**IR Number 1.2.119** **(Source: MVEIRB)**

**Preamble**

*In response to IR Number 1.1.8, Paramount indicated that there is an indirect relationship between Environmental Consequence and Environmental Significance, and that only impacts with a High Environmental Consequence rating have the potential to have significant adverse effects on the environment.*

**Request**

*Please provide the MVEIRB with the following information:*

*a) What conditions must be present for an impact to be considered to have a significant adverse effects on the environment?*

**Response**

a) It is Paramount's opinion that significance is closely related to the concept of sustainable development. Sustainable development has been defined as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (United Nations World Commission on Environment and Development 1987). Although this definition is intended for human generations, Paramount would broaden their definition to include generations of other biological components.

The determination of significance should consider the sustainability of the people who may be affected and their communities, as well as the sustainability of the natural resources. This regional concept is related to the ability of the environment to return to equivalent environmental quality as exists now.

In this case, the question of significance could be based on a determination of whether or not the activities in the respective Cameron Hills Study Areas will result in a shift in a natural resource or human use that is unsustainable on a regional basis and, if so, if this shift is acceptable.

The MVEIRB is also referred to Paramount's response to IR 1.2.59 in addition to this response.

**IR Number 1.2.120** **(Source: MVEIRB)**

**Preamble**

*As noted in Section 7.8.3.4, complete reclamation of disturbed organic soil and terrain units is unlikely where grading or cut and fill is required (page 65) for permanent facilities.*

**Request**

*Please provide the MVEIRB with the following information:*

*a) Please modify the DAR assessment conclusions included in Table 7.3-6 regarding the reversibility of soil and terrain units or provide information relevant to the Cameron Hills CESA area which demonstrate that natural drainage patterns and organic soil parameters can be restored on disturbed organic soil and terrain units.*

**Response**

a) For clarification, the statement in Section 7.8.3.4 of the DAR was meant to reflect that black spruce bogs disturbed by pipeline construction are not expected to immediately revert to black spruce bogs, but will over time. While Paramount acknowledges that organic soils and their drainage patterns may be temporarily disturbed during pipeline construction, particularly within the trenchline, there are no long-term impacts predicted for these areas. As construction of pipelines will be undertaken during the winter when the soil is frozen, the organic soil will be replaced immediately following construction so that internal drainage patterns in these wet, low-lying areas (i.e., typically saturated soils) are expected to be re-established after spring thaw. Note that organic soils are located on level terrain with slopes of 0-1%. Therefore, cut and fill will only be required on rolling terrain which contains mineral soils. While the organic soil horizons may experience some mixing during pipeline construction, this is not expected to change soil properties related to plant growth as the lower organic horizons are also rich in organic matter. Therefore, as all disturbances are expected to be mitigated over time, the conclusion in Table 7.3-6 that soil disturbances are reversible is considered valid. This conclusion is supported by Paramount's field experience with other pipelines constructed in the NT.

**IR Number 1.2.121** **(Source: MVEIRB)**

**Preamble**

*IR 1.1.20 requested a tabular summary of disturbance by land use feature in the aquatic and terrestrial CESAs for the Existing, Project Application, and Planned Development cases. The response to IR 1.1.20 provides a table that summarizes area of disturbance for three classes of land use features, presumably for the terrestrial CESA.*

**Request**

*Please provide the MVEIRB with the following information:*

a) *A tabular summary of disturbance for **each** of the following land use features in the **Terrestrial CESA** for the **Existing Case**: existing seismic lines, approved 3D seismic lines, 8 m temporary roads, 10 m operations roads, 20 m pipeline ROWs, 30 m utility ROWs, well pads, emergency access for each well, disposal pits, battery/facility sites, satellites, camps, airstrips, borrow pits, and other.*

b) *A tabular summary of disturbance for **each** of the following land use features in the **Aquatic CESA** for the **Existing Case**: existing seismic lines, approved 3D seismic lines, 8 m temporary roads, 10 m operations roads, 20 m pipeline ROWs, 30 m utility ROWs, well pads, emergency access for each well, disposal pits, battery/facility sites, satellites, camps, airstrips, borrow pits, and other.*

c) *Table 1.1.20-1 indicates that road and utilities disturbances for the Baseline Case total 97 ha and 1,652 ha respectively; statistics provided in Table 7.8-8 indicate that road and utilities disturbances for the Baseline Case total 116 ha and 1,633 ha respectively. Please provide statistics that outline the reason(s) for these discrepancies.*

d) *A tabular summary of disturbance for **each** of the following land use features in the **Terrestrial CESA** for the **Project Application Case**: existing seismic lines, approved 3D seismic lines, potential future 2D reconnaissance seismic lines, 8 m temporary roads, 10 m operations roads, 20 m pipeline ROWs, 30 m utility ROWs, well pads, emergency access for each well, disposal pits, battery/facility sites, satellites, temporary camps, permanent camps, airstrips, borrow pits, and other.*

e) *A tabular summary of disturbance for **each** of the following land use features in the **Aquatic CESA** for the **Project Application Case**: existing seismic lines, approved 3D seismic lines, potential future 2D reconnaissance seismic lines, 8 m temporary roads, 10 m operations roads, 20 m pipeline ROWs, 30 m utility ROWs, well pads, emergency access for each well, battery/facility sites, satellites, disposal pits, temporary camps, permanent camps, airstrips, borrow pits, and other.*

f) *Table 1.1.20-1 indicates that combined disturbance for the Application Case will total 28 ha; statistics provided in Table 7.8-8 suggest 37 ha. Table 1.1.20-1 indicates that 6 ha of facilities will be added for the Planned Development Case; DAR Table 7.8-8*

*indicates that 14 ha of facilities will be added. Please provide statistics that outline the reason(s) for these discrepancies.*

g) *A tabular summary of disturbance for* ***each*** *of the following land use features in the* ***Terrestrial CESA*** *for the* ***Planned Development Case****: existing seismic lines, approved 3D seismic lines, potential future 2D reconnaissance seismic lines, 8 m temporary roads, 10 m operations roads, 20 m pipeline ROWs, 30 m utility ROWs, well pads, emergency access for each well, battery/facility sites, satellites, disposal pits, temporary camps, permanent camps, airstrips, borrow pits, and other.*

h) *A tabular summary of disturbance for* ***each*** *of the following land use features in the* ***Aquatic CESA*** *for the* ***Planned Development Case****: existing seismic lines, approved 3D seismic lines, potential future 2D reconnaissance seismic lines, 8 m temporary roads, 10 m operations roads, 20 m pipeline ROWs, 30 m utility ROWs, well pads, emergency access for each well, disposal pits, battery/facility sites, satellites, temporary camps, permanent camps, airstrips, borrow pits, and other.*

i) *Table 1.1.20-1 indicates that combined disturbance for the Planned Development Case will total 128 ha; DAR page 1 says 147 ha, and statistics provided in Table 7.8-8 suggest 147 ha. Table 1.1.20-1 indicates that 64 ha of roads will be added for the Planned Development Case; DAR Table 7.8-8 indicates that 83 ha of roads will be added. Please provide statistics that outline the reason(s) for these discrepancies.*

j) *A tabular summary of disturbance for* ***each*** *of the following land use features in the* ***Terrestrial CESA*** *for the* ***Far Future Case****: existing seismic lines, approved 3D seismic lines, potential future 2D reconnaissance seismic lines, 8 m temporary roads, 10 m operations roads, 20 m pipeline ROWs, 30 m utility ROWs, well pads, emergency access for each well, battery/facility sites, satellites, disposal pits, temporary camps, permanent camps, airstrips, borrow pits, and other.*

k) *Please indicate the source of the disturbance data used to generate wildlife habitat loss and sensory disturbance estimates in Table 1.1.22-1 (i.e., data used to generate Table 1.1.20-1 or data used to generate Table 7.8-8).*

