Northwest Territories Environment and Natural Resources

May 11, 2012 VIA EMAIL

Eli Nasogaluak
Environmental Impact Review Coordinator
Environmental Impact Review Board
PO Box 2120 Inuvik, NWT, Canada X0E 0T0
eirb@jointsec.nt.ca

Dear Mr. Nasogaluak,

Re: GNWT Round 2 IR Responses, File Number 02/10-05, Inuvik to Tuktoyaktuk Highway Construction Project

Please find attached the Government of the Northwest Territories responses to Information Requests 73 and 74.

Please contact me at gavin_more@gov.nt.ca or 867-873-7107 if you have any questions regarding the attached submission.

Sincerely

Gavin More

Gavin More
Manager
Environmental Assessment and Monitoring
Environment and Natural Resources

IR Number: 73

Source: MSES

To: Government of the Northwest Territories (ENR)

Subject: Caribou habitat fragmentation (EIS Sections 3.1.9.5 p.281, Section 4.2.7.2 p. 520, Table 4.2.7-3; IR Responses Round 1 #29)

Preamble

As stated in the Developer's response to IR #29, the proposed Highway alignment is located south of the traditional summer and fall harvesting areas, but within the spring and winter caribou harvesting areas. As well , the alignment occurs within important winter habitat for the Bluenose-West caribou herd, which is valued for subsistence harvesting year-round by Inuvialuit communities.

The Developer has acknowledged that caribou habitat could be lost, fragmented, or degraded as a result of the proposed development. However, the Developer does not appear to have carried out any type of habitat fragmentation analysis as part of the assessment of impacts to caribou. No rationale is provided for this apparent omission, despite acknowledging that habitat fragmentation, as a result of the proposed development, could impact caribou. As a result, the Developer's residual effects assessment for caribou and caribou habitat in the RSA may be underestimating the potential impacts to caribou. When asked to explain why habitat fragmentation was not carried inthe EIS the Developer implies that it was not necessary to do so because, to date, no habitat fragmentation analysis for barren-ground caribou has been completed for all-weather road projects within tundra ecosystems of the Canadian Arctic. The Developer also states that:

> *Most of the evidence to date suggests that caribou will cross the Tuktoyaktuk-Inuvik road but their behaviour may be affected by it. ENR is undertaking a caribou collaring program designed to look at impacts to Cape Bathurst and Tuktoyaktuk Peninsula caribou movement and habitat use in relation to the road as part of the Wildlife Effects Monitoring Program being developed by DOT and ENR. This will provide a basis for further evaluating fragmentation effects.*
>
> *In summary, the results of the fragmentation analyses conducted at existing and proposed mines in the NWT as well as the evidence surrounding the potential barrier effect of the road suggest that habitat fragmentation analysis of the ITH (Inuvik-Tuktoyaktuk Highway) Project would not contribute meaningfully to the assessment of impact to barren-ground caribou within the study area (IR #29 Response, p.2)*

The Developer has not provided sufficient information in response to the IR (no fragmentation analysis was done). The "evidence" provided is not substantiated in any quantitative way by,

for example, crossing rates and locations. The Developer claims that ENR will provide data that can be used to evaluate potential effects from habitat fragmentation in the context of the proposed project.

Although ENR and DOT may be currently undertaking a caribou collaring program, it is not clear how the results will shape the construction decisions to be made concerning the project.

The GNWT has stated in the past that "*industry, regulatory agencies, and other environmental review agencies will need to work with the GNWT and others to ensure human impacts on caribou herds and their ranges are appropriately monitored and mitigated*." (GNWT 2006b). The Developer cited studies that appear to show that caribou are not impacted by roads. This assertion needs to be substantiated in light of ENR's findings that the Dempster Highway results in a 6 km zone of avoidance by caribou.

