Paramount resources ltd.

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tel 403 290 3600 fax 403 262 7994

January 16, 2004

Mackenzie Valley Environmental Impact Review Board
Box 938
5102 – 50 Avenue
Yellowknife, NT
X1A 2N7

Attention: Kimberley Cliffe-Phillips

Dear Ms. Cliffe-Phillips:

Re: Environmental Assessment EA03-005
Cameron Hills Extension, Information Responses, Round Two 1 - 130

With reference to the subject environmental assessment, the attached document contains Paramount Resources Ltd. responses to Mackenzie Valley Environmental Impact Review Board round two information requests 1 through 130.

Paramount is distributing copies of these Responses as outlined in the attached distribution list. Please contact Shirley Maaskant at (403) 290-3618 should you require additional information.

Yours truly,

PARAMOUNT RESOURCES LTD.

S. Maaskant

Shirley Maaskant, Regulatory & Community Affairs Coordinator

Encl:
12 copies IR Responses
1 map 1.2.114 Buffers for the Terrestrial Study Area
1 CD pdf file of map 1.2.114
1 map for IR 1.2.130 satellite image
1 CD pdf file of map for 1.2.130
1 Canada Benefits Plan 1991
1 Benefits Plan Update & Submission March 2001
1 Annual Report July 2002 – June 2003
1 Annual Report July 2001 – June 2002

Cameron Hills EA 03-005
IR Responses round two 1 – 130

Distribution List

Organization	Individual	Method of Delivery
MVEIRB (12)	Kimberley Cliffe-Phillips	Air courier
Salmo Consulting	Terry Antoniuk	Local courier
Deh Cho First Nation	Herb Norwegian	Air courier
Mandell Pinder	Gillian Calder	Air courier
Ka'a'Gee Tu First Nation	Lloyd Chicot	Hand Delivered by Paramount
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GNWT	Gavin More	Air courier

IR Number 1.2.1 (Source: GNWT)

Preamble

According to the public registry, [http://www.sararegistry.gc.ca/gen_info/HTML/approach_e.cfm] the Species at Risk Act (SARA), *was passed by Parliament on December 12, 2002. It is coming into force in three phases. The first phase resulted in changes to other related federal laws that were amended through the legislative process enacting SARA. These amendments came into force on March 24, 2003.*

As of June 5, 2003, two-thirds of the SARA sections came into effect. A comprehensive listing process for species at risk was established and attached as Schedule 1 to the Act. The development of Recovery strategies for threatened species initially listed as Wildlife Species at Risk Schedule 1 must be prepared by June 5, 2007 (within 4 years). In addition, any projects requiring an environmental assessment under federal law that are likely to affect a listed species or its critical habitat need to identify the adverse effects, and, if the project goes forward, steps must be taken to avoid or lessen those effects and to monitor them.

The transitional stages for implementing SARA will be complete on June 1, 2004 when the remaining sections, covering the SARA prohibitions, including critical habitat protection, and enforcement of the law come into force.

Given the lack of definition of the impact of SARA on a current development that covers two jurisdictions, the GNWT believe that all parties would benefit from a clear understanding of SARA and its obligations.

Request

The MVEIRB asks Environment Canada to provide the following information:

Clarify the meaning of the legislation in terms of:

a) *The interpretation of Environment Canada in the applicability of SARA to existing or planned developments within the Northwest Territories.*

b) *The application of Section 77 to the Mackenzie Valley Land and Water Board, Department and Indian and Northern Affairs and the National Energy Board in authorizing a project within habitat of a Listed Species in the Northwest Territories.*

c) *The application of Section 79 to the Mackenzie Valley Environmental Impact Review Board when conducting an environmental assessment that includes the range of Listed Species.*

d) The role of Environment Canada, INAC or other Federal Departments in defining steps that must be taken to avoid or lessen the effects of a develop and to monitor the effects' if a project goes ahead as per Section 77 of the Act in the Northwest Territories.

e) The specific federal permits required to permit the harming, or destruction of critical habitat on June 1, 2004 (section 73 of the Act) in the Northwest Territories. Please clarify how a developer applies and who will issue.

f) How recovery plans will be developed and the level of coordination between jurisdictions on Federal Lands in the Northwest Territories (e.g. Department of Indian and Northern Affairs, Government of Alberta, etc).

g) The requirements for developers and departments managing federal lands to participate in recovery plan development and implementation under Section 78 of the Act in the Northwest Territories.

Response

This I.R. was addressed to Environment Canada.

IR Number 1.2.2 (Source GNWT)

Preamble

Seismic activity results in the direct loss of timber and wildlife habitat. The GNWT is responsible for the assessment of forest disturbance within forest management units. To determine the actual potential of habitat disturbance and forest yield, the GNWT requires clarification on the area and amount of possible 2D.

Request

Please provide the MVEIRB with the following information:

a) Clarify if the 2D seismic projected for the next five years is included and mapped.

b) If not, what is the possible length of the 2D seismic and is the 2D seismic within the area of the projected 510 km of 3D seismic?

c) If the possible 2D seismic is outside of the projected 3D seismic area, please provide an electronic file of "best guess" area and possible lines?

Response

a) Baseline Case includes all existing and approved developments as of June 2003 which includes a 3D seismic program that has a balance of approximately 510 km left to acquire. The Planned Development Case anticipates an additional 200 km of either 2D or 3D seismic. The Planned Development Case seismic is not mapped, however, it would occur outside of the Baseline Case 3D seismic areas but within the SDL area.

b) As above

c) An electronic file of "best guess" and possible lines is not included as results from additional drilling are required to predict the area within the SDL subject to future seismic. A reasonable assumption would be that this future seismic activity would be in an area not previously covered by 3D in the Baseline Case.

IR Number 1.2.3 (Source: GNWT)

Preamble

Given the growing infrastructure in the Cameron Hills, the values at risk and ensuring protection from wildfire are a concern to GNWT. No information is provided on specific operational procedures or predicted requirements for burning are provided.

Request

Please provide the MVEIRB with the following information:

a) Describe the amount of burning that has occurred.

b) Describe Paramount's understanding of local restrictions including the GNWT legislation and burn permit standard conditions.

c) Describe Paramount's operational procedures during burning activities.

Response

a) To date no burning has occurred.

All slash and trees resulting from clearing operations have been used as rollback and to lesser extent corduroy.

b) Paramount understands that burn permits are available from RWED, and it is Paramount's intent to get that approval before disposing of wood by burning, should the need arise.

c) Paramount's operating procedures during burning activities are detailed in Appendix F of the Environmental Protection Plan Manual (EPPM). The EPPM has been filed with the NEB and a copy is provided to the MVEIRB.

In summary, the highlights of the EPPM procedures include:

- the assignment of a person responsible for the burning operation
- ensuring adequate fire fighting equipment is available at the burn site
- conduct infrared scans of the burn site at the completion of burning to assure the fire is completely extinguished.

I.R. Number 1.2.4 (Source: GNWT)

Preamble

In the DAR, Paramount has indicated that decked merchantable timber has not been utilized in the past. No information is provided on what mills were contacted and the reason why the opportunity to secure merchantable timber was rejected.

The DAR uses two terms for valued timber (i.e. merchantable and marketable) but no definition is provided for either.

The DAR also indicates that timber is salvaged but the methods used are either indicated as blading or are undefined.

The GNWT requires clarification to determine the applicability of timber salvage in the Cameron Hills.

Request

Please provide the MVEIRB with the following information:

a) *A list of companies contacted in prior years related to salvage timber and the reasons why timber was not salvaged by these companies.*
b) *Whether Paramount has attempted to contract these companies or other companies to haul salvaged wood.*
c) *Whether Paramount has attempted to use forest harvest equipment to clear ROWs in order to improve quality and suitability of salvage timber for commercial use at a mill.*
d) *Whether Paramount has considered alternate means of processing of timber such as portable mills or chipping.*

Response

a) As there is no timber to salvage, Paramount has not contacted any companies related to salvage timber.

b) N/A

c) N/A

d) Paramount has not considered alternate means of processing the timber that results as a consequence of its clearing operations.

IR Number 1.2.5 (Source: GNWT)

Preamble

Previous Environmental Assessments were based on development plans that included a Cameron Hills Fuel Gas Pipeline to the H-03 Central Battery from the Bistcho Gas Plant (Paramount Transmission Ltd. Cameron Hills Pipeline and Fuel Gas Pipeline NEB Application June 2001).

A fuel gas system comprised of an 88.9 mm OD polyethylene pipeline from H-03 to B-05, with laterals coming off this mainline to each of the following oil wells: G-03, I-73, M-73 (2), A-04, B-05, B-25, C-75, H-04, D-74 and C-74 was described on page 2 Section 1.1 in the Environmental Impact Assessment for the Cameron Hills Gathering System and Facilities Project (Paramount, Golder Associates and Alpine Environmental 2001).

Dispersion modelling conducted as part of the previous EA assumed that the compressor and other equipment located at the central battery would be using fuel with no H_2S content ('sweet' fuel gas) and therefore zero SO_2 emissions. However, it appears that the 'sweet' gas pipeline proposed in the EA to supply fuel for the central battery equipment was never built and the equipment is using locally produced gas which contains H_2S. If the equipment is burning gas containing H_2S, this obviously increases the project SO_2 emissions.

For the purposes of the cumulative environmental assessment, it should be emphasized that an accurate accounting and detailed description of ALL contaminant emission sources - both existing and proposed - is critically important if the subsequent modelling predictions and assessment are to be worthwhile. If the use of field gas was considered an option for the central battery equipment then this is the emissions scenario (worst case) that should have been modelled and assessed in the EA.

Although, the short term impacts to air quality of individual well evaluations (flaring) were deemed "insignificant" in previous EA's, it should not now be assumed that this will be the case for the proposed and future well evaluations. The emission scenarios may be different and the potential impacts exacerbated by the additional affects of existing contaminant concentrations.

While the focus of this EA may be cumulative effects, the potential for short term impacts to air quality due to the proposed individual well evaluations should not be ignored. Assessment (modelling) should be conducted for the proposed individual well evaluations (flaring) as well as the cumulative effects of the overall development proposal.

Mitigation measures that are not feasible or planned should not be reflected in the Environmental Assessment.

Request

Please provide the MVEIRB with the following information:

a) Confirm if the sweet fuel gas pipeline was built as planned.

b) If not, please describe why the change was made and who approved the change. Provide documentation of the approval for the public registry including any emissions modeling that was done subsequent to the MVEIRB Environmental Assessment.

c) If the sweet fuel gas pipeline was built, please explain why only a few wells will use this sweet fuel to minimize SO2 emissions.

d) If the sweet fuel gas pipeline was not built, please explain how use of sweet gas can be used as a mitigation measure using sweet gas as fuel at the wells and using sweet fuel at the battery as fuel.

e) Confirm if the compressor at the Battery currently uses well gas as fuel. If so when does Paramount plan to convert to sweet gas as fuel.

f) Confirm what mitigations measures are actually feasible will actually be applied from the list in Sections 7.2.6.1 and 7.2.6.3.

g) Confirm the modeling approach and that modelling has been conducted for individual well evaluations as well as the cumulative effects of the overall development proposal.

h) Describe what Paramount means by "ensure compliance with relevant ... federal objectives." In Section 7.2.6.3

Response

a) The sweet gas pipeline to deliver fuel gas to the Cameron Hills Battery has not yet been constructed.

b) The use of sour gas as fuel was approved by the National Energy Board.

Paramount made its initial application in April 2002 to fuel the electrical generators at H-03. That application was approved by the NEB on April 23, 2002.

Paramount applied to increase the use of sour fuel at the H-03 battery on December 3, 2002. That application was approved by the NEB on January 16, 2003.

Copies of those applications, and the approvals are attached.