**Response**

a) Terrestrial CESA – Existing Case

| Land Use Feature | Area (ha) |
|---|---|
| seismic lines – 2D | 721 |
| seismic lines – 3D | 303 |
| seismic lines – Approved 3D | 539 |
| 10 m temporary roads | 85 |
| 18 m pipeline and roads | 11 |
| 18 m pipeline ROWs | 57 |
| 24 m utility (pipeline and roads) ROWs | 20 |
| well pads | 118 |
| 10 m emergency access | 13 |

| | |
|---|---|
| disposal pits (on leases) | 0 |
| battery/facility sites | 6 |
| satellites | |
| camps | 13 |
| airstrips | 32 |
| borrow pits | 0 |
| other | 0 |
| Total | 1,918ha |

b) Aquatic CESA – Existing Case
The Aquatic CESA was established to focus assessment of aquatic issues on a watershed basis, as such; existing terrestrial disturbances are not mapped or measured in the Aquatic CESA.

c) Table 7.8-8 Cumulative Changes to Disturbance by Class

| | Baseline Case | | Application Case | | Planned Development Case | |
|---|---|---|---|---|---|---|
| | ha | % of TSA | ha | % of TSA | ha | % of TSA |
| roads | 116 | 0.1 | 139 | .1 | 222 | 0.2 |
| facilities | 169 | 0.2 | 175 | 0.2 | 239 | 0.3 |
| utilities | 1,633 | 1.7 | 1,633 | 1.7 | 1,633 | 1.7 |
| **Total** | **1,918** | **2.0** | **1,946** | **2.0** | **2,093** | **2.2** |

Table 1.1.20-1 Area of Disturbance by Land Use Feature for the Baseline, Application and Planned Development Cases.

| Land Use Feature | Development Case | | |
|---|---|---|---|
| | Baseline | Application | Planned |
| Facilities[a] | 169 ha | 6 ha | 64 ha |
| Roads | 97 ha | 22 ha | 64 ha |
| Utilities[b] | 1,652 ha | - | - |
| **Total (cumulative)** | **1,918 ha** | **28 (1,946) ha** | **128 (2,074) ha** |

a New wellpads and associated infrastructure
b Seismic lines, power lines and pipelines

The numbers in the Table 1.1.20-1 are correct except that 19 ha of disturbance should be added to the Roads in the Planned Development Case to compensate for 1 km of emergency access for each wellsite. Although the total (cumulative) numbers are consistent between the two tables above, there is a discrepancy of 19 ha between the Utilities and Roads land use features. This discrepancy is caused by a seismic line and road overlapping and resulting in a categorization difference between two assessors. This small discrepancy has no bearing on the results of the environmental impact assessment results presented in the DAR.

d) New Table - Application Case

| Land Use Feature | Area (ha) |
|---|---|
| seismic lines – 2D | |
| seismic lines – 3D | |
| seismic lines – Approved 3D | |
| 10 m temporary roads | |
| 18 m pipeline and roads | 16ha |
| 18 m pipeline ROWs | |
| 34 m pipeline and roads | 6ha |
| well pads | 6ha |
| 10 m emergency access | |
| disposal pits (existing) | 0 |
| battery/facility sites | |
| satellites | |
| camps | |
| airstrips | |
| borrow pits | 0 |
| other | 0 |
| Temporary Camps | |
| | |
| Subtotal | 28 |
| Cumulative Total | 1,946 ha |

e) Aquatic CESA – Application Case
See response to b)

f) There appears to a calculation error in the IR. The combined disturbance for the Application is 1,918 ha, when this disturbance is subtracted from the combined disturbance for the Application Case (1,946 ha) the result is 28 ha of disturbance. This corresponds to the values presented in Table 1.1.20-1.

Similarly, the values in both tables indicate 6 ha of facilities will be added, in Table 7.8-8 175 ha (Application Case) – 169 ha (Baseline Case) = 6 ha difference, not 14 as indicated in this information Request.

g) New Table - Planned Development Case

| Land Use Feature | Area (ha) |
|---|---|
| seismic lines – 2D | |
| seismic lines – 3D | |
| seismic lines – Approved 3D | |
| 10 m temporary roads | |
| 18 m pipeline and roads | 59ha |
| 18 m pipeline ROWs | |
| 24 m utility (pipeline and roads) ROWs | 0.1ha |

| | |
|---|---|
| 28 m pipeline and roads | 5 ha |
| 34 m pipeline and roads | 0.03 ha |
| well pads | 55 |
| 10 m emergency access | |
| disposal pits | 4 |
| battery/facility sites | |
| satellites | 4.5 |
| camps | 0.5 |
| airstrips | |
| borrow pits | 0 |
| other | 0 |
| Temporary Camps | |
| Potential Future Seismic (not mapped as location not known)<br>Refer to IR's 1.2.2 and 1.2.106 | |
| Total | 128 ha +19ha emergency |
| Cumulative Total | 2,093 |

h) Aquatic CESA – Planned Development Case
See response to a) above.

i) The difference in these numbers is 19 ha. The 19 ha of emergency access (1 km of emergency access (6 m wide) for each well in the Planned Development Case) was accounted for with a note under the table. When the Table 1.1.20-1 was created, the 19.2 ha was supposed to be added in with the note (see the table below).

| | Baseline | | Application | | Planned Development | |
|---|---|---|---|---|---|---|
| | **Incr.** | **Cumul.** | **Incr.** | **Cumul.** | **Incr.** | **Cumul.** |
| GIS | 1918 | 1918 | 28 | 1946 | 147* | 2093 |

* note that the incremental disturbance for the planned development case includes 19.2 ha of emergency access that is theoretical and does not exist on the physical footprint as we don't know where it will go.

This also accounts for the difference between 64 ha of roads and 83 ha of roads.

j) There was no Far Future Case scenario. It is assumed that all disturbances are revegetated to natural vegetation communities; therefore, no industrial disturbances remain.

k) Aquatic CESA – Far Future Case

Data was not set-up to calculate areas and buffering for the Aquatic CESA and there was no Far Future Case scenario.

**IR Number 1.2.122** **(Source: MVEIRB)**

**Preamble**

*The zones of influence used in the disturbance analysis do not represent the maximum distance that a disturbance will potentially affect animals, and the rationale for the selected zones of influence is not clear.*

**Request**

*Please provide the MVEIRB with the following information:*

a) *The zones of influence for songbirds included in Table 7.6-8 are defined there as the maximum distance that a disturbance will potentially affect a species. Please provide the rationale, including supporting literature relevant to the Cameron Hills CESA area, for use of a 50 m zone of influence for songbirds near access, wellsites, and utility corridors, when the cursory literature review included in Section 7.6.1 indicates that effects have been documented to at least 150 m from linear features. Flaspohler et al. (2001) found that nest success of ovenbird and hermit thrush, two ground-nesters found in the Cameron Hills area, was affected up to 300 m from clearings.*

b) *Please provide the rationale, including supporting literature relevant to the Cameron Hills CESA area, for use of a 250 m zone of influence for marten near access and wellsites, and a 100 m zone of influence near utility corridors.*

**Response**

a) There is ample literature on the effects of fragmentation on forest songbirds, however, the majority of the literature comes from the eastern United States where research has been conducted in deciduous hardwood stands, such as Flashpohler et al. (2001). When considering fragmentation effects, one should examine studies conducted in the northern boreal forest where natural disturbance regimes such as fire have been posed as a means of rendering songbirds more resilient to habitat alterations (Schmiegelow et al. 1997). Villard et al. (1998) supported the conclusion that habitat loss should be the focus of efforts for long-term solutions to habitat fragmentation (Fahrig 1997). In addition, Schmiegelow and Mönkkönen (2002) also suggest that system- and species-specific considerations are important when assessing habitat loss and fragmentation.