Request:

1) ***Please explain if, in the cited studies, road structure (width, height, general configuration, etc) and mitigation of impacts to caribou was similar to that of the proposed Inuvik-Tuktoyaktuk Highway.***
2) ***Pleaseclarify why the Dempster ITH Project would not affect caribou, while the Dempster highway appears to have an effect.***
3) ***Please identify when the results of the aforementioned caribou collaring program designed to look at impacts to Cape Bathurst and Tuktoyaktuk Peninsula caribou movement and habitat use in relation to the road as part of the Wildlife Effects Monitoring Program will be released to the Board.***
4) ***Please explain how such information will be integrated I nto the follow-up programs so that the Board can make an informed decision regarding the potential impacts to caribou.***
5) ***Will ENR require the Developer to develop a species-specific wildlife management and monitoring program for barren-ground caribou in consultation with ENR, prior to construction?***

Request/Response:

73.1 Please explain if, in the cited studies, road structure (width, height, general configuration, etc) and mitigation of impacts to caribou was similar to that of the proposed Inuvik-Tuktoyaktuk Highway.

The GNWT ENR has not attempted, in this response, to review all of the roads in the literature references provided in the EIS, Information Responses in Round 1 or other IRs posed in Round 2 as these contain summaries of effects for a wide variety of landscapes, levels of human infrastructure development, caribou ecotypes, season of use by cariou as well as road design/levels of use. In particular, the cited references from Norway are less relevant from a landscape and infrastructure perspective. Vistnes *et al*. (2001) and Vistnes *et al*. (2004) relate more to the effects of powerline developments. The landscapes and levels of human development (e.g. agricultural and hydro-electic developments, communities, paved highways)in these study areas are more similar to the Banff/Canmore corridor or central British Columbia than the undeveloped tundra area of this project. Moreover, some of the studies were based on range analysis and did not include telemetry or ground observations. A more recent conference presentation from Norway based on satellite collars by Panzacchi *et al*. (August 2011) does not have sufficient detail to include it in the following review although it appears to have similar results to the studies described below. While these are not necessarily directly comparable to the Project or landscape under review; they do provide a basis for consideration of the potential impacts.Appendix A contains detailed descriptions of the road structure and caribou mitigation measures for other roads in the NWT including :

a) Dempster Highway
b) Tuktoyaktuk Source 177 Access
c) Tibbitt to Conwoyto Winter Road
d) Ekati Mine Haul Roads

Of these roads, the Dempster Highway and the Tuktoyaktuk Source 177 Access Road are the most directly comparable to the Inuvik to Tuktoyaktuk Highway (design parameters in Table 2 of the EIS) in terms of road structure, public use and landscape. Mitigations used on these road are most relevant to the proposed project. For example, pertinent mitigations for the Porcupine Caribou Herd along the Dempster Highway outlined in the *Harvest Management Plan for the Porcupine Caribou Herd in Canada*(March 2010) include highway patrols by government officers and other representatives, hunter education signage and programs, best practices related to harvest and signage on the highway warning drivers of caribou crossing areas. As this herd is co-managed by the Porcupine Caribou Management Board (PCMB) and wildlife management agencies, harvest management options are developed jointly and communicated to the public via a pamphlet outlining the current rights and responsibilities of all caribou hunters on the Dempster Highway, as well as applicable laws and restrictions that must be respected (submitted as Attachment 1 of the Developer's Response to Environment

Canada's Conformity Review). For the portion of the Dempster in the NWT, the GNWT Department of Transportation has mitigation measures identified related to highway maintenance, detailed in Appendix A.

Mitigations used along the Tuktoyaktuk Source 177 Access Road have included minimization of direct habitat loss during construction, progressive reclamation of quarries, use of wildlife monitors during construction to monitor speed limit compliance and wildlife mortalities; effective waste handling and management practices, worker education regarding wildlife attraction, hunter education programs and hunting closures.

While the Tibbitt to Contowoyto Winter Road, a long-distance heavy haul ice road, and the Ekati Mine Haul Roads, all-season, reasonably long, private haul roads, are less comparable in terms of structure, their location within the range of the Bathurst and Bluenose-East herds allow for lessons related to mitigations for barren-ground caribou to be nonetheless examined. For example, The Independent Environmental Monitoring Agency's (2006[1]) Technical Annual Report 2005-2006 for WEMP report states that of the two studies conducted in 2005-2006 that "*one study indicates that caribou are attracted to roads for travelling, but not for feeding or resting. It was also observed that caribou react more strongly to pit blasts and people compared to light-truck traffic, and that caribou with calves responded more strongly in general. The other study indicated that caribou are not avoiding Misery road, or the proposed Sable Road, and small groups of caribou seem to be crossing roads more readily than in previous years*."

