring to verify their prediction of no significant adverse impacts. Provided that the precautions and mitigation efforts described in the EA report and supporting documents are applied, EC concurs with Paramount that project effects on water quality will likely be minimal.

6.6.1 Conclusions

The Review Board concludes, based on the analysis provided, that the proposed development will not likely have a significant adverse impact on water quality and quantity.

6.6.2 Recommendations

The Review Board recommends that the MVLWB ensure, through the use of permit and license conditions, that Paramount fulfils the commitments made in the EA report, including the collection of water samples and calculations of projected draw-down, to maintain water quality and quantity. The MVLWB should also consider the recommendation made by the GNWT.

6.7 Wildlife and Wildlife Habitat

Paramount shall describe potential impacts on wildlife and wildlife habitat due to flaring/venting and discuss mitigation methods and predicted residual impacts.

Paramount predicts that no direct impacts on wildlife are expected to occur as a result of the emissions associated with the well evaluations planned as part of the project. As there were no direct impacts predicted on vegetation or water quality due to flaring, they anticipate that there will not be any indirect impacts on wildlife due to flaring.

Disturbances due to noise and light will result in larger wildlife species such as lynx and caribou avoiding areas of activity. The distance of avoidance is expected to be in the range of 250 to 1000 meters. This impact is expected to be mitigated by the low densities and large home ranges of these species. Smaller species are not expected to be as impacted as the larger species. It is expected that species will return to the area after the work has been completed.

Other potential impacts are habitat loss/alteration and fragmentation and increased human access to the area. Mitigation used will be avoiding key habitat, using existing trails and cutlines as much as possible, limiting

Report of Environmental Assessment on the Paramount Resources Liard East Drilling Project

Mackenzie Valley Environmental Impact Review Board

well site sizes to that required for safety considerations and maintaining all activities within surveyed leases and rights-of-way. The residual impacts are expected to be negative, local, short-term in duration, of low magnitude, can be reversed in the short- to medium-term, likely to occur and considered to be not significant.

There is the potential that some of the well evaluations could be completed during the summer months with equipment transported to the site by helicopter. In this case, the well evaluation activities may overlap with the breeding, nesting or rearing period of migrant species that utilize the project area on a seasonal basis. Based on the scope of the project and the limited time period of the test, Paramount predicts that disturbance due to noise and light for migrant birds would be localized and minimal, lasting the length of the test only and not significant.

The GNWT agrees with Paramount that the residual impacts to wildlife and habitat are not significant.

EC restricted its review to assessing the impacts of flaring on migratory birds. EC agrees that the impacts on migratory birds due to flaring would be not significant. However, EC notes that Paramount states that some well evaluations may occur in the summer during the breeding, nesting or rearing period of migrant species, resulting in disturbance due to noise, light and smoke associated with flaring and other activities. EC strongly recommends that the proponent complete all of the work in the winter season to minimize direct disturbance of migratory birds.

6.7.1 Conclusions

The Review Board concludes, based on the analysis provided, that the proposed development will not likely have a significant adverse impact on wildlife and wildlife habitat.

6.7.2 Recommendations

The Review Board recommends that the MVLWB ensure, through the use of permit and license conditions, that Paramount fulfil the commitments made in the EA report and other documentation to avoid impacts to wildlife and wildlife habitat. The MVLWB should also consider the recommendation made by EC.

6.8 Socio-Economics

Paramount shall provide details on the existing socio-economic environment and discuss potential development effects. This should include information such as identifying the local businesses that will be involved in the project, the likely increase in local employment, implications for community quality of life effects as well as the documentation and details behind any other predicted socio-economic effects and mitigation measures. A specific item to be addressed is the potential impact of flaring/venting on human health along with a discussion of mitigation methods and predicted residual impacts.

Paramount has consulted with community leaders and members of Fort Liard during the project design. This consultation identified the following potential impacts, both positive and negative, that may occur as a result of the project:

- Employment and contracting opportunities for northerners and northern business;
- Increased interaction with the communities;
- Short-term increased utilization of existing businesses and services;
- Continued accessibility to hunting and gathering areas for traditional land users;
- Short-term increased demands on local construction capabilities and skilled labor resources;
- Population increases in the region in the short term; and
- Potential minimal impact to traditional land uses such as trapping, hunting, fishing and gathering.

Mackenzie Valley Environmental Impact Review Board

Paramount concludes that the predicted overall socio-economic effects are positive and sub-regional, but short-term, low in magnitude and considered to be not significant.