The sweet fuel gas pipeline was included in the original application because Paramount foresaw, under some conditions, the potential need to use sweet fuel. It is important to understand that, if fuel consumption is limited, acceptable environmental conditions can be achieved using sour gas fuel. However, in some circumstances the use of sweetened gas could be necessary to achieve acceptable environmental conditions. In those cases, sweetened fuel could be imported, as the approved sweet fuel gas pipeline facilitates, or sweetened fuel could be derived from sour gas on site.

Current fuel gas demand, and fuel gas character, yields acceptable environmental conditions without sweetening. At some time in the future, it may become prudent to convert to sweetened fuel.

c) Not applicable.

d) If the need to use sweetened fuel materializes, sweet fuel gas could be imported, as the approved sweet gas fuel line facilitates, or sweetened gas for use as fuel could be derived from sour gas at the battery site.

Sweetening of sour gas is not new in the gas industry. Many processes are used conventionally, with process selection driven by fuel gas quality, operating conditions, sweetened gas yield volumetric requirements, residue gas quality and condition, and other considerations.

Based on its best guess of the future conditions and requirements, Paramount suggests it could be reasonable to use a circulating, regenerative amine system to sweeten raw sour gas, to yield sweetened fuel and the separated acid gas stream. (It is acid gas contamination of natural gas that makes it sour gas.) The separated acid gas could be recovered from the amine system, and disposed of by injection, with or without produced water, to an underground reservoir, or the pipeline for ultimate delivery to the Bistcho Gas Plant.

e) The gas compressor at the Battery currently uses raw sour gas as fuel.

There are no current plans to convert to sweet fuel gas.

f) Any of the mitigative measures listed in 7.2.6.1 and 7.2.6.3 could be used to provide acceptable environmental conditions.

g) The air quality assessment of the Cameron Hills Expansion project evaluated three separate scenarios that evaluated the cumulative effects of the approved sources in the region (the Baseline Case), the approved sources plus the applied for wells (the Application Case) and all approved, applied for and planned activities in the area (the Planned Development Case). These scenarios were described in section 7.2.3.1 of the DAR. In addition to these scenarios, a separate modelling scenario developed to describe the expected maximum effects during well test evaluations was presented in

Appendix IV-Well Testing Assessment. This evaluation considers the cumulative air quality effects of three individual well evaluations in combination with the Application Case sources. As stated in Appendix IV of the DAR, the wells considered in this well evaluation scenario include the future oil well N-16 and the two future gas wells H-04 and A-04. It is also stated that ... *"Paramount does not plan to test more than two gas wells and one oil well concurrently"*. Therefore the evaluated scenario represents the maximum number of concurrent individual well evaluations that could occur concurrent with the applied for expansion.

Since the effects of an individual well evaluation on its own would result in lower emissions and, logically, lower impacts, no separate evaluation of an individual well test in the absence of the approved or planned sources in the area was completed.

h) Paramount's compliance strategy involves two steps: (1) dispersion modelling to indicate that satisfactory environmental conditions are expected, and (2) subsequent ambient air quality monitoring to validate the model results.

IR Number 1.2.5

Attachment

National Energy Board / Office national de l'énergie

File 2520-D-4-4
23 April 2002

Mr. Tom Hong - Project Manager
Paramount Resources Ltd.
4700 Bankers Hall West
888 - 3rd Street S.W.
Calgary, Alberta
T2P 5C5
Facsimile: (403) 266-6032

Dear Mr. Hong:

Paramount Resources Ltd. (Paramount) request dated 17 April 2002 for approval of a variance on the Cameron Hills Oil and Gas Development Project approved under Order EPO-01-2002 pursuant to Paragraph 5(1)(b) of the *Canada Oil and Gas Operations Act*

The National Energy Board has considered the Paramount submission dated 17 April 2002 requesting approval of a variance to the project approved under Order EPO-01-2002 with respect to the electric generators at the Cameron Hills facilities. The variance is hereby approved.

If you have any questions, please do not hesitate to contact Gary Woo at 299-3143.

Yours truly,

T. M. Baker
Chief Conservation Officer

444 Seventh Avenue SW
Calgary, Alberta T2P 0X8

444, Septième Avenue S.-O.
Calgary (Alberta) T2P 0X8

Canada

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Paramount resources ltd.

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NEB File 2520-D-4-4

April 17, 2002

National Energy Board
444 Seventh Avenue SW
Calgary, Alberta
T2P 0X8

Attention: Mr. Terry Baker
Chief Conservation Officer

Dear Sir;

Re: Paramount Resources Ltd.'s ("Paramount") Cameron Hills Oil and Gas Development Project – Variation No. 2 (Turbine Generators) to Project Approved under National Energy Board ("NEB") Order EPO-01-2002

Paramount Resources Ltd. hereby requests approval of the attached variation to the project to comply with conditions 2 and 3 of the NEB Order EPO-01-2002.

If you have any questions regarding this matter, then please contact the undersigned at (403) 290-3696.

Yours truly,

PARAMOUNT RESOURCES LTD.

Tom Hong, Project Manager

Attachment

PARAMOUNT RESOURCES LTD.
CAMERON HILLS GATHERING SYSTEM PROJECT
NATIONAL ENERGY BOARD APPROVAL EPO-01-2002
VARIANCE NO. 3 – TURBINE GENERATORS

INTRODUCTION

This document describes the proposed change to the Cameron Hills H-03 Central Facility (Central Facility) as approved under the National Energy Board (NEB) approval EPO-01-2002. As stated in condition 3 of the order, approval of the Chief Conservation Officer is required prior to the implementation of any variation to the project.

DESCRIPTION OF VARIATION

The current configuration of the electrical generation equipment at the Central Facility is as follows:

- Primary electrical generator: One 27.5 kw diesel fueled generator
- Emergency backup generators: Two 200 kw natural gas fueled turbine generators
- Configuration: Only one generator may run at one time.

The proposed variation to the electrical generation is as follows:

- Primary electrical generator: One 200 kw natural gas fueled turbine generator
- Emergency backup generator: One 200 kw natural gas fueled turbine generator
- Secondary emergency backup generator: One 27.5 kw diesel fueled generator
- Configuration: Only one generator may run at one time.

CHANGE TO EMISSIONS

Attached to this document is a report generated by Golder Associates Ltd. (Golder), which details the changes to the emissions from the project in regards to the use of the turbine generator. Since the turbine generator use sour natural gas as its fuel, the SO_2 emissions is predicted to increase by 26% but the NO_x emissions are predicted to decrease by 23% compared to the original calculations in the environmental impact assessment submitted with the NEB application. The SO_2 emissions, however, will be below the Northwest Territories maximum level standards.

One of the commitments that Paramount has stated in the Environmental Assessment Commitments Table, which forms part of the NEB approval, is that two total sulphation monitors will be installed at the Central Facility. This has been done and it will ensure that territorial and federal standards are being met during the operation of the project.

MEMORANDUM

10th Floor, 940 – 6 Ave. S.W.
Calgary, Alberta, Canada
T2P 3T1

Golder Associates

Golder Associates Ltd.
Telephone No.: 403-299-5600
Fax No.: 403-299-5606

DATE: April 17, 2002

002-2252

TO: Tom Hong, Paramount Resources

cc: Daryl Johannesen

FROM: Martin Rawlings

RE: **Revised Dispersion Modelling for the Cameron Hills Development**

INTRODUCTION

Two 200 kw turbine electrical generators are proposed for the H-03 Central Battery to replace the two 400 kw electrical generators in the original design. Only one of the turbine generators will be operating at one time since the second turbine will be used as a backup. A key difference between the proposed plan for power generation and the original application is that the turbines will be using raw well gas as a fuel source rather than sweet fuel gas. Since these gases contain varying percentages of sulphur compounds, the overall emissions of sulphur dioxide (SO_2) from the central battery will increase. However, the nitrous oxide (NO_X) is predicted to decrease due to the different combustion process.

This memorandum outlines the overall change in facility emissions and ground level concentrations resulting from the proposed power generation system.

FACILITY EMISSIONS

As described in the introduction, Paramount is proposing to modify the design of the Cameron Hills Project to include a pair of 200 kW gas turbines for the generation of electrical power. The turbines would utilize raw well gas as a fuel source. For the purposes of the air quality evaluation, all of the gas used in the turbines was assumed to come from the A-73 well. In reality, the fuel gas will be a combination of gases from the A-73 well and wells with lower concentrations of sulphur compounds. Table 1 provides a summary of the gas composition for the A-73 well, which was used in determining the sulphur dioxide emissions from the gas turbine units.

Table 1 **Composition of Gases from the A-73 Well**

Composition	Mole Percent [%]
H_2	0.00
He	0.09
N_2	1.52
CO_2	3.32
H_2S	2.00
C_1	90.56
C_2	1.25
C_3	0.65
iC_4	0.11
nC_4	0.23
iC_5	0.06
nC_5	0.06
C_6	0.04
$+C_7$	0.11

(a) Based on the gas composition for the A-73 well.

When the fuel consumption, gas composition (see Table 1) and engine specifications are combined, the emissions characteristics presented listed in Table 2 result. The table includes the stack release characteristics used to model the emissions from the new gas turbines.

Table 2 **Source Characteristics for the Gas Turbine Generators**

Parameter	Power Generators	
	Turbine–1	Turbine–2
stack height [m]	10	10
stack diameter [mm]	300	300
exit velocity [m/s]	19.09	19.09
exit temperature [K]	473	473
SO_2 emissions [g/s]	1.087	—[(a)]
NO_X emissions [g/s]	0.100	—[(a)]

(a) Only one of the gas turbines will be in operation at any time. Therefore, the dispersion modelling included the releases from Turbine–1 only.

Overall, the inclusion of the 200 kW gas turbines for power generation will result in an increase of 26% in the overall emissions of SO_2, from 0.3637 t/d to 0.4576 t/d. The overall NO_X emissions from the project will decrease by 23% from 0.6549 t/d to 0.5017 t/d. The decrease in NO_X emissions reflects the lower power output and emission rates from the gas turbines. The overall facility emissions for the proposed development have been compared to the original application information in Table 3.

Table 3 Comparison of Emissions for the Cameron Hills Project

Project Component	Original Emissions [a] [t/d][b]		Emission[c] [t/d]	
	SO_2	NO_X	SO_2	NO_X
11 oil wells on the oil gathering system	0.0297	0.0264	0.0297	0.0264
2 oil wells on the gas gathering system	0.0054	0.0048	0.0054	0.0048
7 gas wells on the gas gathering system	0.2499	0.0007	0.2499	0.0007
water disposal well	—	—	—	—
test satellite (H-04)	0.0034	0.0001	0.0034	0.0001
central battery facility at H-03	0.0753	0.6229	0.1692	0.4697
Project Total	**0.3637**	**0.6549**	**0.4576**	**0.5017**

(a) The original emissions correspond to the emissions presented in the original project application.

(b) Emissions are expressed as tonnes per calendar day (t/cd).

(c) The revised emissions have been adjusted to account for the use of a single gas turbine for the generation of electrical power at the facility. This unit replaces the two, 400 kW generators listed in the original application.

GROUND LEVEL CONCENTRATIONS

The changes in emissions from the planned development may also have an effect on maximum ground level concentrations of SO_2 and NO_X. To assess the possible effects on ground-level concentrations, the dispersion modelling completed for the original application was repeated to include the emissions from the gas turbine generators.

Ground Level SO_2 Concentrations

The ground level SO_2 concentrations from the Cameron Hills development were predicted using the ISCST3 dispersion model and five years of hourly meteorological data from the airport in Fort Smith. The resulting ground level concentrations have been summarized in Table 4. The results indicate that there would be no predicted SO_2 concentrations in excess of the NWT standards. The maximum 1-hour and 24-hour SO_2 concentrations were not predicted to increase with the use of the gas turbines. However, the maximum annual concentration was predicted to increase from 4.5 to 7.1 µg/m³, which is still less than 24% of the NWT standard.