   Therefore, a zone of influence of 50 m, on top of the direct habitat loss, was used to assess habitat loss and reductions in habitat quality for songbirds. However, inferences related to effects on population were not considered as these are poorly understood, and are likely species- and system-specific.

b) See response to IR 1.2.11. In addition to the response provided for IR 1.2.11, the assumptions used in defining the ZOI for different project components are as follows:

- potential higher noise levels near access due to traffic (although primarily in winter) and near active wellsites justifies a larger zone of influence of 250 m; and
- 100 m zones for utility corridors based on the Hargis and McCullough (1984) findings.

However, it should be noted that Paramount believes the sensory disturbance assessment for marten is conservative.

**References:**

Fahrig, L. 1997. Relative effects of habitat loss and fragmentation on on population extinction. Journal of Wildlife Management 61: 603-610.

Flashpohler, D.J., S.A. Temple and R.N. Rosenfield. 2001. Species-specific edge effects on nest success and breeding bird density in a forested landscape. Ecol. Appl. 11: 32–46.

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.

Schmiegelow, F.K.A., C.S. Machtans and S.J. Hannon. 1997. Are boreal birds resilient to forest fragmentation? An experimental study of short-term community responses. Ecology 78: 1914–1932.

Schmiegelow, F.K.A. and M. Mönkkönen. (2002). Habitat loss and fragmentation in dynamic landscapes: Avian perspectives from the boreal forest. Ecological Applications 12: 375–389.

Villard, M.A., M.K. Trzcinski and G. Merriam. 1999. Fragmentation effects on forest birds: relative influence of woodland cover and configuration on landscape occupancy. Conservation Biology 13: 774–783.

**IR Number 1.2.123** **(Source: MVEIRB)**

**Preamble**

*Follow-up to the request for additional spatial information on linear disturbance density and habitat effectiveness for woodland caribou. (IR 1.1.30)*

**Request**

*Please provide the MVEIRB with the following information:*

a) *Provide a spatially-explicit map displaying linear corridor density variation throughout the terrestrial CESA.*

b) *The zones of influence for caribou included in Table 7.6-8, defined there as the maximum distance that a disturbance will potentially affect a species, are attributed to Dyer (1999). Please discuss why a 250 m zone of influence was used for wellsites, when Dyer (1999) reported the maximum zone of influence for wells to be 1000 m. Please discuss why a 1000 m zone of influence was used for access, when Dyer (1999) reported the maximum zone of influence for roads to be 500 m. Please discuss why a 100 m zone of influence was used for utility corridors (including seismic lines), when Dyer (1999) reported the maximum zone of influence for seismic lines to be 250 m.*

c) *Please update Table 1.1.22-1, Summary of Direct Habitat Loss and Area Affected by Sensory Disturbance for Wildlife VECs Under Each Development Case, to reflect the maximum zones of influence reported by Dyer (1999): 1000 m for wells; 500 m for access; and 250 m for seismic lines. Indicate the source of the disturbance data used to generate these estimates (i.e., data used to generate Table 1.1.20-1 or data used to generate Table 7.8-8).*

d) *The Alberta Boreal Caribou Committee (2003) has concluded that the following formula is an excellent predictor of woodland caribou population trends:*

$$Y = (-0.258*I)-(0.212*F) +1.140$$

*Where: Y is the population's finite rate of increase (1.0 is a stable population).*

*I is the % of the planning range (CESA in this case), within 250 m of an industrial feature.*

*F is the % of the planning range (CESA in this case), that is fire-origin and less than 50 years old.*

*Please calculate this formula for the Paramount Cameron Hills terrestrial CESA.*

**Response**

a) Map 1.2.123 is attached.

b) The Zones of Influence (ZOI) used in the DAR to determine sensory disturbance impacts on caribou, used the results of Dyer (1999) to help define the ZOI. Within Dyer (1999), it is important to note, that caribou movements were examined during five biological time periods (early winter, late winter, calving, summer, rut) and that "avoidance" did not necessarily indicate no use of a development buffer by caribou. Therefore, for the sensory disturbance assessment, the percentage of expected use by caribou within development buffers (see Figures 3-7, 3-8, 3-9, 3-10 and 3-11 from Dyer (1999)) were used to delineate Disturbance Coefficients. For example, if 100% of expected use of a buffer was displayed by caribou within a figure, it was assumed to have a DC of 1. If only 50% of expected use of a buffer was displayed by caribou, than that distance was given a DC of 0.5, and so on.

A 250 m zone of influence was used for wellsites in an effort to account for varying levels of sensory disturbance experienced by caribou, depending on the biological season, as supported by results presented in Dyer (1999). In Dyer (1999) caribou avoid ***new*** wellsites during the late winter, calving and early winter seasons. Caribou response to new wellsites during the summer was deemed to be random. During periods of avoidance, compositional analysis indicated that caribou observations were located within the 250 m buffer from new wells significantly less than the outer matrix during the late winter, rut and early winter (i.e., using Dyer's methods of determining avoidance, during the late winter, rut and early winter caribou avoid ***new*** wellsites to a maximum of 250 m). Only during calving did caribou observations occur significantly less in the 1000 m buffer than the outer matrix around new wellsites, yet caribou locations still occurred within these buffers (see Figure 3-9; Dyer 1999).

For ***old*** wellsites, caribou displayed a significant response and avoidance during the late winter and summer seasons only. During the late winter/calving season, caribou used buffers within 500 m of old wellsites significantly less than the outer matrix and during the summer used buffers within 250 m of old wells significantly less than the outer matrix during summer (i.e., indicating an avoidance up to 500 m in late winter and 250 m in summer for old wells). The important point to note is that although caribou occurred significantly less frequently in buffers within 500 m of old wells during the late winter – caribou observations still occurred in these areas. In fact, Dyer reports that mean caribou use of the 0-250 m buffer was 84% of expected observations in late winter and 85% of expected use during the summer. Mean use of the 500-1000 m buffer ranged from 79% of expected use during the late winter to 146% of expected use during the summer. Therefore, given the amount of caribou use of habitat at distances greater than 250 m of wellsites, Paramount believes that a zone of influence of 250 m around wellsites is sufficient when predicting the overall sensory disturbance impact of wellsites on caribou.

The ZOI used for roads within the DAR was 1000 m *with variable DCs* (see DAR, Table 7.6-8), which reflected the results reported in Dyer's (1999) Figure 3-8. The ZOI for roads was greatest within the DAR to reflect a conservative approach to assessing the impacts of sensory disturbance. Although Dyer reported an avoidance of roads up to 500 m in open coniferous wetlands habitats, there was still a reduction in the number of caribou observations (i.e., less than 100% of expected observations) around roads until caribou occurred at distances of 1000 m or greater (see Figure 3-8, Dyer 1999). Therefore, DCs were developed to reflect this variable caribou habitat effectiveness as the distance to roads increases. For example, within 100 m of roads caribou are not expected to occur and habitat effectiveness was reduced to 0; within 250 m of roads caribou habitat was assumed to decrease by 75% (i.e., 25% habitat effectiveness); at 500 m from roads, caribou habitat is assumed to be reduced by 50%, and at distances from 500 -1000 m from roads caribou habitat is assumed to be reduced by 25% (i.e., with 75% habitat effectiveness).