INAC and EC note that Paramount has provided a commitment to developing a mutually beneficial relationship with the Fort Liard Band Council, the community members and local contractors. INAC and EC both conclude that although the socio-economics of the proposal will be of a short-term nature, it will be positive at the local level.

6.8.1 Conclusions

The Review Board concludes, based on the analysis provided, that the proposed development will not likely have a significant adverse impact on the socio-economic environment.

6.8.2 Recommendations

The Review Board does not have any recommendations.

6.9 *Land and Resource Use*

Paramount shall discuss the potential impacts of the proposed development on land and resource use along with potential mitigation methods and residual impacts.

To mitigate potential impacts to land and resource use, Paramount will do the following:

- Maintain communications with the Fort Liard Band to keep them apprised of locations and timing of the project activities;
- Avoid sensitive areas identified by the community;
- Utilize existing disturbance corridors for access to the extent practical;
- Limit the amount of clearing to that required to safely complete the drilling and evaluation;
- Leave the skidoo trails open when they intersect access;
- Leave game trails unblocked; and
- Restrict activity within approved leases and rights-of way.

Paramount will also contact trappers to review the project, identify concerns and discuss mitigative measures. If these traplines are affected by the drilling and evaluation activities, the trappers will be compensated for any demonstrable loss.

Paramount predicts that the only residual impact to land and resource use would be related to easier access into the project area by way of the winter road. This impact is considered to be positive, localized in extent, low in magnitude, could be reversed in the short-term and likely to happen. This potential residual impact is considered to be not significant.

INAC states that the mechanism for compensating trappers should be addressed.

The GNWT agrees that increased access into the area will result. However, they believe that the improved access may increase hunting pressure on game species. The GNWT believes that this issue is best resolved at the community level and recommends that Paramount consult with the community to examine any concerns with improved access and to develop mitigative measures if necessary.

6.9.1 Conclusions

The Review Board concludes, based on the analysis provided, that the proposed development will not likely have a significant adverse impact on land and resource use.

Report of Environmental Assessment on the Paramount Resources Liard East Drilling Project

6.9.2 Recommendations

The Review Board recommends that the MVLWB ensure, through the use of permit and license conditions, that Paramount fulfils the commitments made in the EA report and other documentation to avoid impacts to land and resource use. The MVLWB should also consider the recommendations made by EC and INAC.

6.10 Cumulative Impacts

Paramount shall analyze and report on the cumulative impacts of the development. This assessment should include impacts as a result of production testing (flaring) and/or venting.

Paramount intends to complete the drilling and well evaluation activities in a manner that minimizes the potential for cumulative effects by using conscientious construction and operation standards, mitigation plans and emergency response plans. All potential residual impacts are predicted to be not significant.

INAC states that it has not been indicated whether or not the flaring of the seven existing wells, in addition to the testing of the proposed wells, may have a significant impact on air quality.

The GNWT states that direct cumulative impacts should be minimal to both habitat and wildlife.

EC recommends that Paramount include the potential pipeline in their assessment of the cumulative effects of this project because the construction of the gathering facilities and pipeline are necessary for further development of the area. As such, EC feels that they should be considered reasonably foreseeable developments and included in cumulative effects assessment.

6.10.1 Conclusions

The Review Board concludes, based on the analysis provided, that the proposed development, in conjunction with other developments, will not likely have significant adverse cumulative impacts.

The Review Board disagrees with Environment Canada regarding the inclusion of the gathering facilities and pipeline in the cumulative effects assessment. For the Board's purposes, the gathering facilities and pipeline do not constitute reasonably foreseeable developments because they are not in the permitting stage with any government or regulatory body.

6.10.2 Recommendations

The Review Board does not have any recommendations.

6.11 Abandonment and Restoration

Abandonment and restoration was not listed as an item in the Terms of Reference because it was addressed by Paramount in previous documentation.

Paramount will move all equipment, material and other debris from the project area to Fort Liard. All sites will be stabilized and reclaimed to a condition that will mitigate residual impacts, promote re-vegetation and not impair pre-disturbance land use activities. Snow pads will be scoured and scraped as necessary to ensure that no impact occurs to the ground surface following the thawing of the pad. Drilling and camp sumps will be restored in a manner consistent with land use permit conditions. Borrow pits will be recontoured and/or terraced as necessary to promote site stability and all cuts and fills will be backsloped to a slope ratio of not less than 3:1 or as required in land use or quarry permits. If required, downhole abandonment will be according to NEB requirements immediately following drilling operations.

Mackenzie Valley Environmental Impact Review Board

EC correctly notes that this EA actually covers several other reports besides the EA report that was submitted in response to the Terms of Reference. Paramount provided an Abandonment and restoration plan to cover well sites and access roads with the report *Environmental Assessment for the 1998/99 Fort Liard Exploratory Drilling Project*. EC considers this plan and any other commitments made in the EA report or other reports by the proponent to be binding.