Table 4 Ground Level SO_2 Predictions

Parameters	Ground Level Concentrations [µg/m³]		
	1-hour	24-hour	Annual
Original Facility Configuration			
maximum ground-level SO_2 predictions	416	63.6	4.5
Proposed Configuration with Gas Turbines			
maximum ground-level SO_2 predictions	416	63.6	7.1
NWT SO_2 standard [µg/m³]	**450**	**150**	**30**

Ground Level NO_2 Concentrations

The maximum ground-level NO_X and NO_2 concentrations resulting from the Cameron Hills development were calculated using a series of approaches detailed in the responses to supplemental information requests, namely:

- The maximum ground-level NO_X predictions were determined using the ISCST3 model and meteorological data from Fort Smith.
- The maximum ground-level NO_2 concentrations were calculated directly using the ISC-OLM model, a background O_3 concentration of 25 ppb and calculations on individual plumes. This is consistent with the Environment Canada recommendations for modelling the Liard Gathering System.
- The maximum ground-level NO_2 was also determined using the ISC-OLM model, and a background O_3 of 50 ppb (as per the most recent Environment Canada requests) and calculations on combined plumes (per AENV [2000] protocols).
- Finally, the maximum ground-level NO_2 concentrations were calculated from the ISCST3 predictions of ground-level NO_X, using the AENV (2000) guidelines. These guidelines include a three tiered process as follows:

  - Tier 1 is a screening assessment that assumes all of the NO_X will get converted to NO_2. If the maximum NO_X from the dispersion modelling is less than the applicable guideline levels then no additional calculations are required.
  - Tier 2 makes use of the ozone limiting method described by Cole and Summerhays 1979). The maximum ground-level NO_X predictions would be converted to NO_2 concentrations using the following formula:

$$[NO_2] = [O_3] + 0.1 \times [NO_X]$$

    where:

$[NO_2]$	=	the NO_2 concentration [ppm]
$[NO_X]$	=	the NO_X concentration [ppm]
$[O_3]$	=	site-specific O_3 concentration [ppm], or
	=	50 ppb for 1-hour NO_2 in rural areas
	=	40 ppb for 24-hour NO_2 in rural areas
	=	35 ppb for annual NO_2 in rural areas

  - The Tier 3 approach uses a minimum of 1-year of site-specific ambient NO_X and NO_2 data, from which an ambient ratio between the two compounds can be developed. AENV must be consulted prior to using this ambient ratio method (ARM).

The results of the revised modelling of NO_2 have been presented in Table 5, along with the results presented in the responses to the supplemental information on the original application modelling. The modelling results confirm that the maximum 1-hour, 24-hour and annual NO_2 concentrations (regardless of the calculation method) are below the respective federal acceptable guidelines of 400, 200 and 100 µg/m³. There are no regulations limiting the quantities of NO_X in the atmosphere.

Table 5 Ground Level NO_2 Predictions

Parameters	Ground Level Concentrations		
	1-hour	24-hour	Annual
Original Facility Configuration			
maximum NO_X predictions[(a)] [µg/m³]	1,543	426	30
ISC3-OLM[(b)] NO_2 predictions [µg/m³]	350	148	17
ISC3-OLM[(c)] NO_2 predictions [µg/m³]	248	111	15
AENV[(d)] NO_2 predictions [µg/m³]	242	113	30
Proposed Configuration with Gas Turbines			
maximum NO_X predictions[(a)] [µg/m³]	679	283	19
ISC3-OLM[(b)] NO_2 predictions [µg/m³]	179	120	12
ISC3-OLM[(c)] NO_2 predictions [µg/m³]	162	107	11
AENV[(d)] NO_2 predictions [µg/m³]	156	98	19
federal NO_2 objectives [µg/m³]	**400**	**200**	**100**

(a) The maximum NO_X concentrations were determined using the ISCST3 dispersion model.

(b) The ISC3-OLM model predictions were made using a background ozone value of 25 ppb and using "individual-source" OLM conversions.

(c) The ISC3-OLM model predictions were made using a background ozone value of 50 ppb, and using combined plumes OLM conversions.

(d) The AENV predictions used the predicted NO_X concentrations determined using the ISCST3 dispersion model. These values were converted to NO_2 using the OLM approach and background O_3 values of 50 ppb (for 1-hour), 40 ppb (for 24-hour) and 35 ppb (for annual) as recommended by AENV (2000).

References:

AENV. 2000. Air Quality Model Guidelines. Prepared by the Science and Technology Branch, Environmental Services Division Alberta Environment. Edmonton, Alberta. October.

Cole, H.S. and J.E. Summerhays. 1979. A Review of Techniques Available for Estimating Short-Term NO_2 Concentrations. Air Pollution Control Association, U.S. EPA.

Figure 1a **Maximum 1-Hour SO_2 Concentrations — Calculated Using the ISCST3 Model and Meteorological Data from the Airport at Fort Smith, NWT**

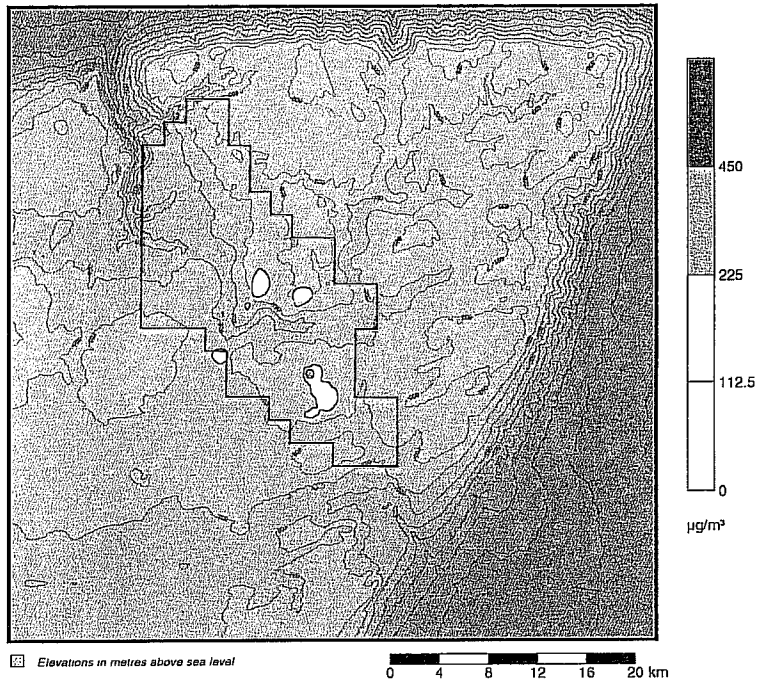


Figure 1b **Maximum 1-Hour NO_2 Concentrations — Calculated Using the ISC-OLM Model, "Combined Plumes" and a 50 ppb Background Ozone Concentration**

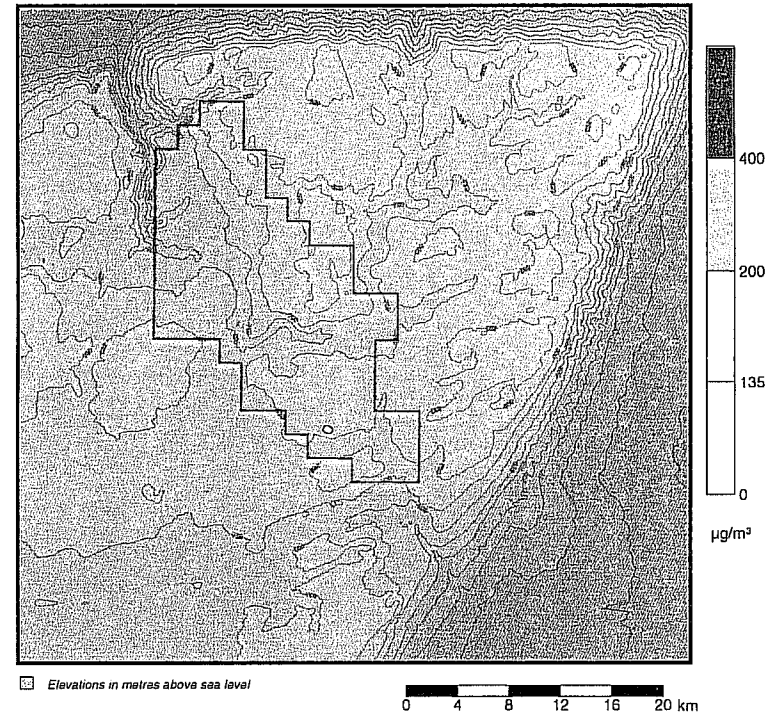


Figure 2a **Maximum 24-Hour SO_2 Concentrations — Calculated Using the ISCST3 Model and Meteorological Data from the Airport at Fort Smith, NWT**

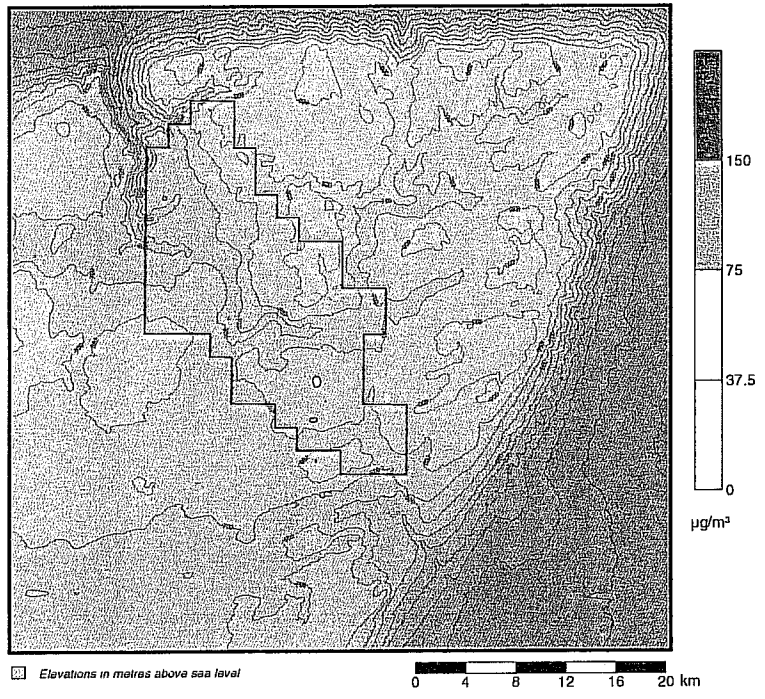


Figure 2b **Maximum 24-Hour NO_2 Concentrations — Calculated Using the ISC-OLM Model, "Combined Plumes" and a 50 ppb Background Ozone Concentration**

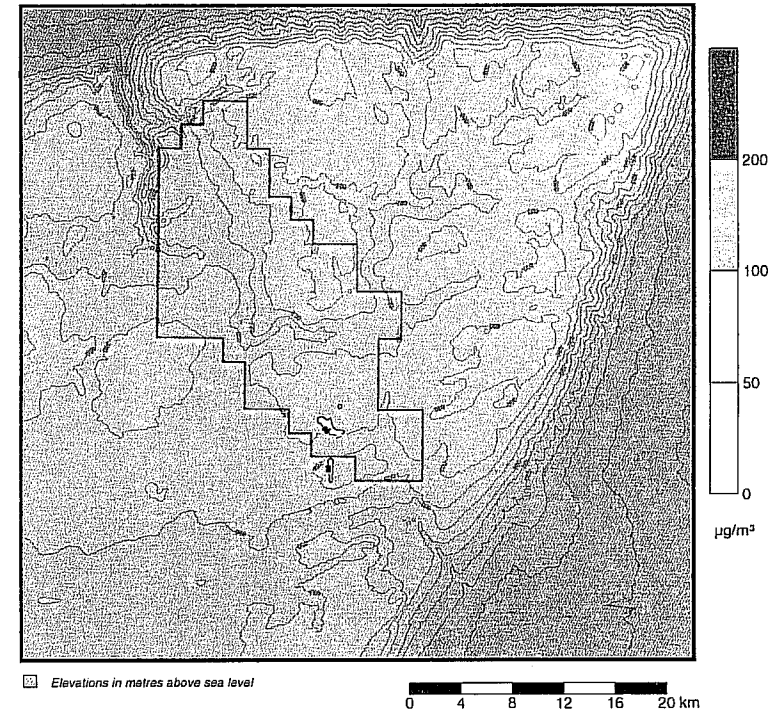


Figure 3a **Maximum Annual SO_2 Concentrations — Calculated Using the ISCST3 Model and Meteorological Data from the Airport at Fort Smith, NWT**