Dyer (1999) reported that caribou avoided seismic lines up to 250 m in late winter and up to 100 m during all other time periods (i.e., early winter, calving, summer, rut). However, in late winter, although caribou locations were less than expected in the 100-250 m buffer from seismic lines, 85.5% of expected caribou use was still reported. Based on the 100 m "avoidance" of seismic lines during 4 biological seasons, and 3-D seismic activity planned to occur during a single winter only in a given area, with seismic lines allowed to revegetate, for the Cameron Hills Project, a 100 m ZOI was considered appropriate and used to determine the sensory disturbance impact of utility corridors within the DAR.

c) The zones of influence (i.e., 250 m wellsites, 1000 m roads, 100 m utility corridors) used within the DAR are believed to reflect a conservative estimate of habitat loss associated with sensory disturbance impacts to caribou and other VECs. Therefore, Table 1.1.22-1 was not revised.

d) The Boreal Caribou Committee (BCC) formula that is referred to, was developed specifically for setting habitat effectiveness targets for caribou ranges in Alberta; that have had an extensive amount of historical caribou location data, range data and population data collected. The model/formula was reviewed by Dave Hervieux (Wildlife Biologist, Alberta Sustainable Resource Development, June 2003; BCC AGM Calgary, AB) and at no time was it expressed that the BCC has concluded, published, or had scientifically reviewed, that this is the formula to be used for all caribou ranges to predict woodland caribou population trends. For the Cameron Hills, there is insufficient fire origin data, as well as a lack of a range map for the "Cameron Hills Caribou Population" to assume that the formula will provide an accurate prediction of the state of the caribou population in the Cameron Hills. Additionally, it is believed that the CESA should not act as the "planning range" for the population, as the CESAs boundaries would not necessarily reflect caribou herd/range boundaries (i.e., CESA determined based on one female caribou home range – not on a population boundary). Therefore, it would not be scientifically defensible to apply this model to the Cameron Hills caribou population occurring within the CESA.

**IR Number 1.2.124** **(Source: MVEIRB)**

**Preamble**

*Paramount has provided conclusions regarding the environmental consequence of sensory disturbance associated with three types of activities or features. Because the four wildlife VECs in the terrestrial CESA will be simultaneously affected by concurrent and sequential exploration, development, production, abandonment, and post-abandonment activities and features, additional information on the combined effect of sensory disturbance is required.*

*The DAR assessment conclusions and response to IR Number 1.1.21 b) indicate that the worst-case scenario for sensory disturbance is associated with a winter 3D seismic program during the winter it is completed. This presumes that noise and human activity is the only source of sensory disturbance. However as noted later in Paramount's response, sensory disturbance includes all sources of impact that result in reduced use (avoidance) of areas adjacent to land use features. Literature referenced by Paramount indicates that boreal-ecotype caribou avoid seismic lines (Dyer 1999). Oberg's (2001) study may not be directly applicable to the Cameron Hills area because it involved mountain-ecotype caribou; nevertheless, this study found that caribou were less likely to occur near seismic lines <23 years old than near lines >23 years old. These studies suggest that caribou display reduced use near conventional seismic lines like those used in the Cameron Hills CESA for >20 years after they are cleared (i.e., a long-term impact). During this period, caribou will also be exposed to sensory disturbance from existing seismic lines roads and utility corridors; camp, battery, and well operations, aircraft overflights, and any subsistence, trapping, and recreational activity.*

**Request**

*Please provide the MVEIRB with the following information:*

a) *The response to IR Number 1.1.21 b) indicates that sensory disturbance resulting from production operations will be local in geographic extent (i.e., confined within lease boundaries and rights-of-way). Please provide relevant information that confirms that sensory disturbance effects (defined as "reduced use of adjacent habitat") can in fact be restricted to development features, or modify the geographic extent criterion included in Table 7.6-16 to Regional for all four wildlife VECs.*

b) *Information provided in the DAR and response to IR Number 1.1.21 does not appear to support the DAR conclusion that reduced caribou use near seismic lines will not occur after 20 years post-disturbance. Please modify the DAR assessment conclusions regarding duration of sensory disturbance on caribou, or provide data that demonstrates that boreal-ecotype woodland caribou do not display long-term sensory disturbance from seismic lines.*

c) *Provide a combined rating of the environmental consequence of sensory disturbance on woodland caribou. Conclusions for the sensory disturbance pathway must integrate all forms of sensory disturbance associated with exploration, production, abandonment, and post-abandonment activities and features. The rationale for any differences between the combined sensory disturbance rating and the original rating provided in Table 7.6-16 should be presented.*

d) *Provide a combined rating of the environmental consequence of sensory disturbance on moose. Conclusions for the sensory disturbance pathway must integrate all forms of sensory disturbance associated with exploration, production, abandonment, and post-abandonment activities and feature. The rationale for any differences between the combined sensory disturbance rating and the original rating provided in Table 7.6-16 should be presented.*

e) *Provide a combined rating of the environmental consequence of sensory disturbance on marten. Conclusions for the sensory disturbance pathway must integrate all forms of sensory disturbance associated with exploration, production, abandonment, and post-abandonment activities and features. The rationale for any differences between the combined sensory disturbance rating and the original rating provided in Table 7.6-16 should be presented.*

f) *Provide a combined rating of the environmental consequence of sensory disturbance on forest songbirds. Conclusions for the sensory disturbance pathway must integrate all forms of sensory disturbance associated with exploration, production, abandonment, and post-abandonment activities and features. The rationale for any differences between the combined sensory disturbance rating and the original rating provided in Table 7.6-16 should be presented.*

**Response**

a) The response to IR Number 1.1.21(b), as well as Table 7.6-16 in the DAR, state that sensory disturbance impacts for woodland caribou and moose were assessed as being regional in geographic extent due to the reduction in habitat effectiveness around development features and the greater extent of impacts associated with species with larger ranges. Therefore, the geographic extent criterion does not require modification for moose or caribou.

Although not clearly defined within the DAR, it was assumed during the wildlife assessment that species with small home ranges would experience a local geographic extent of sensory disturbance impacts. This included both marten and forest songbirds. To compensate for the lack of information on the impacts of sensory disturbance to martens and songbirds, sensory disturbance impacts were defined as being high and moderate in magnitude, which is likely to be an overestimation of actual impacts. Therefore, the geographic extent was not modified from being local in extent for marten and forest songbirds.

b) No specific research results have been reported on the response (positive or negative) of the boreal ecotype of woodland caribou to seismic lines of a specific age. However,

it has been acknowledged by the scientific community and the BCC that seismic lines do not stay on the landscape forever – they in fact display natural regeneration, provided they are not redisturbed. For example, due to the level of natural re-growth acknowledged on seismic lines in west-central Alberta, and a corresponding lack of response of the mountain ecotype of woodland caribou, Oberg (2001) reported that caribou locations were more likely to occur near seismic lines > 23 years of age, presumably due to natural re-growth which had occurred on the lines. Even though the results reported in Oberg (2001) were dealing with the mountain ecotype of woodland caribou, MacFarlane (1999) also concluded that in the boreal forest (study conducted on Alpac's FMA, within boreal caribou range in Alberta) seismic lines reach similar tree densities to those found after wildfires (natural disturbance) after 10-20 years post-disturbance. Based on the knowledge that seismic lines can naturally regenerate and be removed from the disturbance footprint over time for caribou, and on the negative impacts associated with linear corridors to caribou (as reported in Dyer 1999 and James 1999); the Caribou Range Recovery Project (CRRP) was initiated in Alberta with a goal to speed the "recovery" of linear disturbances (roads, seismic lines, pipelines) so that their negative effects on woodland caribou and other sensitive species are lessened and eventually eliminated (Szkorupa 2002). The CRRP began as a pilot project in 2001/2002 and is yet to determine how and when (i.e., number of years a line becomes insignificant to a caribou) linear disturbances are "recovered" in terms of becoming effective habitat for caribou.

