DOMINION DIAMOND

September 30, 2015

Mackenzie Valley Environmental Impact Review Board
200 Scotia Centre
P.O. Box 938
Yellowknife, NT
X1A 2N7

Attention: Chuck Hubert, Senior Environmental Assessment Officer

Re: EA1314-01 Jay Project, homework items from Jay Project hearings

Dear Mr. Hubert:

In response to the letter issued by the Mackenzie Valley Environmental Impact Review Board (MVEIRB), dated September 24, 2015, please find attached the following homework responses for the Jay Project:

- Active mines in the 1980s (Assigned Document Code: DAR-MVEIRB-HW-03)
- NRCAN research agreement (DAR-MVEIRB-HW-04)
- Traditional Knowledge reports on caribou decline (DAR-MVEIRB-HW-05)

Homework responses to items #1 (women in traditional versus non-traditional roles) and #2 (hiring from the South Slave) were previously submitted to the Review Board public registry on September 14, 2015.

Please note, as indicated in the letter from MVEIRB, Homework item #6 (i.e., Security deposits) was addressed to the Government of Northwest Territories (GNWT), so a response is not provided.

We would also like to take this opportunity to thank MVEIRB and all parties for their participation and input during the Jay Project Hearings.

Regards,

Richard Bargery
Manager, Permitting Jay Project
Dominion Diamond Corporation

DOMINION DIAMOND

Undertaking Number: DAR-MVEIRB-HW-03

Source: Hearing Response from Day 2 (Sept 15) of the Public Hearings

Subject: Active mines in the 1980s

DAR Section(s): 12

Request:

Dominion Diamond to provide a list of mines active in the 1980s and where they are in the Bathurst herd range.

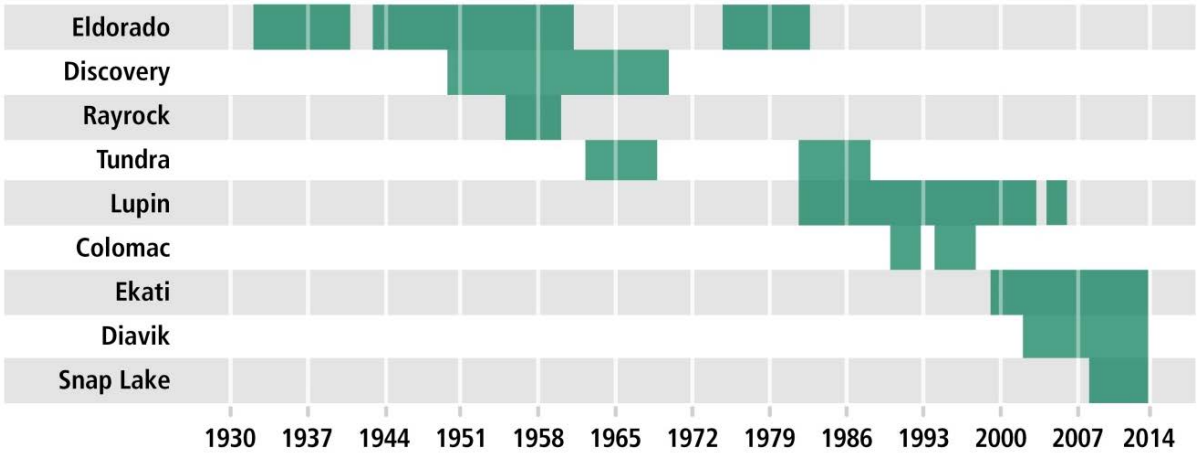
Response:

Mines operational within the current range of the Bathurst herd in the 1980s included the Lupin, Tundra and Colomac mines (see the timeline in Figure 12.2-2 below, which is from the Developer's Assessment Report [DAR]). Eldorado, Giant and Con mines also operated in the 1980s and are near the annual range boundary of the Bathurst herd provided in the DAR. The locations of all the mines included in the cumulative effects assessment on caribou are listed in Figure 12.2-2 and are illustrated in Map 1 attached (which is derived from Map 12.4-1 of the DAR). Other developments (e.g., exploration camps, lodges, staging areas, and power stations) included in the cumulative effects assessment have been excluded from Map 1 to provide clarity for the request.