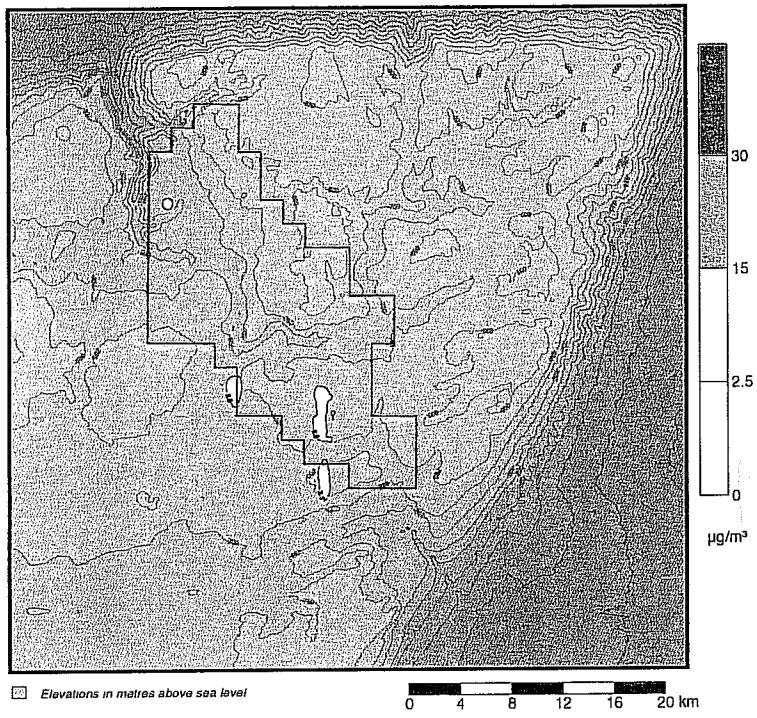
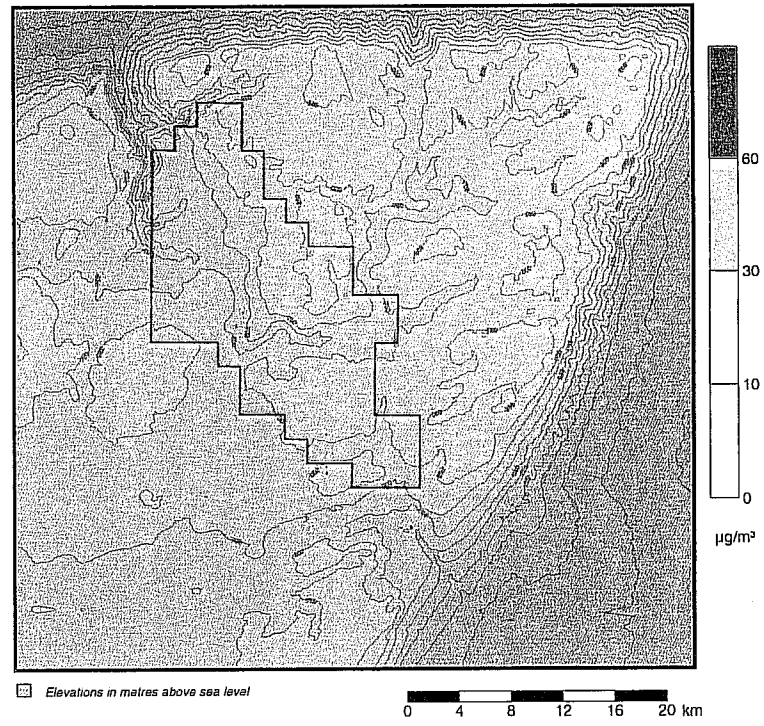


Figure 3b **Maximum Annual NO_2 Concentrations — Calculated Using the ISC-OLM Model, "Combined Plumes" and a 50 ppb Background Ozone Concentration**



National Energy Board

Office national de l'énergie

File 2520-D-4-4
16 January 2003

Mr. Brad Macson
Manager, Engineering and Construction
Paramount Resources Ltd.
4700, 888 - 3rd Street S.W
Calgary, Alberta
T2P 5C5
Facsimile (403) 266-6032

Dear Mr. Macson:

Paramount Resources Ltd. (Paramount) Cameron Hills Oil and Gas Development Project Request to Use Sour Gas for Fuel dated 3 December 2002

The National Energy Board (the Board) has considered the Paramount submission dated 3 December 2002 requesting the use of sour gas as fuel at the wellsites and the central battery at the Cameron Hills Oil and Gas Development Project. The request to use sour gas for fuel at the wellsites and central battery is hereby approved subject to the following condition:

> In the Cameron Hills field Annual Reports submitted to the Board, Paramount shall include a statement indicating if any parameter used in the air emissions modeling has changed and, if a parameter has changed, the details shall be provided. Changes in the air emissions modeling parameters would include, but not limited to, such things as a change in equipment or a change in H_2S content.

The Board may, upon consideration of the parameter change, request that Paramount conduct follow-up air emissions modeling. If you have any questions, please do not hesitate to contact John Korec at 292-6614 or Gary Woo at 299-3143.

Yours truly,

T. M. Baker
Chief Conservation Officer

paramount resources ltd.

4700 Bankers Hall West, 888 3rd Street SW Calgary, Alberta, Canada T2P 5C5 www.paramountres.com
tel 403 290 3600 fax 403 262 799

C.H. Oil
3.1

December 3, 2002

National Energy Board
444 – 7th Avenue S.W.
Calgary, Alberta
T2P 5C5

Attention: Mr. T.M. Baker
Chief Conservation Officer

Dear Mr. Baker:

Reference: Cameron Hills Oil and Gas Development Project Approval to Construct Order No. EPO-01-2001

On September 19th and November 15th, 2002, Paramount submitted letters to update the NEB as to Paramount's plans to continue the development that was approved under the subject order. (Construction under the subject order was started in February of 2002.)

This letter is to provide a further update with respect to the affects of using sour fuel at the wellsites and central battery.

Oil battery construction for the immediate upcoming season shall include:

- H-03 dedicated test separator,
- group inlet separator,
- group inlet liquid heater,
- group liquid/liquid separator,
- associated and solution gas compressor,
- 3 x 120 m^3 tanks,
- oil and water shipping pumps,
- oil and water recycle pumps,
- compressed instrument and starting air delivery systems.

As promised in our November 15th, 2002 update, Paramount has completed the analysis of using sour gas as fuel at the wellsites and battery. The findings are summarized in the attached report prepared by Golder Associates.

Paramount requests your consent to proceed with its plan to use sour gas as fuel as outlined here.

Page 2.....

Paramount resources ltd.

4700 Bankers Hall West, 888 3rd Street SW Calgary, Alberta, Canada T2P 5C5 www.paramountres.com
tel 403 290 3600 fax 403 262 7994

Mr. Terry Baker
National Energy Board
December 2, 2002

Should you have any questions or comments regarding this application, please direct them to Neil Kelly by telephone at (403) 651-1802, by email at kelly55@telus.net, or mail at the letterhead address.

Thank you for your ongoing assistance and understanding.

Yours truly,

PARAMOUNT RESOURCES LTD.

Brad Macson, P. Eng.
Manager, Engineering and Construction

NK/hr
Enclosures

CC: A. Hollingworth
L. Doyle
T. Hong
S. Maaskant
D. Block
N. Kelly

File: Cameron Hills Oil 3.1

MEMORANDUM

10th Floor, 940 – 6 Ave. S.W.
Calgary, Alberta, Canada
T2P 3T1

Golder Associates

Golder Associates Ltd.
Telephone No.: 403-299-5600
Fax No.: 403-299-5606

DATE: November 29, 2002 022-2297

TO: Neil Kelly, Paramount Resources Limited

cc: Daryl Johannesen

FROM: Pam Simpson and Martin Rawlings

RE: **Revised Dispersion Modelling Analysis for the Cameron Hills Development**

INTRODUCTION

Paramount Resources Limited (Paramount) is proposing to modify the design of the Cameron Hills Development and has incorporated an updated gas composition for the fuel used at the battery and the gas wells. In addition, Paramount is also proposing to make changes to the number of wells operating and the equipment at some of the wells on the gas gathering system. The revised equipment and the updated gas composition for the gas will result in changes to the emissions profile for the development. This memorandum outlines the overall change in facility and gas well emissions and provides dispersion modelling results that confirm the modified emissions at the Cameron Hills Development will still comply with the NWT standards for sulphur dioxide (SO_2) and the federal objectives for nitrogen dioxide (NO_2).

FACILITY EMISSIONS

To further the proposed modification by Paramount for the Cameron Hills Development to use the well gas as fuel at the battery, Paramount has obtained an updated gas composition, which will have a maximum hydrogen sulphide (H_2S) content of 2%. Table 1 provides a listing of the latest gas composition for the gas from the A-73 well. The pumpjack drivers at the oil wells on the oil gathering system will use gas with a composition equivalent to the gas from the M-73 well. Table 2 provides a summary of the gas composition for the M-73 well.

Table 1 **Gas Composition for the A-73 Well**

Composition	Mole Percent [%]
H_2	0.00
He	0.09
N_2	1.52
CO_2	5.00
H_2S	2.00
C_1	88.88
C_2	1.25
C_3	0.65
iC_4	0.11
nC_4	0.23
iC_5	0.06
nC_5	0.06
C_6	0.04
$+C_7$	0.11

Table 2 **Gas Composition for the M-73 Well**

Composition	Mole Percent [%]
H_2	0.01
He	0.07
N_2	1.81
CO_2	4.16
H_2S	1.01
C_1	90.05
C_2	1.65
C_3	0.75
iC_4	0.12
nC_4	0.21
iC_5	0.06
nC_5	0.05
C_6	0.04
$+C_7$	0.01

As part of the ongoing engineering design process, Paramount proposes several changes in the equipment used in the development. These changes include:

- removing the treater unit;
- removing the 192 hp and one of the 634 hp compressors;
- removing the dehydrator unit;
- removing the line heaters at the gas wells A-05 and B-08;
- removing the flares for the oil wells on the oil gathering system; and
- removing the oil wells on the gas gathering system.

Table 3 presents the updated emissions from the Cameron Hills Development. The stack parameters used for all of the sources at the central facility have been sized to ensure compliance with the NWT standards for SO_2 and the federal objectives for NO_2.

Table 3 Emissions for the Cameron Hills Development

Project Component	Project Emissions [t/d][a]	
	SO_2	NO_X
central battery facility at H-03		
process heater	0.0417	0.0012
compressor 1	0.2117	0.1308
LP flare[b]	0.0717	0.0013
turbine	0.0950	0.0086
heat medium heater	0.0149	0.0004
Battery total	**0.435**	**0.142**
oil wells on the oil gathering system	0.009	0.019
gas wells on the gas gathering system	0.270	0.007
water disposal well	—	—
test satellite (H-04)	—	—
Project Total	**0.714**	**0.169**

(a) Emissions are presented in tonnes/day

(b) Includes pilot and purge gas

DISPERSION MODELLING METHODS

The Industrial Source Complex (ISCST3) model was selected for use in evaluating the site emissions. The ISCST3 dispersion model is recommended for use by Alberta Environment (AENV) and by the U.S. EPA for evaluating pollutant releases from a wide variety of situations. The model has been accepted for use in many Canadian jurisdictions, including the Northwest Territories, British Columbia and Alberta.