We feel that since the majority of seismic lines created for the Cameron Hills Project will be of a narrow width (4-6 m), will be created during a one-time event, and will not be reused (i.e., most seismic will not be used for winter or summer access, including ATVs and access to be restricted), that the lines will naturally regenerate similar to a natural post fire disturbance (i.e., 10-20 years post fire disturbance, MacFarlane (1999)). Within the DAR, seismic lines have been assessed as a direct loss of habitat, with a **medium-term** duration to account for the time required to complete exploration and for habitat to regenerate along the lines. As for the duration of the HIGH magnitude of sensory disturbance predicted to impact caribou from the seismic lines, it is assumed within the DAR that a high magnitude of sensory disturbance will occur for only a short-term duration due to the one-time event of the seismic creation.

As for sensory disturbance during the other activities (production, abandonment and post-abandonment activities), it is agreed that caribou, if present, in the area are likely to occur less often than expected around and along seismic lines (see response 1.2.123b) for a MEDIUM-term duration, but that the magnitude of the disturbance will be LOW given the density of seismic, present day continued sightings of caribou in habitats within the terrestrial study area (TSA) (particularly in the southern portion) (see also Table 7.6-15 in the DAR – and the minimal percentage increase of sensory disturbance over Baseline) and historical low numbers of caribou reported in the Cameron Hills.

Additionally, if the sensory disturbance impact predictions are revised based on the MVEIRB's comments, Paramount believes that this would over-estimate the impact

potentially felt by caribou. This is due to inclusion of reduced habitat effectiveness for both moose and caribou, twice within the rating system. Reduced habitat effectiveness was first included within the HSI models (see DAR Table 7.6-8 & Section 7.6-15 for modeling results) as an indirect habitat loss, and than again included as being of a regional geographic extent (i.e., becomes a regional impact when it occurs beyond the lease boundary or ROW – this would essentially represent the same habitat loss as modeled with the HSI analysis). Within the DAR, this doubling of impacts was controlled by maintaining a short-duration, as this is believed to be more reflective of the planned one-time 3-D seismic program and use of winter roads only, and not all seismic lines.

c) The environmental consequence of sensory disturbance on caribou, as expressed as a combined rating (i.e., integrating sensory disturbance from exploration, production, abandonment, and post-abandonment activities) would be predicted to be negative in direction, moderate in magnitude (+10), regional in geographic extent (+1), medium-term in duration (+2) (i.e., for life of the project), reversible (-3) and moderate in frequency (+1) (i.e., due to infrequent encounters of low numbers of caribou with development activities). **This would be predicted to result in an overall moderate environmental consequence rating (+11) for caribou.** Again, as stated in response IR Number 1.1.21, this takes into consideration the fact that caribou still utilize cutlines / production areas, and the buffers around cutlines and developments to some extent and that the density of caribou, and therefore the encounter rate of caribou with the developments, is expected to be low on the Cameron Hills.

d) The environmental consequence of sensory disturbance on moose, as expressed as a combined rating (i.e., integrating sensory disturbance from exploration, production, abandonment, and post-abandonment activities) would be predicted to be negative in direction, moderate in magnitude (+10), regional in geographic extent (+1), medium-term in duration (+2) (i.e., for life of the project), reversible (-3) and medium in frequency (+1) (i.e., intermittent encounter rates with sensory disturbances). **This would be predicted to result in a moderate environmental consequence rating (+11) for moose.**

e) The environmental consequence of sensory disturbance on marten, as expressed as a combined rating (i.e., integrating sensory disturbance from exploration, production, abandonment, and post-abandonment activities) would be predicted to be negative in direction, high in magnitude (+15), local in geographic extent (0), medium-term in duration (+2) (i.e., for life of the project), reversible (-3) and medium in frequency (+1) (i.e., intermittent encounter rates with sensory disturbances). **This would be predicted to result in a moderate environmental consequence rating (+15) for marten.**

f) The environmental consequence of sensory disturbance on forest songbirds, as expressed as a combined rating (i.e., integrating sensory disturbance from exploration, production, abandonment, and post-abandonment activities) would be predicted to be negative in direction, moderate in magnitude (+10), local in geographic extent (0), medium-term in duration (+2) (i.e., for life of the project), reversible (-3) and medium

in frequency (+1) (i.e., intermittent encounter rates with sensory disturbances). **This would be predicted to result in a low environmental consequence rating (+10) for forest songbirds.**

**References:**

Dyer, S. 1999. Movement and distribution of Woodland Caribou (Rangifer tarandus caribou) in response to industrial development in northeastern Alberta. M.Sc. thesis, University of Alberta, Edmonton, AB. 106 pp.

James, A.R.C. 1999. Effects of Industrial Development on the Predator-Prey Relationship Between Wolves and Caribou in Northeastern Alberta. Ph.D. Dissertation, University of Alberta, Edmonton, AB. 77 pp.

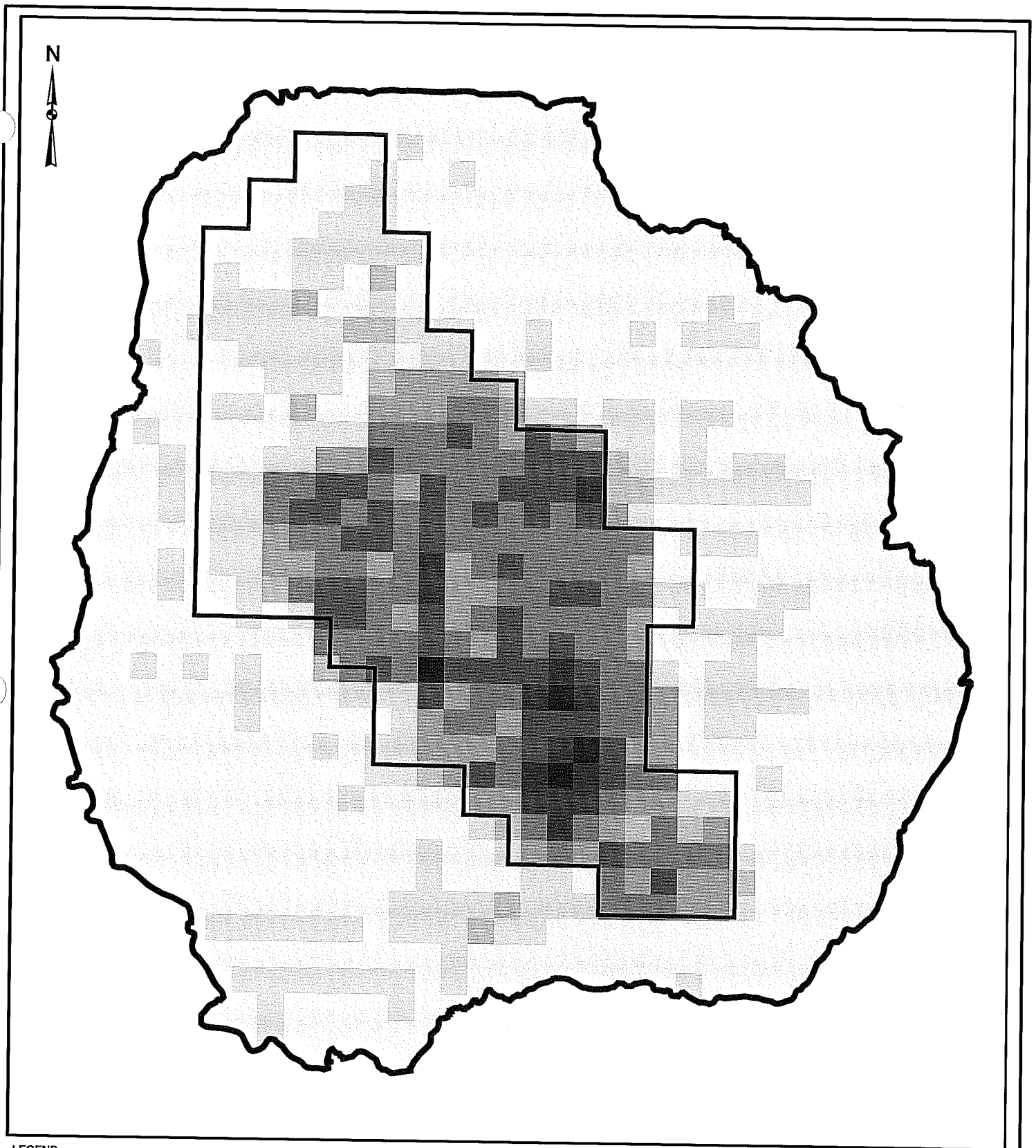
MacFarlane, A. 1999. Revegetation of wellsites and seismic lines in the boreal forest. B.Sc. Honor's Thesis, Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada.