It is important to note that caribou ranges change over time, and that there are limited data to estimate the range of the Bathurst caribou in the 1980s. The barren-ground caribou effects study area on Map 1 was derived from a collaring program initiated in 1996. A contemporary estimate of the Bathurst caribou range included the Eldorado mine (Williams 1990), as did some more recent estimates using select years of data (Gunn et al. 2013).

The environmental assessment of the Ekati Diamond Mine in 1995 (BHP 1995) was the first in the Northwest Territories. Previous permitted mines were not required to have caribou and wildlife mitigation and monitoring plans. In contrast, the Ekati Mine's Environmental Agreement requires wildlife mitigation and monitoring plans, as has been the practice for other currently active mines and under the new *NWT Wildlife Act*.

Figure 12.2-2 Mining Activity since 1930 Within or Near the Caribou Effects Study Area



References:

BHP (Broken Hill Proprietary Company). 1995. NWT Diamonds Project. Volume I: Project Description.

Gunn A, D'Hont A, Williams J, Boulanger J. 2013. Satellite Collaring in the Bathurst Herd of Barren-ground Caribou 1996-2005. ENR, GNWT. Manuscript Report No. 225. Yellowknife , NT, Canada.

Williams MT. 1990. Results of the 1985 Spring Classification Counts on the Bathrust Barren-Ground Cairbou Herd. Department of Renewable Resources, GNWT. File Report No. 89. Yellowknife, NT, Canada.

LEGEND

- JAY PROJECT
- MINE - OPERATIONAL
- MINE - DECOMISSIONED
- MINE - DECOMISSIONED (ACTIVE IN THE 1980s)
- TERRITORIAL CAPITAL
- POPULATED PLACE
- HIGHWAY
- ALL-SEASON ROAD
- WINTER ROAD
- TIBBITT TO CONTWOYTO WINTER ROAD
- NORTHERN PORTION OF TIBBITT TO CONTWOYTO WINTER ROAD
- TERRITORIAL/ PROVINCIAL BOUNDARY
- TREELINE
- WATERCOURSE
- WATERBODY
- BARREN-GROUND CARIBOU EFFECTS STUDY AREA

150 0 150

SCALE 1:6,000,000 KILOMETRES

REFERENCE

WATER OBTAINED FROM ATLAS OF CANADA
NATURAL RESOURCES CANADA, CENTRE FOR TOPOGRAPHIC INFORMATION, 2012
PROJECTION: CANADA LAMBERT CONFORMAL CONIC

PROJECT

DOMINION DIAMOND

JAY PROJECT
NORTHWEST TERRITORIES, CANADA

TITLE

PREVIOUS AND EXISTING MINES IN THE BATHURST CARIBOU RANGE

Golder Associates

PROJECT	1419751.3600		FILE No.	
DESIGN	LD	15/07/14	SCALE AS SHOWN	REV. 0
GIS	ANK	17/09/15		
CHECK	DP	17/09/15	MAP 1	
REVIEW	JV	17/09/15		

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DOMINION DIAMOND

Undertaking Number: DAR-MVEIRB-HW-04

Source: Homework from Day 2 (Sept 15) of the Public Hearings

Subject: NRCAN research agreement

DAR Section(s): 12

Request:

The TG requested that DDEC's research agreement with NRCAN be put on the Review Board's public registry.

Response:

The following is a NRCAN synopsis of the 2015 field work plan for the SMART program (Agreement Schedule B).

Synopsis of 2015 field works for the NWT CIMP project entitled "Satellite Monitoring for Assessing Resource Development's Impact on Bathurst Caribou (SMART)".

Resource development has become one of the most important economic pillars in the North. On the other hand, caribou have played an important role in the culture, economy, and way of life of northern aboriginal peoples for thousands of years. Balancing resource development and caribou conservation is thus a top priority in northern governance and decision making. Similar needs have also been identified by resource development industries. Companies are required to monitor project impacts as a condition of development, and they have indicated two critical needs to meet that requirement. The first is better baseline data for regulatory approvals, remediation initiatives, and management in the North. The second is the capacity to distinguish project-specific impacts from those that result from broader-scale changes such as climate change, a critical area where science and technological development can support resource development.