The meteorological data from the Meteorological Services Canada (MSC) station in Fort Smith were deemed to provide the most complete and representative set of meteorological data for use in the dispersion modelling. In total, five-years of data from 1995 through 1999 were used in the modelling.

The maximum ground-level NO_X and NO_2 concentrations resulting from the Cameron Hills Development were calculated using a series of approaches detailed in the responses to supplemental information requests, namely:

- The maximum ground-level NO_X predictions were determined using the ISCST3 model and meteorological data from Fort Smith.

- The maximum ground-level NO_2 concentrations were calculated directly using the ISC-OLM model, a background O_3 concentration of 25 ppb and calculations on individual plumes. This is consistent with the Environment Canada recommendations for modelling the Liard Gathering System.
- The maximum ground-level NO_2 was also determined using the ISC-OLM model, and a background O_3 of 50 ppb (as per the most recent Environment Canada requests) and calculations on combined plumes (per AENV [2000] protocols).
- Finally, the maximum ground-level NO_2 concentrations were calculated from the ISCST3 predictions of ground-level NO_X, using the AENV (2000) guidelines. These guidelines include a three tiered process as follows:
  - Tier 1 is a screening assessment that assumes all of the NO_X will get converted to NO_2. If the maximum NO_X from the dispersion modelling is less than the applicable guideline levels then no additional calculations are required.
  - Tier 2 makes use of the ozone limiting method described by Cole and Summerhays 1979). The maximum ground-level NO_X predictions would be converted to NO_2 concentrations using the following formula:

$$[NO_2]=[O_3]+0.1\times[NO_X]$$

where:

$[NO_2]$	=	the NO_2 concentration [ppm]
$[NO_X]$	=	the NO_X concentration [ppm]
$[O_3]$	=	site-specific O_3 concentration [ppm], or
	=	50 ppb for 1-hour NO_2 in rural areas
	=	40 ppb for 24-hour NO_2 in rural areas
	=	35 ppb for annual NO_2 in rural areas

- The Tier 3 approach uses a minimum of 1-year of site-specific ambient NO_X and NO_2 data, from which an ambient ratio between the two compounds can be developed. AENV must be consulted prior to using this ambient ratio method (ARM).

GROUND-LEVEL CONCENTRATIONS

The proposed changes in emissions from the planned development will have an effect on maximum ground-level concentrations of both SO_2 and NO_2. To assess the possible effects on ground-level concentrations, the ISCST3 and ISC-OLM dispersion models were run using five years of meteorological data from Fort Smith and the revised emissions detailed in the previous section. The results of the dispersion modelling are provided in Table 4. The contour maps showing the maximum hourly, daily and annual SO_2 and NO_2 concentrations are also presented in Figures 1a to 3b. As it can be seen

from the Table 4 and the Figures 1a to 3b, the maximum ground-level SO_2 and NO_2 concentrations comply with both the NWT standards for SO_2 and the federal objectives for NO_2

Table 4 Ground Level Predictions

Parameters	Ground Level Concentrations [µg/m³]		
	1-hour	24-hour	Annual
maximum ground-level SO_2 predictions	406.7	128.0	12.3
maximum NO_X predictions[(a)]	335.1	153.1	8.8
ISC3-OLM[(b)] NO_2 predictions	118.6	63.7	5.4
ISC3-OLM[(c)] NO_2 predictions	127.4	108.7	7.4
AENV[(d)] NO_2 predictions	127.5	90.5	8.7
NWT SO_2 standard [µg/m³]	**450**	**150**	**30**
Federal NO_2 objectives [µg/m³]	**400**	**200**	**100**

(a) The maximum NO_X concentrations were determined using the ISCST3 dispersion model.

(b) The ISC3-OLM model predictions were made using a background ozone value of 25 ppb and using "individual-source" OLM conversions.

(c) The ISC3-OLM model predictions were made using a background ozone value of 50 ppb, and using combined plumes OLM conversions.

(d) The AENV predictions used the predicted NO_X concentrations determined using the ISCST3 dispersion model. These values were converted to NO_2 using the OLM approach and background O_3 values of 50 ppb (for 1-hour), 40 ppb (for 24-hour) and 35 ppb (for annual) as recommended by AENV (2000).

CLOSURE

We trust that this report presents the information that you require. Should any portion of the report require clarification, please contact the undersigned.

Respectfully submitted,

GOLDER ASSOCIATES LTD.

Pam Simpson, B.Sc. (Eng.)
Air Quality Scientist

Martin Rawlings, P.Eng.
Senior Air Quality Engineer

REFERENCES:

AENV. 2000. Air Quality Model Guidelines. Prepared by the Science and Technology Branch, Environmental Services Division Alberta Environment. Edmonton, Alberta. October.

Cole, H.S. and J.E. Summerhays. 1979. A Review of Techniques Available for Estimating Short-Term NO_2 Concentrations. Air Pollution Control Association, U.S. EPA.

Figure 1a **Maximum 1-Hour SO_2 Concentrations — Calculated Using the ISCST3 Model and Meteorological Data from the Airport at Fort Smith, NWT**

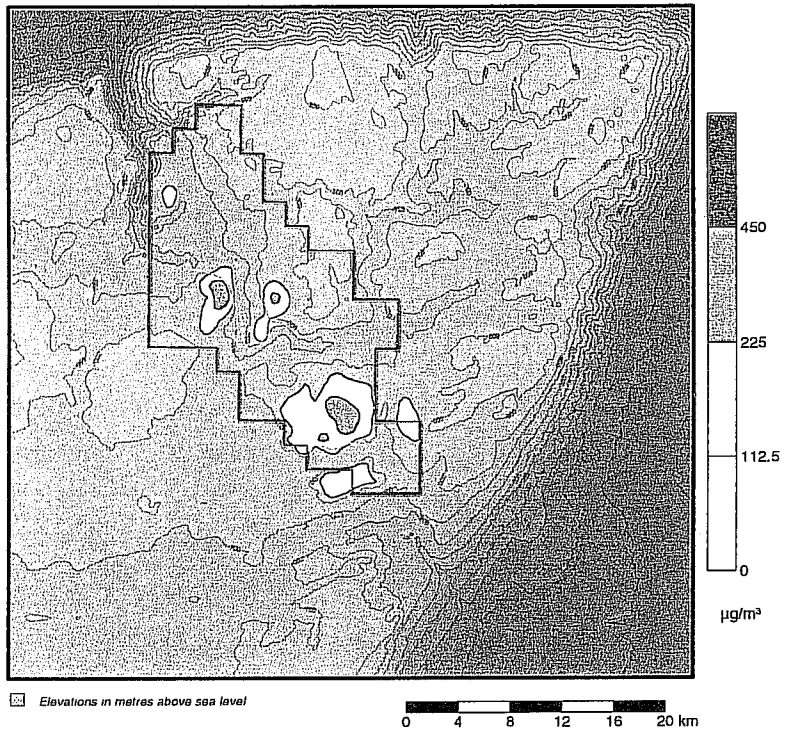


Figure 1b **Maximum 1-Hour NO_2 Concentrations — Calculated Using the ISC-OLM Model, "Combined Plumes" and a 50 ppb Background Ozone Concentration**

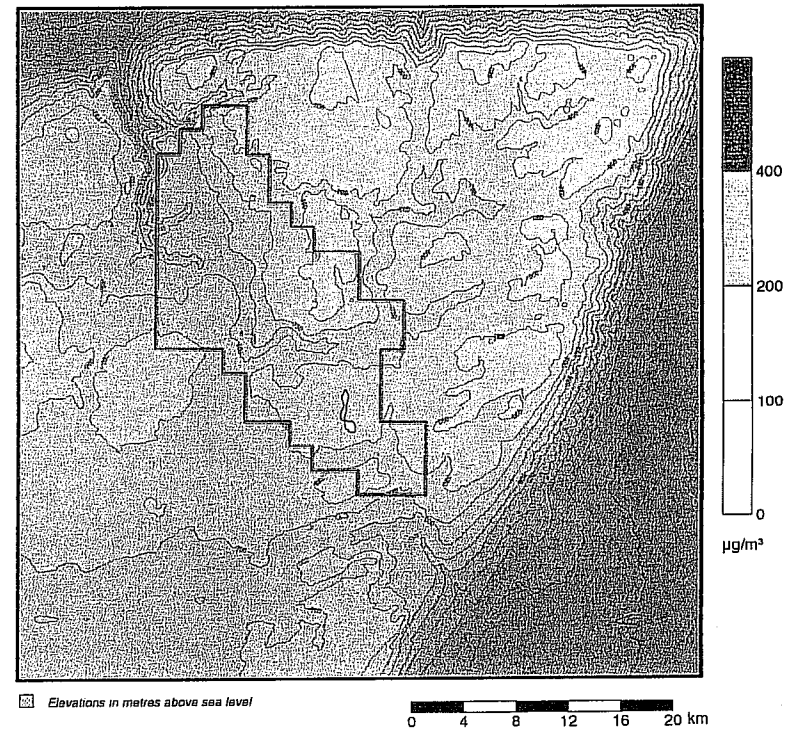


Figure 2a **Maximum 24-Hour SO_2 Concentrations — Calculated Using the ISCST3 Model and Meteorological Data from the Airport at Fort Smith, NWT**

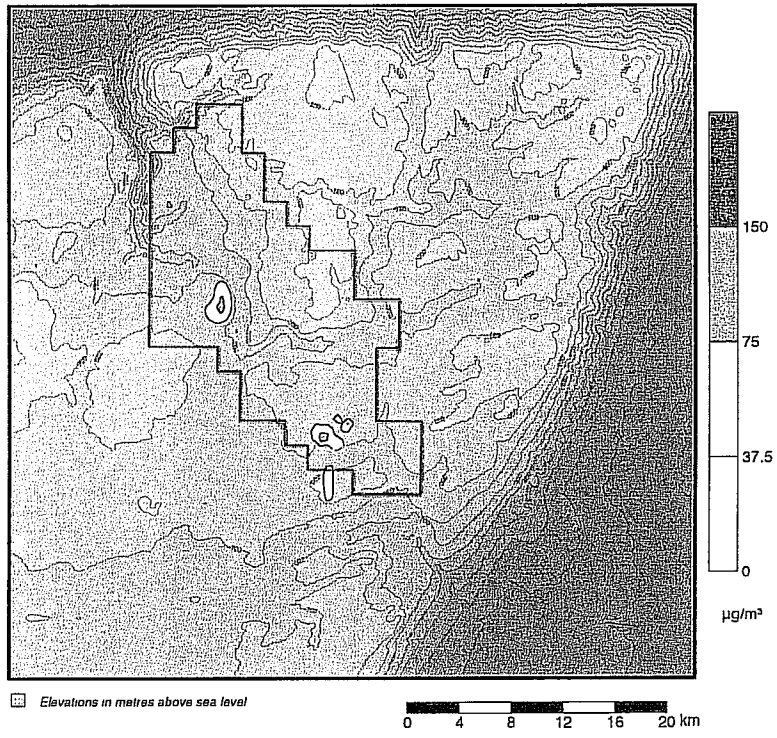


Figure 2b **Maximum 24-Hour NO_2 Concentrations — Calculated Using the ISC-OLM Model, "Combined Plumes" and a 50 ppb Background Ozone Concentration**