Oberg, P.R. 2001. Responses of Mountain Caribou to Linear Features Within a West-central Alberta Landscape. M.Sc. Thesis, Department of Renewable Resources, University of Alberta, Edmonton, AB. 123 pp.

Szkorupa, T. 2002. Caribou Range Recovery in Alberta:2001/02 Pilot Year. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 48. Edmonton, AB. 8pp.

IR Number 1.2.123

Attachment




**LEGEND**

**Corridor Density**

- < 2 km/km²
- 2 - 4 km/km²
- 4 - 6 km/km²
- 6 - 8 km/km²
- 8 - 10 km/km²
- 10 - 12 km/km²
- 12 - 14 km/km²
- > 14 km/km²

**Base Features**

- Terrestrial Study Area Boundary
- Significant Discovery License Area

**REFERENCE**

Datum: NAD 83 Projection: UTM Zone 11

3 0 3 6 9

SCALE 1:200,000 KILOMETRES

PROJECT

Paramount resources ltd.

Cameron Hills Project

TITLE

# Linear Corridor Density Within the CESA, Cameron Hills

Golder Associates
Calgary, Alberta

| | | | |
|---|---|---|---|
| PROJECT No. 03-1322.104 | | SCALE AS SHOWN | REV. 0 |
| DESIGN | CWL | 15 Jan 2004 | |
| GIS | BTR | 14 Jan 2004 | |
| CHECK | | | |
| REVIEW | | | |

**MAP: 1.2.123**

H:\03-1322-104\mxd\C ...r_Density.mxd

**IR Number 1.2.125** **(Source: MVEIRB)**

**Preamble**

*The predicted environmental consequence of each effect pathway is summarized in Table 7.6-16 on page 238. However, each of the four wildlife VECs will be affected by the combined consequence of all four pathways. Additional information on the combined effect of human activity and features is required to reach defensible conclusions on the likely significance of planned development in the Cameron Hills area. A precautionary approach would be to develop a combined rating for each wildlife VEC based on the largest value assigned to each environmental consequence criteria (e.g. for moose: high magnitude, regional extent, medium-term duration, high frequency, reversible).*

**Request**

*Please provide the MVEIRB with the following information:*

*a) Provide a combined rating of the combined environmental consequence of direct habitat loss, sensory disturbance, increased predation/mortality, and barriers to movement on woodland caribou. The discussion should focus on environmental consequences as described in IR Number 1.2.121 and incorporate combined sensory disturbance as requested in IR Number 1.2.127.*

*b) Provide a combined rating of the combined environmental consequence of direct habitat loss, sensory disturbance, increased predation/mortality, and barriers to movement on moose. The discussion should focus on environmental consequences as described in IR Number 1.2.121 and incorporate combined sensory disturbance as requested in IR Number 1.2.127.*

*c) Provide a combined rating of the combined environmental consequence of direct habitat loss, sensory disturbance, increased predation/mortality, and barriers to movement on marten. The discussion should focus on environmental consequences as described in IR Number 1.2.121 and incorporate combined sensory disturbance as requested in IR Number 1.2.127.*

*d) Provide a combined rating of the combined environmental consequence of direct habitat loss, sensory disturbance, increased predation/mortality, and barriers to movement on forest songbirds. The discussion should focus on environmental consequences as described in IR Number 1.2.121 and incorporate combined sensory disturbance as requested in IR Number 1.2.127.*

**Response**
**(a, b, c & d)**

The following table provides a combined environmental consequence rating for all wildlife VECs, using revised sensory disturbance impact predictions (see Response to IR 1.2.124). It is important to note that the revised sensory disturbance impact predictions, based on the MVEIRB's comments, is believed (expert opinion) to be an over-representation of the true impact to be felt by caribou. This is due to inclusion of reduced habitat effectiveness for both moose and caribou, twice within the rating system. Reduced habitat effectiveness was first included within the HSI models (see DAR Table 7.6-8 & Section 7.6-15 for modeling results) as an indirect habitat loss, and than again included as being of a regional geographic extent (i.e., becomes a regional impact when occurs beyond the lease boundary or ROW – this would essentially represent the same habitat loss as modeled with the HSI analysis). Within the DAR, this doubling of impacts was controlled by maintaining a short-duration, as this is believed to be more reflective of the planned one-time 3-D seismic program and use of only winter roads. Therefore, for moose and caribou it is believed that if sensory disturbance is assumed to be of a medium-term duration with a regional extent, and medium frequency; that the magnitude of the impact will drop from high to moderate to correctly reflect the actual impact associated with reduced habitat effectiveness (see Response to 1.2.124 for further explanation). Therefore, for moose and caribou, sensory disturbance is modified to represent a negative impact, of MODERATE magnitude, with a regional geographic extent, medium-term duration, with a medium (i.e., intermittent) frequency and is a reversible impact through the natural regeneration of seismic lines and other ROWs. These ratings produce a moderate (+11) environmental consequence for caribou and moose – for both sensory disturbance – and as an overall net change resulting from the project.

The environmental consequence for the net change from the project used a precautionary approach, combining the largest value assigned to each environmental consequence criteria.