The GNWT suggests that the well site and access roads should be treated to minimize soil compaction in order to enhance revegetation and that the areas should be revegetated with local seed stock. The GNWT recommends that Paramount should undertake proactive abandonment and restoration of their leases. They also recommend that the Regional Resources, Wildlife and Economic Development (RWED) office should be contacted to develop an appropriate revegetation plan for the project.

6.11.1 Conclusions

The Review Board concludes, based on the analysis provided, that Paramount has provided adequate information on how they will abandon and restore the project area.

6.11.2 Recommendations

The Review Board recommends that the MVLWB ensure, through the use of permit and license conditions, that Paramount fulfils the commitments made in the EA report and other documentation to properly abandon and restore the project area. The MVLWB should also consider the recommendations made by the GNWT.

6.12 Follow-up Programs

Paramount shall describe the follow-up programs that will be used to assess the actual impacts of the development on the environment as well as assess the performance of the mitigation methods that were employed.

Paramount will initiate an inspection program, which may include an aerial inspection, to determine the success of natural revegetation and erosion control. If deemed necessary, erosion prone areas would be seeded to promote stability.

Paramount will complete a gas analysis for each well that is evaluated to confirm that the air quality and dispersion modelling is valid.

Community concerns and socio-economic issues will be monitored through continued community consultations.

INAC states that Paramount's inspection program seems to be adequate for the scale of the project.

The GNWT expects Paramount to continue revegetation efforts until the vegetation has been successfully re-established.

6.12.1 Conclusions

The Review Board concludes, based on the analysis provided, that Paramount has provided adequate information on their follow-up programs.

6.12.2 Recommendations

The Review Board recommends that the MVLWB ensure, through the use of permit and license conditions, that Paramount fulfil the commitments made in the EA report and other documentation to complete follow-up programs. The MVLWB should also consider the suggestion made by the GNWT.

Report of Environmental Assessment on the Paramount Resources Liard East Drilling Project

7 Review Board Environmental Assessment Decision

The Review Board concludes, based on the analysis provided, that the proposed development will not likely cause a significant adverse impact on the environment.

For the consideration of the Mackenzie Valley Land and Water Board, the Review Board recommends that:

1. Land use permit and water license conditions reflect the commitments made by Paramount in the Environmental Assessment Report as well as the other documentation that has been submitted.
2. The recommendations made by the Review Board and their technical reviewers in this report are also considered during the development of land use permit and water license conditions.

To make its decision, the Review Board has relied upon the information in Paramount's Environmental Assessment Report (EAR), the additional environmental reports submitted by Paramount, the technical reports provided by reviewers and all of the other information on the public registry. The Review Board fully expects Paramount to discharge all of the mitigative measures described in its EAR and other documentation.

If these mitigative measures are not implemented, the Review Board's conclusions about impact significance will be affected.

Attachment 1 – Commitments Made by Paramount

All conditions listed in the Land Use Permits and Water Licenses from the MVLWB will be adhered to. In addition, Paramount has made numerous commitments in its documentation. The Review Board expects that Paramount will fulfill all of these commitments. Some of these commitments are listed below.

General

- The development will occur under frozen ground conditions in the winter months.
- All combustible garbage will be burned daily in a diesel-fired incinerator on site.
- Metals, plastics and other wastes will be contained in bins for removal to appropriate disposal locations.
- Secured storage containers for fuels, filters, used motor oil and special handling wastes will be placed in a garbage bin with a tank for containing oils.
- Trash will be disposed of at an approved landfill site and waste oils taken to an approved recycling or disposal facility.
- Good housekeeping practices will be enforced in the camps.
- Following camp closure, all equipment, garbage, wastes and structures will be removed and the sump backfilled and compacted.
- Stationary storage tanks will be bermed and the dike and floor area will be lined with an impermeable liner to capture any inadvertently released product.
- All fuel storage tanks will be located on a well-drained and stable area, away from wetlands, channels, or other hydrological features.
- Vehicles and machinery will not be refueled within 100 m of the watercourse crossing sites.
- Vehicles will be checked for oil and fuel leaks that could find their way into streams.
- Absorbent pads and/or socks will be available to pick up any spilled fuel.
- Above ground tanks will be used to store hydrocarbon contaminants for transportation to an approved disposal location.
- Machinery, vehicles and other equipment will be equipped with emission and noise control devices.
- Waste disposal and emergency response plans will be in place.
- Contractors will have safety training and certification.
- Equipment and the set-up will be checked on a routine basis by the safety supervisor.
- Drilling and camp sumps will be restored in a manner suitable to regulators.
- All disturbed sites will be visited in early summer when the snow has gone to check that clean-up was complete and to re-seed disturbed areas as necessary. A seed mix appropriate for the area will be used.