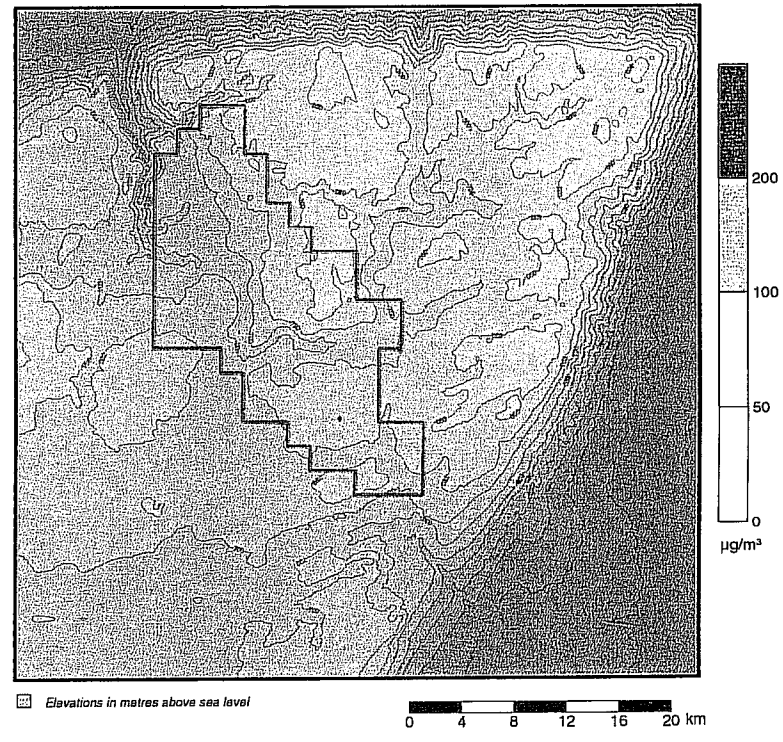


Figure 3a **Maximum Annual SO_2 Concentrations — Calculated Using the ISCST3 Model and Meteorological Data from the Airport at Fort Smith, NWT**

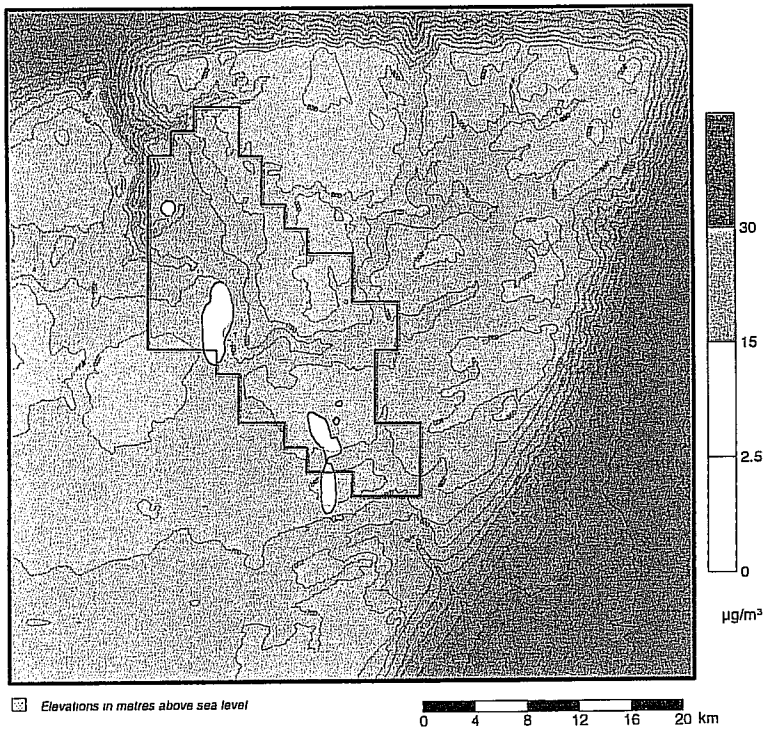
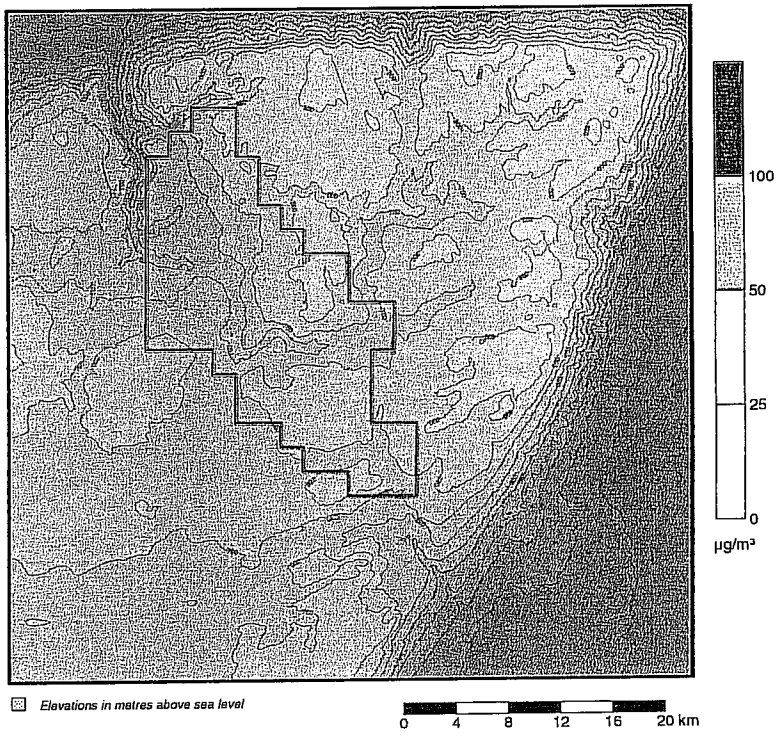


Figure 3b **Maximum Annual NO_2 Concentrations — Calculated Using the ISC-OLM Model, "Combined Plumes" and a 50 ppb Background Ozone Concentration**



IR Number 1.2.6 **(Source: GNWT)**

Preamble

It is unclear if the Far Future Vegetation Composition reflects the annual growth of all vegetation since 1960 (i.e. continued natural change and aging of all vegetation communities since environmental setting from 1960 to 2070) or if it merely reflects the regeneration of vegetation on disturbances resulting from past, planned and future anthropogenic disturbances.

If it reflects only regeneration of disturbed sites it is unclear how much regeneration has occurred in the past 30 years on different vegetation communities on seismic lines that were created in the 1960s and 1970s and whether there is a scientific basis for the assumptions that regeneration will occur and how quickly this will happen.

Clouds may obscure features in the Landsat image used by Paramount. However, they are not a vegetation community. As such other information should be used to augment the Landsat image to overcome this limitation.

If the Far Vegetation Communities reflects natural change in the vegetation communities of the entire RSA there is a need to account for change due to natural disturbances, in particular wildfire. Predictions of fire disturbance are based on past fire history. These include fire frequency, fire sizes, intensity and spatial distribution related to potential ignition sources, fuel types, etc, as well as the effects of fire suppression. The increase in values at risk would indicate that GNWT will likely need to increase its fire suppression efforts in the Cameron Hills to protect Paramount's infrastructure.

Request

Please provide the MVEIRB with the following information:

a) *Clarify exactly what has been modeled in the Far Future Vegetation Composition in the RSA of the Cameron Hills.*

b) *Describe the modeling used to predict fire and its distribution.*

c) *Elaborate on how the modeling includes the implications of fire suppression.*

d) *Clarify if the assumption is that all disturbances of forested vegetation types including pipelines, roads and wellsites will have fully regrown within 70 years to forest cover types given the indication that regrowth is very slow in the Cameron Hills.*

e) Indicate how much, if any, disturbance will occur within areas that are cloud covered in the Landsat image. If any disturbance occurs, please use alternate means to supplement the "blank vegetation" areas.

f) Place on the record any studies by Paramount on the regeneration rate of vegetation communities on seismic lines in the area of the Cameron Hills.

Response

a) Decision rules for modelling the far future vegetation composition are provided in Table 7.8-11. These decision rules were applied to those vegetation communities removed as a result of baseline conditions or developments related to Paramount's existing/approved, and future operations (i.e., Application and Planned Development Case). Areas of vegetation that were not disturbed were assumed to remain within the same community type that they were originally classified to, as successional relationships and patterns are not known for the Cameron Hills Area.

b) There was no modelling tool used to predict fire and its distribution for the far future vegetation composition. There are 399 ha classified as burn for the environmental setting case; four ha are disturbed as a result of existing/approved disturbances leaving a total of 395 ha, or 0.4%, of burned areas in the CESA. The assumption used for determining the amount of burned areas in the far future scenario was that areas burned would be in equal proportion to current conditions (i.e., 395 ha or 0.4%).

c) Fire modelling was not conducted and the amount of area burned for the far future scenario was based on an equal proportion to that currently under baseline conditions. Thus, the proportion of burned areas for the far future case would be based on existing levels of fire suppression for the Cameron Hills area.

d) The assumption of forest regeneration is that vegetation cover on disturbed areas will likely reach similar levels as environmental setting conditions for all vegetation types 70 years after reclamation. However, it is likely that horizontal and vertical vegetation structure may not reach similar levels after 70 years for mature stands.

e) Cloud cover accounts for 1,250 ha, or 1.3%, of unclassified areas within the CESA. Nineteen ha of areas obscured by cloud cover were affected by existing/approved disturbances (see Table 7.8-4 in the DAR). This amounts to 0.02% of the CESA and no further development (i.e., Application Case and Planned Development Case) is anticipated in areas obscured by cloud cover. Therefore, no further means of assessing potential effects on "blank vegetation types" obscured by cloud cover is warranted.

f) There have been no formalized studies to determine vegetation regeneration rates on seismic lines in the Cameron Hills. Paramount is in the process of conducting revegetation monitoring on seeded versus unseeded portions of the pipeline right-of-way, however, this does not include seismic lines. Paramount has presented a worst-case scenario for seismic line regeneration, in that all lines, no matter what age, were considered to be disturbed. However, although no formal surveys have been

completed, seismic lines on the Cameron Hills do exhibit revegetation, with variation related to the habitat type crossed and the age of the cut line.

IR Number 1.2.7 (Source: GNWT)

Preamble

The GNWT appreciates that Paramount has initiated wildlife monitoring starting in February 2003 (Appendix VI of the DAR). The GNWT encourages cooperative approaches to resource management with developers such as Paramount.

However, we are not clear regarding the methodology behind the statement that sighting records leading to a conclusion that populations have not declined.

It is not clear if the wildlife monitoring initiated in 2003 may be terminated in 2005 due to a cessation of construction or certain criteria related to a review of the data.

Request

Please provide the MVEIRB with the following information:

a) *Details on the methodology that permits the sighting records to determine declines in populations.*

b) *Describe the details of cooperative projects with RWED staff regarding caribou projects.*

c) *Clarify the criteria that will be used in 2005 that would result in a termination of wildlife monitoring.*

Response

a) The wildlife sighting cards implemented by Paramount, are intended to provide information on wildlife observations on an ongoing, year-round basis, throughout the Project area. As such, this approach is intended to provide information that indicates trends in wildlife found in the immediate Project area, related to parameters such as habitat use, general location, travel corridors, presence/absence, and/or noted reaction to disturbance.

   There is no methodology that permits the direct determination of wildlife populations from the sighting record data. However, trend data on wildlife observations related to species observed, location and response to presence/disturbance by humans, was used to indicate population status in the project area, considering the lack of historical or regional information.

b) Paramount on a number of occasions has offered and will continue to offer the use of Paramount facilities in the Cameron Hills SDL for the use of RWED staff regarding wildlife projects. For example, during the winter of 2002/03 Paramount frequently communicated with Deb Johnson (Ft. Smith RWED office) as she conducted her

woodland caribou collaring project. Logistical support, camp resources, fuel storage area and runway were offered to RWED during the Collaring program.

For the past few years, Paramount and local RWED representatives have shared updates on wildlife observations, project and activity status on the Cameron Hills plateau and the access leading to the plateau.

Further, Paramount is one of the pioneer companies from 1990 to present, which has assisted in participating in woodland caribou research and monitoring in Alberta. This has created a company awareness that has been applied to this project. The intent is to assist wildlife officials in obtaining accurate data in all areas where Paramount conducts its activities.

c) Paramount proposes to evaluate the value of the data being collected, as it relates to their ongoing operations, in light of the lack of regional information, particularly related to listed wildlife species. Discussions will be undertaken with RWED after the 2005 monitoring year, to determine if continuation of the wildlife monitoring program would be beneficial. As such, criteria for termination of the wildlife monitoring may include: low variation of track data for species of interest, or lack of regional information to put the collected monitoring data into context.