## Revised Table from IR 1.2.124 (DAR Table 7.6-16)

| Parameter | Direction | Magnitude | Geographic Extent | Duration | Reversibility | Frequency | Environmental Consequence |
|---|---|---|---|---|---|---|---|
| **Direct Habitat Loss** | | | | | | | |
| Woodland caribou | negative | low (+5) | regional (+1) | medium-term (+2) | reversible (-3) | low (0) | negligible (+5) |
| Moose | negative | low (+5) | regional (+1) | medium-term (+2) | reversible (-3) | low (0) | negligible (+5) |
| Marten | negative | low (+5) | local (0) | medium-term (+2) | reversible (-3) | low (0) | negligible (+4) |
| Forest Songbirds | negative | low (+5) | local (0) | medium-term (+2) | reversible (-3) | low (0) | negligible (+4) |
| **Sensory Disturbance Potential** | | | | | | | |
| Woodland caribou | negative | moderate (+10) | regional (+1) | medium-term (+2) | reversible (-3) | medium (+1) | moderate (+11) |
| Moose | negative | moderate (+10) | regional (+1) | medium-term (+2) | reversible (-3) | medium (+1) | moderate (+11) |
| Marten | negative | high (+15) | local (0) | medium-term (+2) | reversible (-3) | medium (+1) | moderate (+15) |
| Forest Songbirds | negative | moderate (+10) | local (0) | medium-term (+2) | reversible (-3) | medium (+1) | low (+10) |
| **Increased Predation/Hunting/Trapping** | | | | | | | |
| Woodland caribou | negative | low (+5) | regional (+1) | medium-term (+2) | reversible (-3) | low (0) | negligible (+5) |
| Moose | negative | low (+5) | regional (+1) | medium-term (+2) | reversible (-3) | low (0) | negligible (+5) |
| Marten | negative | low (+5) | local (0) | medium-term (+2) | reversible (-3) | low (0) | negligible (+4) |
| Forest Songbirds | negative | negligible (0) | local (0) | medium-term (+2) | reversible (-3) | low (0) | negligible (0) |
| **Barriers to Movement** | | | | | | | |
| Woodland caribou | negative | moderate (+10) | regional (+1) | medium-term (+2) | reversible (-3) | low (0) | low (+10) |
| Moose | negative | moderate (+10) | regional (+1) | medium-term (+2) | reversible (-3) | low (0) | low (+10) |
| Marten | negative | moderate (+10) | local (0) | medium-term (+2) | reversible (-3) | low (0) | low (+9) |
| Forest Songbirds | negative | moderate (+10) | local (0) | medium-term (+2) | reversible (-3) | low (0) | low (+9) |

**(a, b, c & d)**

| **Net Change from Project** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Woodland caribou | negative | moderate (+10) | regional (+1) | medium-term (+2) | reversible (-3) | medium (+1) | moderate (+11) |
| Moose | negative | moderate (+10) | regional (+1) | medium-term (+2) | reversible (-3) | medium (+1) | moderate (+11) |
| Marten | negative | high (+15) | local (0) | medium-term (+2) | reversible (-3) | medium (+1) | moderate (+15) |
| Forest Songbirds | negative | moderate (+10) | local (0) | medium-term (+2) | reversible (-3) | medium (+1) | moderate (+10) |

**IR Number 1.2.126** **(Source: MVEIRB)**

**Preamble**

*The rationale for Far Future Projections is not clear. The decision rules included in Table 7.8-11 indicate that mature closed aspen forest cant be regenerated to young (not mature) aspen forest within 50 years after disturbance ends. However, the rules indicate that mature black spruce forest with lichen (highest quality caribou habitat) can be regenerated within 50 years after disturbance ends.*

**Request**

*Please provide the MVEIRB with the following information:*

a) *Provide data relevant to the Cameron Hills DAR that document regeneration of mature black spruce forest with lichen on disturbed sites in less than 50 years. Alternatively, provide new decision rules consistent with responses to IR Number 1.2.127 and revise Tables 7.8-12 and 7.6-17 to reflect these new decision rules. Supplement each revised estimate of Far Future Case Habitat Units with numerical estimates of HUs classified as High, Moderate, and Low suitability.*

b) *Discuss how a projection of far future vegetation conditions that ignores natural succession and disturbance (i.e., fire and insects) provides any information that is useful to the MVEIRB in assessing potential long-term cumulative impacts on vegetation and wildlife habitat.*

**Response**

a) The primary disturbance related to the project, that was assumed to have the largest potential to alter succession patterns of revegetation, is where actual earthwork was completed. As such, this was projected to be the trenchline, access used during non-frozen soil periods, and the facility and bridge sites where grading and/or gravelling occurred. The remainder of the areas, which represent the majority of the disturbance (e.g., 3D seismic lines) within the cumulative effects study area, have been primarily subjected to clearing of trees during frozen ground conditions and within a narrow right-of-way, were subject to limited soil disturbance, and are not chronically disturbed for access during operations.

Natural succession on disturbance (e.g., 3D seismic lines) to pre-disturbance vegetation communities typically commences within a year of the initial clearing provided chronic disturbance is excluded. Within approximately 5 – 10 years, shrub and tree species are expected to become established on seismic lines. This regeneration represents the next generation that has the potential to become a mature vegetation community similar to pre-disturbance if chronic disturbance (e.g., ongoing all-terrrain vehicle use) is excluded (CAPP 1999). The shrub and tree species growth rate is dependent on site conditions, with the relatively well drained sites generally having more rapid shrub and tree growth rates compared to poorly-drained sites (Revel et al. 1984). In particular,

bogs and poor fens have the slowest growth rates of tree regeneration due to a long period of frozen soil conditions (short growing season) and poor nutrient regime (Revel et al. 1984). The availability of light is also an important determinant in the tree species that regenerate. Shade-tolerant spruce is more likely to regenerate on narrow lines shaded extensively by adjacent forest, compared to wider lines with more light where deciduous species regenerate (Bella 1986a).

Another consideration in the assessment, is the cumulative amount of actual habitat disturbance within the cumulative effects study area for each of the cases discussed: Baseline (2%); Application Case (2%); Planned Development Case (2.2%). As such, the majority of the study areas remain undisturbed, and represent the habitat indicated, and would be expected to be subject to natural succession and disturbance.

b) Table 7.8-3, on page 266 of the DAR, indicates that insect damage and fire are expected to extend into the Planned Development Case. There was no information found on the presence or extent of insect damage within the Cameron Hills region, and the amount of fire disturbance was extrapolated from the information provided by RWED. The assessment did not evaluate the potential for large scale fires in the region (as reported in the early 1900s by the elders), because if one did occur the effects to habitat would have the potential to reset the entire cumulative effects study area's successional time frame.

The projection of the far future vegetation conditions is considered valid, because, as noted in response a) above, it considers the small amount of actual disturbance within the cumulative effects study area by the project Cases.

**References**

CAPP (Canadian Association of Petroleum Producers), 1999, Environmental operation practices for upstream petroleum producers: Alberta operations. Volume II: geophysics. Canadian Association of Petroleum Producers, Calgary, AB.

Bella, I.E. 1986a. Tree growth response along seismic lines in Alberta. The Forestry Chronicle. February, page 29-34.

Revel, R. D., Dougherty, T. D., and Downing, D. J. 1984. Forest Growth and Regeneration Along Seismic Lines. University of Calgary Press, Calgary, Alberta.

**IR Number 1.2.127** **(Source: MVEIRB)**

**Preamble**

*The Terms of Reference state that both direct and indirect effects on traditional harvesting are to be considered in the DAR, but only direct effects of habitat loss are considered in Section 7.10. The DAR indicates that traditional harvesting could be impacted by alteration of wildlife distribution and/or travel routes due to human activity and equipment disturbance. In the DAR, sensory disturbance is concluded to have Moderate Environmental Consequence for caribou, moose, and marten, while direct habitat loss is concluded to have Negligible Environmental Consequence for these species (Table 7.6-16).*

**Request**

*Please provide the MVEIRB with the following information:*

a) *Provide an assessment of the potential effects of long-term sensory disturbance in the Cameron Hills CESA on traditional harvest opportunities and harvest success (per unit effort).*

b) *Provide additional rationale as to why effects on hunting and trapping are concluded to be highest during baseline conditions (Table 7.10-2), when direct habitat loss and alteration and indirect effects of sensory disturbance will increase over the development period (Table 7.6-15).*

**Response**

a) Paramount's response to IR 1.2.124 outlines the predicted impacts to wildlife populations in the study area considering long-term sensory disturbance. However, it is not appropriate to speculate on the specific affect on wildlife population density as little is know about abundance of wildlife species in the Cameron Hills, and the assessment focused on habitat. Also, consideration must be made for the apparent seasonal, low level of activity related to traditional harvesting within the Cameron Hills.