To assess and distinguish the impacts of resource development and natural factors on caribou productivity and population change is a complex task. Many baseline related methodologies must be developed to address this task, including 1) temporal and spatial information on areas directly and/or indirectly affected by resource developments; 2) environmental changes in adjacent areas that could potentially impact caribou (e.g., vegetation composition, leaf biomass, dust on vegetation, soil PH level, noise level, visibility of resource development activities to caribou) relative to far-away reference areas; (3) methods for addressing the question of "how might these environmental changes affect caribou distribution and movement?" and (4) methods for addressing the question of "what is the implication of the modification in caribou movement and distribution for caribou productivity and population change?"

During the last three years, our current NWT CIMP project team has developed and refined remote sensing methods for mapping and monitoring vegetation growth and phenology across the Arctic (Chen et al., 2014, *International Journal Remote Sensing* 35: 6742-6763; Chen et al., 2013*, Remote Sensing of Environment* 130, 205-218; Chen et al., 2013, *International Journal Remote Sensing* 34: 4320–4343). We also produced a series of habitat indicators for quantifying forage availability, quality and accessibility

over the Bathurst caribou range, partially addressing the first need (Chen et al., 2014, *Natural Resources* 5: 130-145; Chen et al., 2013, *Biodiversity* 14: 36-44). More importantly, we established a significant relationship between summer range conditions and caribou productivity at the population level (Chen et al., 2014, *Natural Resources* 5: 130-145). This relationship could potentially serve as a basis to address the second need.

During the first field season (approximately August 3 to 13, 2015), we propose to conduct field surveys to obtain baseline data on environmental factors that could potentially affect caribou (e.g., what caribou can see (mine visibility, fogginess), hear (noise), taste (dust accumulated on forage, vegetation composition, and leaf biomass), and/or smell (soil PH)), at various distances from the Ekati diamond mine (e.g.., 0, 1, 2,.3, 4, 5, 6, 8, 10, 12, 14, 16, 20 km). At each distance interval, 5 to 20 permanent vegetation plots will be established. At each 0.5 m by 0.5 m plot, GPS position, mining operation visibility, vegetation species composition, and the mean height and percentage cover of each vascular plant species will be recorded. Down-looking digital photos (visible, near-infrared, and hyperspectral) will be taken in order to better link field measurements to satellite remote sensing imagery. Samples of shrub leaves, grass leaves, and lichen will be collected to measure the amount of dust on vegetation (shrub and grass leaves to index current year deposition and lichen for multiple years). Plant material will be washed in water and the dust amount in the washed water will be measured using a turbidity meter (e.g., LaMotte LTC3000we Benchtop Turbidity and Chlorine Meter, EPA compliant). The noise level will be recorded by the Svantkh SVAN 977 Sound and Vibration Meter and Analyzer, while soil PH will be measured using a Soil pH and Conductivity Meter (i.e., HACK H135 Advanced Compact WaterPR by Cole-Parmer Canada). This data will fill in some information gaps in habitat and environmental related factors that may provide additional insight regarding caribou distribution and movements.

The deliverables include:

- Dataset of disturbed areas by resource development within Bathurst caribou habitat since 1985 using Landsat time series and related GIS information; and,
- Initial field measurement data of vegetation composition, leaf biomass, soil PH, noise level, dust accumulation on forage, and visibility at various distances from the Ekati-Diavik mining complex.

Contact information: Wenjun.Chen@NRCan.gc.ca

DOMINION DIAMOND

Undertaking Number: DAR-MVEIRB-HW-05

Source: Homework from Day 4 (Sept 17) of the Public Hearings

Subject: Traditional Knowledge reports on caribou decline

DAR Section(s): 15

Request:

Dominion Diamond to provide the reports where traditional knowledge (TK) indicated past low points in the caribou population.