IR Number 1.2.8 (Source: GNWT)

Preamble

The reference for Gunn et al. is not listed in the reference list in Section 10

Request

Please provide the reference for Gunn et al.

Response

Gunn, Anne, J. Antoine, J. Boulanger, J. Bartlett, B. Croft, and A. D'Hont. In Press. Boreal Caribou Habitat and Land Use Planning in the Deh Cho, Northwest Territories. Report for Environment Canada's Habitat Stewardship Program for Species at Risk.

IR Number 1.2.9 (Source: GNWT)

Preamble

The field work and methodology was not described in Golder and Alpine 2001. As the accuracy of Landsat imagery classification varies based on a number of factors including the amount of ground truthing used in the classification testing. The current DAR does not describe the methodology nor how the accuracy of the vegetation community units was determined.

Request

Please provide the MVEIRB with the following information:

a) Clarify how the accuracy of the vegetation classification was conducted?

b) If this was undertaken, how was it done and what were the results?

Response

a) The vegetation classification was obtained from the Forest Management Division of RWED in Hay River. The satellite imagery (30 m x 30 m) was already classified. The vegetation data was originally in a Lambert Conical Projection and has been projected into UTM Zone 11, Nad83 using CNT - Canadian National Transformation.

On recent data using similar imagery, the Forest Management Division of RWED used between 50 and 250 ground control points on average to rectify each satellite image, and the overall root mean square (RM) error kept to 1 pixel or less. They used polynomial rectification type and a nearest neighbor resampling method to accomplish this step. We do not know if this same verification level was used for the Cameron Hills imagery provided to Paramount, but assume so.

The classification was supplemented with vegetation information collected to support previous environmental assessments conducted by Paramount in the Cameron Hills Area. Originally, the RWED vegetation classification was used as a base for Figure 4 of the gathering system and facilities EIA (Alpine and Golder 2001), to generate a regional context for the vegetation within a regional study area. Subsequently, vegetation community types were characterized for the gathering system route and facility locations, following a field assessment that included a survey of a 50 x 50 m area within each habitat type. Plant species present were identified, the general vegetation community was described, and the habitat type confirmed. Wetland communities were classified according to the Alberta Wetland Inventory (Halsey and Vitt 1996).

Subsequently, the regional map was used to generate values for the DAR report to maintain the link between the previous assessment and the DAR. During initial discussions with regulators, this approach was presented, and no concerns were raised at that time.

b) Vegetation information that was collected for the original EIA (Golder and Alpine 2001) was used to cross reference representative habitat types noted within the vegetation cover regional map provided by RWED. This was considered appropriate, in that the gathering system, and subsequently the habitat types, were located through the central portion of the regional study area, and therefore, crossed representative habitat types.

References:

Golder Assosciated Ltd and Alpine Environmental Consulting Ltd. 2001. Environmental Impact Assessment for the Cameron Hills Gathering System and Facilities Project. Prepared for Paramount Resources Ltd. 152 pp plus appendices.

IR Number 1.2.10 (Source: GNWT)

Preamble

In the Cameron Hills, where specific scientific information is lacking it is necessary to use the results of scientific studies from other areas. The reference results, however, need to be compared to the Cameron Hills to support the applicability of the results to HSI models.

Request

Please provide the MVEIRB with the following information:

a) *Clarify how the habitat in the Cameron Hills compares to areas from which the HSI model was developed?*

b) *Clarify if the HSI models used and represented in the Wildlife VEC HSI 7.6-1, 7.6-2 and 7.6-3 Figures apply to year round habitat or seasonal habitat?*

c) *Provide a comparison of results from other jurisdictions that demonstrates that boreal caribou habitat use is tied to availability of habitats.*

Response

a) The wildlife habitat modelling process used a Habitat Suitability Index (HSI)-based approach, but did not use specific HSI models for each VEC. Vegetation types were subjectively ranked as nil, low, medium or high based on their potential to provide habitat for each VEC. Rankings for each vegetation type were conducted based on information from literature, field observations in the Cameron Hills and expert opinion. Standard HSI models rank vegetation types based on the measurement of specific variables that are deemed to be meaningful to the species being modeled. Thus, the approach used was a qualitative evaluation of the vegetation types as potential habitat for each VEC; as opposed to a quantified assessment of site-level variables that are important for a given wildlife species within a certain geographic area.

b) The HSI approach used for moose, woodland caribou and marten were used to assess potential year-round habitat, as opposed to seasonal habitat.

c) Woodland caribou naturally occur at low densities as a result of a variety of factors including reproductive output, spatial segregation and discontinuous distribution (Dzus 2001). Thus, the current thinking is that there is not a good link between boreal caribou habitat use and availability. However, defining habitat is likely the best means of assessing potential distribution of caribou (Bradshaw et al. 1995) and can be used for range planning and environmental assessments.

References:

Bradshaw, C.J.A., D.M. Hebert, A.B. Rippin and S. Boutin. 1995. Winter Peatland habitat selection by woodland caribou in northeastern Alberta. Can. J. Zool. 73: 1567–1574.

Dzus, E. 2001. Status of the Woodland Caribou (*Rangifer tarandus caribou*) in Alberta. Alberta Environment, Fisheries and Wildlife Management Division, and Alberta Conservation Association, Wildlife Status Report No. 30, Edmonton, AB. 47 pp.

IR Number 1.2.11 (Source GNWT)

Preamble

Table 7.6.3.4 bases Zones of Influence and Disturbance on published literature for caribou only.

Request

Please provide the MVEIRB with the following information:

a) Clarify how the zones of influence and disturbance coefficients were established for moose and marten?

Response

a) Zones of influence (ZOI) and disturbance coefficients (DC) used to determine levels of sensory disturbance for woodland caribou were based on information in Dyer (1999) and professional judgement of experienced wildlife biologists. The reader is referred to IR Response 1.2.123 for a more detailed discussion on the determination of ZOI related to caribou.

The ZOI and DC determined for woodland caribou were used as a basis for assessing sensory disturbance for moose. However, ZOIs and DCs for caribou would be considered a highly conservative approach for assessing sensory disturbance to moose. Moose are considered to be a species with a preference for using edge areas that tend to provide higher forage availability, diversity and quality. In Alberta, moose densities have been shown to be positively related to proximity to human settlements and road density (Schneider and Wasel 2000). Therefore, the ZOI was simplified for road effects on moose and was left the same for moose and woodland caribou for facilities and developments and utility corridors. It should be noted that although sensory disturbance assessments for moose and woodland caribou are considered to be conservative or worst-case scenario, Paramount believes that their assessment for potential impacts to moose is even more conservative than for woodland caribou.

There is little information available on sensory disturbance and furbearers, particularly for marten. However, it has been shown that marten will generally not cross open areas >50-100 m wide (Hargis and McCullough 1984). However, this finding may be related to reduced access to sub-nivean space in open areas, rather than avoidance due to predation risk. Nevertheless, this information formed the basis of the zone of influence for marten, while the disturbance coefficient was based on expert opinion. The assessment of sensory disturbance for marten is considered to be conservative. It is

also important to note that retention of slash on cleared areas, where practical, may mitigate this effect.

References:

Hargis, C.D and D.R. McCullough. 1984. Winter diet and habitat selection of marten in Yosemite National Park. Journal of Wildlife Management 48: 140–146.

Schneider, R.R. and S. Wasel. 2000. The effect of human settlement on the density of moose in northern Alberta. Journal of Wildlife Management 64: 513–520.

IR Number 1.2.12 (Source: GNWT)

Preamble

The statement on low wolf numbers, predation rates and predictions of future predation are not substantiated by scientific research.

Request

Please provide the MVIERB with the following information:

a) *Provide any relevant studies on wolf or prey densities to substantiate the statement that predation rates are not expected to increase greatly as a result of increased access.*

Response

a) Paramount recognizes that increases in new access in some researched areas has been linked to increased predation by wolves. The DAR was based on assessing the cumulative effects related to the various phases of the development. The statement referred to in the request, is based on the cumulative effects assessment, which considers the amount of existing disturbance corridors within the Terrestrial Study Area (TSA). The increase in access predicted for the Application Case, and Planned Development case, over the existing Baseline Case, are expected to be small, considering the Baseline disturbance corridors present. As such, the statement refers to the low potential for a small increase in access within the TSA over the Baseline Case, to result in increased predation.

   Further, the statement considers the low density of prey species for wolves, particularly moose and caribou, reported for the Cameron Hills SDL area, and as noted during the various field programs, including monitoring. Extensive use by wolves, of an area with low prey densities, would not be expected.

   Wolf densities are positively related to moose densities, with the highest wolf densities in areas with the highest moose density (Gasaway et al. 1992).

References:

Gasaway, W. C., Boertje, R. D., Grangaard, D. V., Kelleyhouse, D. G., Stephenson, R.O. and D. G. Larson. 1992. The role of predation in limiting moose at low densities in Alaska and Yukon and implications for conservation. Wildlife Monographs 120:1-59.

IR Number 1.2.13 (Source: GNWT)

Preamble

The methodology to determine existing linear disturbances is not provided. In addition, the amount of linear disturbance planned does not seem to be reflected in the Planned Development Case. The case of the density of the specific layout of linear disturbance not causing a physical barrier to species movement is not supported by scientific study.

Request

Please provide the MVEIRB with the following information:

a) *Describe how the baseline case of linear disturbance was developed and provide an assessment of accuracy. In particular, were any older linear disturbances assumed to be revegetated or sufficiently revegetated to not be included.*

b) *Explain why the amount of additional linear disturbance was only an additional 75 km when at least 200 km of 2D is also planned.*

c) *Provide any relevant studies that demonstrate that the Planned Development Case does not restrict caribou movement? Of particular relevance are studies related to 3D (i.e. high density rate of disturbance in small areas).*

d) *Provide the total linear disturbance density within the Local Study Area.*

Response

a) Linear disturbance density was calculated by summing lengths (km) of all linear features on the landscape for each development case then using the area (km^2) of the Terrestrial Study Area (TSA) as the denominator. Linear features considered for determining this metric include:

- seismic lines (2D and 3D)
- pipeline ROW
- access ROW
- pipeline and access ROW combined

All existing linear features that were present prior to Paramount's development and that were visible on the satellite imagery were used in this calculation. The assessment of linear disturbance density is accurate, based on the best historical information available and information related to Paramount's existing/approved developments and future developments.

To assess the worst-case scenario, all linear disturbance were classified as disturbed, and no allowance made for different stages of regeneration. However, the older cutlines and disturbances (e.g., airstrips) are exhibiting regeneration of vegetation.

b) Paramount has indicated that 2-D seismic may precede 3-D seismic in a given area. Because the exact length and location of the 2-D lines were not known, the 200 km of 2-D seismic was not directly included into the maps used to generate the spatial information. However, because the calculation of disturbance double-counted approximately 165 km of linear disturbance which was used to calculate the linear density, the potential additional seismic activity disturbance is accounted for.

c) The Planned Development Case was determined to have a low (+10) residual impact classification on woodland caribou movement (Table 7.6-16). This classification was based on a combination of potential effects from roads and seismic lines on caribou movement. Roads have been shown to act as a semi-permeable barrier to caribou movement with movement being most restricted by roads during late winter, when traffic is highest (Dyer et al. 2002). However, it should be noted that this study occurred in areas that have higher levels of industrial development than the Cameron Hills, and hence, with higher levels of traffic (i.e., 600-800 vehicles per day).