   It is Paramount's opinion that this assessment overestimates the impact to wildlife species in the area due to a number of conservative assumptions. It is also Paramount's opinion that the net benefit of increased access during the winter to potentially better hunting and trapping sites than are currently used, outweighs the adverse effects to wildlife populations. As such, the traditional harvest opportunities and harvest success are predicted to be comparable to those experienced at-present, considering the small incremental increase in potential access, and the low levels of activity.

b) The MVEIRB is referred to Paramount's response to IR 1.2.96 to answer this question.

**IR Number 1.2.128** **(Source: MVEIRB)**

**Preamble**

*The Cameron Hills SDL appears to be located in an area with Low potential to reduce acidity which suggests that soils are sensitive to acid input (CASA 1999). The Air Quality assessment suggests that areas with elevated PAI levels (i.e., above the 0.17 keq/ha/y) will occur at Cameron Hills. This value represents the Monitoring Load established by CASA at which monitoring and research is to be initiated. Section b) of the response to IR Number 1.1.10 notes that no areas are likely to experience PAI values in excess of 0.25 keq/ha/yr. This value represents the Critical Load established by CASA - management actions (including emissions reduction) are designed to maintain PAI levels below this value. No specific predictions were provided to support these conclusions, and the response to IR Number 1.1.10 indicates that specific predictions (i.e., modelling) are not warranted because Critical Loads are unlikely to be exceeded. However, the DAR includes numerous examples where modelling was used to provide support for conclusions that critical thresholds for other VECs will not be exceeded by Planned Development activities.*

**Request**

*Please provide the MVEIRB with the following information:*

a) *Given that PAI values are expected to exceed the Monitoring Load, describe the monitoring program that Paramount will implement to document actual PAI levels in the Cameron Hills SDL. Discuss sample site number, location, sampling frequency, and parameters to be monitored.*

b) *Describe the specific management actions to be undertaken by Paramount in the event that the 0.17 keq/ha/yr PAI Monitoring Load is exceeded.*

c) *Describe the specific management actions to be undertaken by Paramount in the event that the 0.22 keq/ha/yr PAI Target Load is exceeded.*

d) *Describe the specific management actions to be undertaken by Paramount in the event that the 0.25 keq/ha/yr PAI Critical Load is exceeded.*

**Response**

a) The reviewer may have misinterpreted the information provided in the DAR and the response to IR 1.1.10. The information provided did not state that PAI values are expected to exceed 0.17 keq/ha/yr, rather that if any areas did experience PAI above this level they would be highly localized in area.

While 0.17 keq/ha/yr is numerically equal to the monitoring load value suggested by CASA (1999) for areas that are highly sensitive to acidic inputs, the CASA document

clearly states that monitoring would be required if the PAI levels over an area 1° by 1° in size is expected to exceed a PAI level of 0.17 keq/ha/yr. At the latitude of the Cameron Hills, a 1° by 1° grid cell covers an approximate area of 572,000 ha. Given that the entire Cameron Hills SDL covers less than 33,000 ha, the PAI over the entire lease would need to exceed 2.94 keq/ha/yr before the 0.17 keq/ha/yr monitoring load over an area of 1° by 1° would be exceeded and monitoring justified under the CASA (1999) management framework.

The Paramount project is expected to produce 2.59 t/d of combined SO2 and NOX emissions. By way of comparison, the Athabasca Oil Sands Region of northeastern Alberta was not predicted to have any grid cells in which monitoring is required (CASA 1999), despite having nearly 580 t/d of combined SO2 and NOX emissions. In the most recent EIAs completed in the Oil Sands Region (CNRL 2002), only two grid cells were predicted to exceed 0.17 keq/ha/yr when using the meteorological data for 1985. This region of Alberta experienced above average rainfall during 1985, therefore the predictions are considered to be conservative estimates of long-term deposition.

b) As noted in the response to 1.2.128(a), the PAI for the 1° by 1° grid cell in which the Cameron Hills is situated is not expected to be anywhere near the monitoring load of 0.17 keq/ha/yr recommended by CASA (1999). The reviewer is reminded that CASA stipulates that the monitoring, target and critical loads proposed in the management framework document (CASA 1999) should only be applied on the scale of 1° by 1°, and that it is not appropriate to attempt to apply these values on a local scale.

c) As noted in the responses to 1.2.128(a & b), the PAI for the 1° by 1° grid cell in which the Cameron Hills is situated is not expected to be anywhere near the monitoring load of 0.17 keq/ha/yr recommended by CASA (1999), and therefore is not expected to get anywhere near a target load of 0.22 keq/ha/yr for sensitive ecosystems. The reviewer is reminded that CASA stipulates that the monitoring, target and critical loads proposed in the management framework document (CASA 1999) should only be applied on the scale of 1° by 1°, and that it is not appropriate to apply these values on a local scale.

d) As noted in the responses to 1.2.128(a, b and c), the PAI for the 1° by 1° grid cell in which the Cameron Hills is situated is not expected to be anywhere near the monitoring load of 0.17 keq/ha/yr recommended by CASA (1999), and therefore is not expected to get anywhere near a critical load of 0.25 keq/ha/yr for sensitive ecosystems. The reviewer is reminded that CASA stipulates that the monitoring, target and critical loads proposed in the management framework document (CASA 1999) should only be applied on the scale of 1° by 1°, and that it is not appropriate to apply these values on a local scale.

**Reference:**

CASA (Clean Air Strategic Alliance). 1999. Application of Critical, Target, and Monitoring Loads for the Evaluation and Management of Acid Deposition. Prepared by the Target Loading Subgroup.

**IR Number 1.2.129** **(Source: MVEIRB)**

**Preamble**

*Policy related to air quality applicable in the development area (and the Mackenzie Valley in general) includes Air Quality Standards set out under the territorial Environmental Protection Act. The environmental management of impacts often requires effective monitoring, inspection and enforcement. It is unclear how this is presently done with respect to air.*

**Request**

*Please provide the MVEIRB with the following information:*

a) *Specify what binding legal air quality guidelines or standards you organization is responsible for.*

b) *Specify if regular compliance inspections for air quality are conducted by your organization to ensure that developments in operation are meeting those standards. If your organization does not conduct such inspections, please specify who currently is responsible for doing so.*

c) *Specify if your organization is responsible for air quality enforcement, and if so, exactly how it is currently done. Provide examples.*

**Response**

This I.R. was addressed to GNWT, INAC, and EC.

**IR Number 1.2.130** **(Source: MVEIRB)**

**Preamble**

*The Review Board believes that spatial analysis of the Paramount Cameron Hills SDL is key to making sound decisions about current and future management plans.*

**Request**

*Please provide the MVEIRB with the following information:*

*Paramount's most recent satellite images or aerial photos of the Cameron Hills SDL area, including the main access routes. This information should be provided in the form of paper maps, at a scale of 1:50 000.*

**Response**

One paper copy of the satellite image in 1:50:000 and a PDF file is being submitted to the MVEIRB for their public registry in support of this EA. Please note the airstrip noted on the map does not exist.