Response:

Barren-ground caribou populations have natural cycles of high and low numbers, and their distributions change through time. These natural cycles in the abundance and distribution of caribou populations have been reported in Traditional Knowledge (TK) reports, as well as scientific studies that also reference TK (Thorpe 2000; Zalatan et al. 2006; Sandlos 2007; Adamczewski et al. 2009; Tłı̨chǫ Government and ENR 2010; Festa-Bianchet et al. 2011). The reference list is provided below along with relevant excerpts from some of the reports.

Thorpe NL. 2000. Contributions of Inuit Ecological Knowledge to Understanding the Impacts of Climate Change on the Bathurst Caribou Herd in the Kitikmeot Region, Nunavut. Thesis, Simon Fraser University, Burnaby, BC.

> *"Within these complex ecological linkages, Qitirmiut (Inuit of the Kitikmeot region) have observed increasing temperatures since the 1950s that have led to earlier spring-melt, later fall freeze-up and more variable and unpredictable weather. Other environmental impacts of a warming climate include thinner ice, lower water levels, richer vegetation, more extreme heat days and sporadic freeze-thaw cycles. Locals have linked these impacts to more incidences of caribou drowning, overheating (or "suffocating") or becoming exhausted as well as shifting their migration routes and locations of calving grounds on a local scale. Finally, Qitirmiut have observed a general increase in the quantity and quality of forage on the tundra."* – Page iii

> *"Qitirmiut have noticed that caribou numbers decrease during and after the years of frequent freeze-thaw cycles. Therefore, an indirect effect of warmer temperatures and the concomitant unpredictability of weather conditions is a possible decrease in caribou population levels owing to starvation or death."* – Page 85

Zalatan R, Gunn A, Henry GHR. 2006. Long-Term Abundance Patterns of Barren-Ground Caribou Using Trampling Scars on Roots of Picea mariana in the Northwest Territories, Canada. Arct Antarct Alp Res, 38: 624-630.

> *"The scar frequency distributions (dated from A.D. 1760 to 2000) from both groups of sites showed similar abundance patterns through time. Caribou numbers were high during the mid-1940s, and 1990s, and were very low during the 1920s, 1950s–1970s, and at the turn of the 21st century.*

These abundance patterns determined from scar frequencies correlate strongly with data obtained from traditional knowledge of Dogrib elders in the region and animal counts based on aerial photography. The scar frequency distribution developed in this study is the longest proxy record of caribou abundance to date." – Page 624

"Research on the TK data was conducted by the West Kitikmeot Slave Study in conjunction with the aboriginal elders of the Dogrib Nation. The data were used to index Bathurst caribou herd abundance to the 1920s (Dogrib Treaty 11 Council 2001). The TK data were only recorded back to the 1920s because the elders would not provide any information on caribou population abundance and migration that they had not directly witnessed or felt certain about." – Page 626

Adamczewski JZ, Boulanger J, Croft B, Cluff D, Elkin B, Nishi J, Kelly A, D'Hont A, Nicholson C. 2009. Decline of the Bathurst Caribou Herd 2006-2009: A technical evaluation of field data and modeling. Draft technical report December 2009. GNWT.

"Traditional Knowledge of aboriginal people in the NWT and studies by biologists both have demonstrated that barren-ground caribou have fluctuated widely over time, going back hundreds and possibly thousands of years. A re-construction of a cycle in caribou numbers from D. Beaulieu's family and Chipewayan elders shows peaks and troughs every 30 years (Figure 3.8). The peaks occurred in years when caribou were very numerous near Rocher River (southwest of Great Slave Lake, near the Taltson River). During the low periods in caribou numbers, hunters from Rocher River had to travel long distances to find caribou. Although the peaks have occurred on a 30-year interval, successive peaks have been lower and lower, possibly due to increased hunting and cumulative effects of development." – Page 16

"In summary, the declining trend of the Bathurst herd, like those of other herds in NWT/Nunavut, is consistent with a global declining trend in most migratory caribou and reindeer herds. Large increases and decreases in numbers of Bathurst caribou and other herds have occurred in the past, based on Traditional Knowledge, spruce root scars on caribou migration trails, and in the last 40 years, from aerial surveys. These fluctuations are most likely driven by weather at a large scale, although the relationships are complex (Gunn 2003). Variation among neighboring herds has occurred, though, including sometimes opposite trends, thus explanations for declines in particular herds must consider each herd's individual conditions." – Page 18 and 19

Tłı̨chǫ Government and ENR (Department of Environment and Natural Resources). 2010. Revised Joint Proposal on Caribou Management Actions in Wek'eezihii. Submitted to Wek'eezhii Renewable Resource Board.