   In addition, Dyer et al. (2002) found that seismic lines did not restrict caribou movements. However, seismic line densities in that study area were lower than the total linear disturbance densities currently existing in the Cameron Hills. Nevertheless, results from Dyer et al. (2002) suggest that roads with high levels of traffic (i.e., 600-800 vehicles per day) act as semi-permeable barriers, particularly during late winter, while seismic lines had no effect on caribou movement. Road traffic in the Cameron Hills is expected to be much less than the heavy traffic areas found in Dyer et al. (2002), and primarily only during winter when the winter road can be constructed. There are no known studies to date that have looked at threshold levels of seismic line densities on woodland caribou movement.

d) For the DAR a Local Study Area was not used because the purpose of the report was to complete a cumulative effects assessment within the Terrestrial Study Area (TSA). The reader is referred to IR Response 1.2.123 for a map displaying the linear corridor density variation throughout the terrestrial CESA.

References:

Dyer, S.J., J.P. O'Neill, S.M. Wasel and S. Boutin. 2002. Quantifying barrier effects of roads and seismic lines on movements of female woodland caribou in northeastern Alberta. Journal of Wildlife Management 80: 839-845.

IR Number 1.2.14 (Source: GNWT)

Preamble

The proponent has stated that experience and observations have indicated they expect about 25% of their work force to be Northerners. This ratio was garnered from previous employment records from 1999-2003.

Request

Please provide the MVEIRB with the following information:

a) As 25 percent ratio is not a hiring target but an estimation of the percentage of northern workers based on previous employment records would the proponent be prepared to provide a minimum hiring target for this and future projects?

Response

a) Paramount is not prepared to provide minimum hiring targets due to the potential fluctuations of Paramount's Cameron Hills annual activity, its seasonal nature, and the uncertainty of an available, willing and qualified northern workforce and services at the time of hiring.

Paramount has currently exceeded the long-term northern employment goal and will continue to encourage qualified northerners to apply for production operator positions as they become available.

IR Number 1.2.15 (Source: GNWT)

Preamble

The proponent has stated that the percentage of Northern hires will depend on the availability of labour as particularly skilled or high school educated labour will be required for ~ 75% of the jobs.

The proponent also states that they have in the past and will continue to conduct on the job training as a means towards enabling employment of Northerners.

Request

Please provide the MVEIRB with the following information:

a) *Reconcile the two statements referenced above?*

b) *If the proponent is willing to conduct on the job training to allow Northerners to join their workforce please explain how lack of education or training would be a barrier to employment?*

c) *Indicate in detail the plans for potential on the job training?*

d) *Indicate what the policy on educational equivalencies is in terms of their hiring process?*

e) *Detailed initiatives planned in the directly affected communities with regards to training and education opportunities for residents of those communities.*

f) *Indicate what partnerships exist or are planned with other members of the oil and gas industry to provide training opportunities to northerners?*

Response

a) The first statement refers to availability of labour. The evidence from across the north is that more educated and/or skilled people who are in the labour force and are able to work already experience high employment rates. Within the order of 75% of the jobs require specialized skills and/or a high school education, and with these skills found largely in the already employed labour force, Paramount may experience challenges in identifying northerners able and willing to work in a remote location at seasonal work. Challenges would be expected to decrease with time, as more oil and gas sector activity occurs and more people are drawn into the workforce, are trained and gain experience.

The second statement notes Paramount's existing on the job training programs, which are intended to increase the skills of the employable such that they may advance to

more highly skilled and/or responsible positions. On the job training presumes that people are employed by the project, and meet minimum standards for that employment. While there is some flexibility to hire and train the marginally employable (enabling employment), there are legal, health and safety, and zero tolerance constraints on the one hand, and financial constraints on the other to employing a workforce that is inadequate to operational requirements. With time, as more well sites may be developed, there should be an improvement in the overall quality of the workforce as people move up the employment ladder.

b) Related to the above, the education and oil and gas experience of people in the north are limited relative to the requirements of the full range of oil and gas sector jobs that are being made available. As a result, many of these jobs are being taken up by non northerners. Education and training (skill level) constraints will continue to represent a barrier to the full uptake of available oil and gas sector jobs by northerners, for some time. On the job training will enhance skill levels over time for some individuals, but cannot create a workforce with the full diversity of education, skills and experience necessary to implement a project such as Paramount's.

   At the individual level, lack of education and training can be a barrier to employment insofar as there are limits to what on the job training can achieve. For example, it is not Paramount's intention to include literacy, high school completion or university degree programs in on the job training where these are minimum job requirements for legal, health and safety or other reasons.

c) Potential short-term employment on the job training may include heavy equipment operations, electrician tasks, radiography, slashing, camp and catering services, safety, and environmental monitoring. Potential long-term employment job training was provided in EA01-005, IR 1.10.

d) For short-term employment, Paramount presently considers primarily previous work history, and references in lieu of education requirements, proactively seeking out information that comes from a range of sources and networks that maintain records or have information on employment and contracting in the north. Sources include RWED, contractors, community leadership, and individuals themselves. In addition, for jobs requiring lower skill levels or where traditional knowledge is of value such as for environmental monitoring, Paramount has sought out and considered the advice of community leadership on suitable candidates. Contractors adhering to industry acceptable safety, training and employment criteria provide most short-term employment opportunities

e) Paramount does not presently plan itself to intervene directly in communities to undertake training and education, though we have in the past encouraged contractors to implement training programs for northerners.

f) As there are no other oil and gas sector companies operating in the area of the project, Paramount has to date worked only with GNWT representatives in Hay River, on an informal basis, to identify means to involve people from directly affected communities in employment (including on the job training) and business opportunities, and as stated in e) above, Paramount has encouraged contractors to implement training programs for northerners.

IR Number 1.2.16 (Source: GNWT)

Preamble

The proponent has indicated that they may not be able to recruit from the directly affected communities as required skill sets may not be available in the directly affected communities, as such they will recruit from across the NWT.

Request

Please provide the MVEIRB with the following information:

a) Indicate whether Paramount has an 'affirmative action' hiring policy in regards to both the directly affected communities and the NWT at large.

b) If so, provide the details of that policy?

Response

a) Paramount does not have a formal, corporate affirmative action hiring policy. Paramount has however committed itself to preferential hiring of firstly people from potentially directly affected communities, and secondly northerners (consistent with operational imperatives), as described in the Benefit Plan and Update, in the DAR, and in other information request responses. In addition, Paramount has committed itself to proactive initiatives that are intended to facilitate the access to jobs by people from directly affected communities and the north more generally, primarily through provision of timely information on opportunities, on the job training, discussions with community leadership on available candidates and information exchange with GNWT representatives. Such initiatives are intended to increase the number of job applicants to be preferentially considered.

b) See above

IR Number 1.2.17 (Source: GNWT)

Preamble

In determining health and social impacts, the developer must consider other indicators beyond the limited list above (i.e. strain on infrastructure, alcohol and drug use, and teen pregnancy).

The Developers Assessment Report does not provide enough information to determine what the health and social impacts of the development may be. Further, the information does not address what the developer proposes to do to minimize or mitigate any negative impacts and effects of the project.

The developer states it does not propose to implement monitoring of community socio-economic parameters (page 332) and, should routine data collection (on the part of others) suggest that negative trends in community well being are occurring, they will be dealt with through the developer's consultation process.

The consultation process is, at best, described as ongoing consultation with communities and with two trappers potentially affected by the project, to ensure that as issues arise, they can be dealt with in a fair and timely way (page 331). The GNWT is not listed as a party to the consultation process and finds the developer's response to consulting on negative trends to be inadequate.

Below is what the developer provided in its Assessment Report on potential socio-economic benefits, areas of concern, and monitoring. Because the developer has down played any potential effects of the project and has provided essentially no information on what it would do to minimize or mitigate any impacts, the following Information Requests are being submitted for response.

The developer has noted that the employment (page 324) and contracting (page 326) opportunities are seasonal and considered to be of high consequence at the local level. Also, the developer has noted that the overall impact on the NWT economy (page 326-327) is considered to be moderate.

Request

Please provide the MVEIRB with the following information:

a) *Can the developer quantify the above statements?*

b) *Can the developer identify the anticipated effects on local employment and contracting in the communities of Enterprise, Hay River, Hay River Reserve, Kakisa and Fort Providence during the developer's seasonal activity as well as during the downturn of activity, or off-season?*

c) *Further, can the developer identify what the related health and social impacts might be in the above communities as a result of this activity and downturn in employment and contracting at the local level?*

d) *Of particular interest to the GNWT is for the developer to identify any anticipated impacts or strains on i) health and social services infrastructure, and ii) population health and well being; that are associated with both an increase and a decrease of employment and affluence in local communities.*

e) *Further to the above identification of impacts, the GNWT is interested in what the developer proposes to do to minimize and mitigate the anticipated impacts, and requests that the developer provide this information.*

Response

a) The cumulative impact assessment considers effects beyond those of the Application Case (which were not quantified) on the basis of a potential for up to 48 new well sites. As there has been no decision to proceed with any of these, quantitative modeling of economic benefits would be based on very tenuous assumptions and be too highly speculative as to provide useful information. Ongoing land claim and distribution of power negotiations between the federal, territorial, regional and local levels add additional layers of uncertainty as to where economic benefits will fall in the future.

   Quantification of economic benefits was therefore limited to extrapolation of what data are available on past experience in Cameron Hills, for example on employment and procurement patterns in the north. Paramount has not in the past been required in its reporting to differentiate between potentially directly affected communities and the north at large and does not have complete records in this regard.

b) As per the above, there are no complete records that would permit accurate extrapolations to the number of jobs with Paramount, its contractors, or businesses supplying the project that may be taken up by residents of specifically the potentially directly affected communities. Business benefits during the construction phase are estimated to be in the order of $3 million per year and are also seasonal. Indirect impacts of both employment and business opportunities are primarily related to capacity building as experience with oil and gas sector employment is accumulated, and to increased income and the associated improved quality of life.

c) The CEA argues that there are positive health and social impacts associated with increased employment and income. Reporting by Statistics Canada and the GNWT demonstrate that overall, trends in the north indicate health and social indicators are improving (e.g. life expectancy, educational performance, housing) or stabilizing (teen age pregnancy, crime rates) and that employment and income is growing. The presumption is that there is a positive correlation between health and social status on the one hand and employment and income on the other. This is what underlies GNWT

policies to encourage employment of northerners, and the desire of communities to see employment benefits from large projects. The remoteness of the project ensures that there will be negligible direct impacts of out of area workforces on potentially directed community populations or social infrastructure.

This is not to argue that there will be no negative health and social impacts at the individual level, only that the net effect at the community level is expected to be positive. Certain individuals who choose to seek rotational employment and/or see increased income as a result of the project may make choices that are not in their best interests. Such choices are personal and unpredictable, and have varying impacts at the individual level. Further, the health and social infrastructure is in place to assist individuals with personal difficulties, however successfully. Also with increasing benefit to health and social status in the population overall as a result of the project, resources should be freed up to address problem individual cases.

The CEA looks at the potential for an eventual 48 wells. The employment and income benefits are primarily seasonal over a notional ten year construction phase. This in turn implies that employment is temporary on the one hand and uncertain (it is not necessary that in fact 5 wells will be developed in each of the next ten years) on the other. Increased employment and income will not therefore be continuous. However, the job experience and skill building that occurs with formal wage employment is a benefit, is cumulative and can be applied elsewhere in the economy. Increased capacity of the work force is in the context of GNWT policies to maximize northern employment and procurement, and encourage resource development project development towards economic growth and diversification. The coming to an end of any eventual new projects of Paramount should not imply economic downturn but new availability of skilled labour for alternative employment.

d) See above. The expected overall effect on health and social infrastructure and on population health and well being is expected to be positive and to increase with time.

e) Paramount has not in its Application Case proposed to intervene directly in communities and is not proposing to do this in relation to this CEA. Impact mitigation and benefit enhancement measures include preferential employment and business opportunities, zero tolerance for substance abuse at the work site, health and safety training of employees which is often then applied to life outside work, the keeping of out-of-area workforces away from potentially affected communities at great distances from the project site and other measures as described in the Application Case and the CEA. There is an expected overall net benefit to community well being. Should, in any eventual development of additional projects to proceed with new wells, impact assessment conclude that there is a requirement to mitigate specific impacts at the community level, this would be considered at that time.