Snow Roads and Water Crossings

- A buffer zone of 100 m will be maintained between roads and water bodies (except at water crossings).
- Road slash will be windrowed along the edge of the right-of-way but not into adjacent timber.
- Snow road construction will be consistent with the methodology and guidelines identified by the GNWT's Department of Transportation.
- Timber salvage will occur if required by the Land Use Permit.
- Only clean snow and ice are to be used for construction of water crossings.
- The approaches of compacted snow and ice will be constructed of sufficient thickness to protect the stream or riverbanks.
- The ice bridges will not interfere or impede water flows in any stream.
- Ice thickness and strength will be measured frequently to ensure the load-bearing capacity of the ice is capable of handling vehicle loads.
- Any equipment or debris that enters the water will be immediately removed with measures taken to contain any pollutants.
- Crossings will be removed completely or a "V" notched will be placed in the middle of the crossing to

Mackenzie Valley Environmental Impact Review Board

allow flow.

- If necessary, at the end of the season, the road approaches will be stabilized and revegetated and berms will be constructed to divert run-off and reduce erosion.
- Borrow pit slopes will be re-contoured to a stable profile (backsloped) and the salvaged topsoil/organic material replaced.

Well Sites

- Only the minimal area necessary to safely allow the drilling operations will be cleared.
- The potential of using a non-square lease will be evaluated for environmental advantages.
- Any timber deemed to be salvageable or merchantable will be handcut and decked on the edge of the lease sites.
- A compacted snow pad will be used to level micro-relief variations to the maximum extent feasible.
- The potential for run-off will be reduced through the use of berms on the low side of the leases.
- If access is on the low side of the lease, the access shall go over and not through the berm.
- A buffer zone of 100 m will be maintained between well sites and water bodies.
- The compacted snow pads will be scoured and scraped as necessary to ensure that no impact occurs to the ground surface following thawing of the pad.
- Any non-producing sites will be reclaimed and associated equipment transported out of the area immediately following drilling operations.

Flaring

- The Alberta Energy and Utilities Board's (AEUB's) Guide 60 will be adhered to.
- Flaring volumes will be controlled to ensure that NWT air quality standards are not exceeded.
- A gas analysis will be completed for each well that is evaluated to confirm that the flaring modeling is valid.

Wildlife

- A wildlife survey will be done before construction.
- Company personnel will not be allowed to hunt.
- No dogs or firearms will be allowed.
- Eight-meter wide breaks will be created every 250 m in snow piles and windrows to facilitate movement of wildlife.
- Snow piles will not exceed a height of 60 cm.
- Drivers will be instructed to maintain safe and appropriate speeds and to be aware of potential encounters with wildlife.
- Drivers will not herd or chase animals down the road and, as an avoidance measure, will be advised to stop and turn headlights off for a moment, to allow animals to disperse off the road.
- Large trees containing nests will not be knocked down unless it is unavoidable.
- If a bear den is encountered, the local GNWT Renewable resources officer will be notified.
- GNWT bear safety literature will be distributed to staff.
- Kitchen sumps will be treated with lye or lime to render them unattractive to wolverines.

Land and Resource Use

- Every effort will be made to avoid destroying traps or snares during construction of access routes.
- The GNWT renewable resources officer and the Fort Liard Band Council will be kept informed of project scheduling.
- Trappers that have set lines in the project area will be contacted. If these traplines are affected by the development, the trappers will be compensated for any demonstrable loss.
- Snowmobile trails and game trails will not be blocked.

Mackenzie Valley Environmental Impact Review Board

- Activity will be restricted within approved leases and rights-of-way.

Socio-Economics

- A benefits plan will be implemented with the community of Fort Liard, including training and education.
- Meetings will continue to be held with the communities of Fort Liard and other stakeholders.
- First consideration will be given to qualified residents for employment and training.
- Qualified local businesses will be invited to bid on contracts.

Fish and Water

- The projected drawdown of source waterbodies will be calculated prior to their use to ensure that aquatic habitat will not be damaged.
- The suction hose will not disturb the lake or stream bed.
- Water pumps with intake screens of 5 mm will be used to prevent potential entrainment of overwintering fish.
- Water samples will be collected prior to using a water body and after ice-out. The test results on these water samples should be submitted to the MVLWB.