"The relationship between Tłı̨chǫ and caribou is maintained by traditional laws governing human behaviour towards caribou. When these laws are not respected, it is believed that caribou populations will become smaller and their migration patterns will change. There have been times of scarcity and times of abundance, which have been influenced by both natural cycles of wildlife abundance and human influence. The Elders have always believed that when the caribou became scarce they would go away to be left alone - to recover and replenish themselves. They would then come back to offer themselves to the Tłı̨chǫ - there was a mutual respect between man and animal.

There have been previous times of caribou scarcity. The most recent Tłı̨chǫ memory of low caribou numbers was in the 1960s. At this time, the community of Wekweètì had to be evacuated to Behchokö and Gamètì, because of a scarcity of caribou and other game. This move led to significant changes in the political and social fabric of Tłı̨chǫ society." – Page 8 and 9

"Through their collaborative work, the TG and ENR-GNWT have come to a shared consensus that Bathurst caribou are in real and serious decline and that decisive management actions are imperative to conserve and recover the herd. It was understood that Tłı̨chǫ elders recognize that caribou cycle naturally and that the current decline was not caused solely by hunting, but when caribou numbers become this low, hunting and predation affect the ability of caribou to recover. If the status quo levels of hunting were allowed to continue, the Bathurst caribou herd might not be able to recover. All data analyses and modeling completed to date indicate that a harvest of the size estimated for 2008-2009 for the Bathurst herd (3000 to 5000 cows and 1000 to 2000 bulls) can only lead to further rapid decline, regardless of calf productivity. TG and ENR-GNWT recognize that the Bathurst herd is shared with communities, governments and hunters outside Wek'èezhìi, whose interests must also be considered and respected." – Page 10

Festa-Bianchet M, Ray JC, Boutin S, Côté SD, Gunn A. 2011. Conservation of caribou (Rangifer tarandus) in Canada: an uncertain future. Can J Zool 89:419-434.

"The numbers of Migratory Tundra caribou typically rise and fall over a time scale of decades (Gunn 2003; Payette et al. 2004; Bergerud et al. 2008). Analysis of hoof scars on black spruce (Picea mariana (Mill.) B.S.P.) roots exposed across caribou trails revealed trends similar to those described by Aboriginal Traditional Knowledge (Zalatan et al. 2006)." – Page 420

References:

Adamczewski JZ, Boulanger J, Croft B, Cluff D, Elkin B, Nishi J, Kelly A, D'Hont A, Nicholson C. 2009. Decline of the Bathurst Caribou Herd 2006-2009: A technical evaluation of field data and modeling. Draft technical report December 2009. GNWT.

Festa-Bianchet M, Ray JC, Boutin S, Côté SD, Gunn A. 2011. Conservation of caribou (Rangifer tarandus) in Canada: an uncertain future. Can J Zool 89:419-434.

Sandlos J. 2007. Hunters at the margin: Native People and Wildlife Conservation in the Northwest Territories. Vancouver: UBC Press.

Tłı̨chǫ Government and ENR (Department of Environment and Natural Resources). 2010. Revised Joint Proposal on Caribou Management Actions in Wek'eezihii. Submitted to Wek'eezhii Renewable Resource Board.

Thorpe NL. 2000. Contributions of Inuit Ecological Knowledge to Understanding the Impacts of Climate Change on the Bathurst Caribou Herd in the Kitikmeot Region, Nunavut. Thesis, Simon Fraser University, Burnaby, BC.

Zalatan R, Gunn A, Henry GHR. 2006. Long-Term Abundance Patterns of Barren-Ground Caribou Using Trampling Scars on Roots of Picea mariana in the Northwest Territories, Canada. Arct Antarct Alp Res, 38: 624-630.