BHP Billiton continues to examine the proportions of caribou groups that were deflected or crossed the Misery road during winter. The 2010 Wildlife Effects Monitoring Program (2010 WEMP) reports on the snow track surveys conducted along parts of the Misery Road (haul road) to determine if the road is serving as a barrier. The executive summary from the 2010 *Road Permeability to Caribou (Snow Track Survey)* report states: "*Caribou were deflected at Misery Road in approximately 57% of the observed events from 2002 to 2010. This suggests that Misery Road is potentially acting as a barrier to caribou movement. Characteristics that appeared to influence road permeability included height of snow banks at the edge of the road, group size, and year. These results indicate that permeability of the road to caribou may be increased by mitigating snow bank height during sensitive periods of dense caribou migration.*"

The 2010 WEMP further indicates smaller groups are less likely to cross, and higher snow berms discourage crossing as well. The mitigation recommended is the reduction of snow bank height during sensitive periods of dense caribou migration.

[1]Independent Environmental Monitoring Agency. 2006. Technical Annual Report 2005-2006. Retrieved April 20, 2012 from http://www.monitoringagency.net/LinkClick.aspx?fileticket=tjiXM1b9ptw%3D&tabid=64

73.2 Please clarify why the ITH Project would not affect caribou, while the Dempster highway appears to have an effect.

The source of the statement that the "*ITH Project would not affect caribou*" is unclear given that the Developer "has acknowledged that caribou habitat could become lost, fragmented or degraded as a result of the proposed development" and considered other potential impacts related to vehicle collision mortality and increased harvester access. The Preamble implies that the Developer has not given due consideration to fragmentation effects for barren-ground caribou because a formal analysis based on the quantification of metrics typically associated with habitat fragmentation, including edge, patch size and connectivity, has not been conducted. GNWT ENR agrees with the statement in the response to IR 29 that this type of analysis is not the most meaningful consideration of potential fragmentation effects of this particular road on barren-ground caribou. The concepts of "edge", "patch size of effective habitat" or "change in distance between patches" are more appropriate in landscapes characterized by a greater level of existing disturbance. Rather, the Developer has taken a habitat-based assessment approach consistent with how fragmentation effects were handled for the Mackenzie Gas Project (outlined in a slideshow presentation to the Joint Review Panel on May 17-18, 2006) in which the availability of effective habitat (direct habitat loss/footprint effects), indirect habitat disturbance (zone of influence effects) and connectivity (the potential barrier effect) have been examined.

To address the request for information on caribou crossing rates and locations, GNWT ENR has conducted further examination of collar data on the Cape Bathurst and Tuktoyuktuk Peninsula herds from 2005-2010. As a point of clarification, while the Bluenose-West is indeed valued year-round by Inuvialuit communities as stated in the EIS Executive Summary, Figure 3.1.9.13 (EIS p. 234) shows that in more recent years of lower herd numbers, radio-collared animals from the Bluenose-West herd have ranged well to the east and south of the project area. As the Bluenose-West animals appear to not currently use the potential winter range in the immediate vicinity of the Project; the analysis was focused on the Cape Bathurst and Tuktoyaktuk Peninsula herds, which have animals that do appear to be using winter range around and west of the road allowance.

Overall annual movements

The following two maps show the annual movements of collared caribou from the Cape Bathurst herd from 2005-2010 and the Tuktoyaktuk Peninsula herd from 2006-2010. Seasonal locations for each calendar period are 'colour coded' to separate the key seasonal movement[2] as follows:

Calving	1 June – 25 June
Early summer	26 Jun to 15 August
Mid summer	16 July to 7 August
Late summer	8 August to 7 October

[2] Based on Nagy et al seasonal range report 2005

Fall/rut	8 October - 31 October
Fall/post rut	1 November – 30 November
Winter	1 December to 31 March
Spring, spring migration and pre-calving	1 April to 31 May

It should be noted that range use varies as herd populations cycle and that these data represent the herds at a low point in the long term cycle. The Cape Bathurst map shows a predominant pattern of migration from the calving/post calving range on Cape Bathurst back to winter range to the east of Husky Lakes and west of Husky Lakes. The map for the Tuktoyaktuk Peninsula herd shows calving to early summer movements are largely on ranges at the end of the Tuktoyakuk Peninsula with a move west to winter range to the east of the Husky Lakes with some overlap of use of the Cape Bathurst winter range west of Husky Lakes.

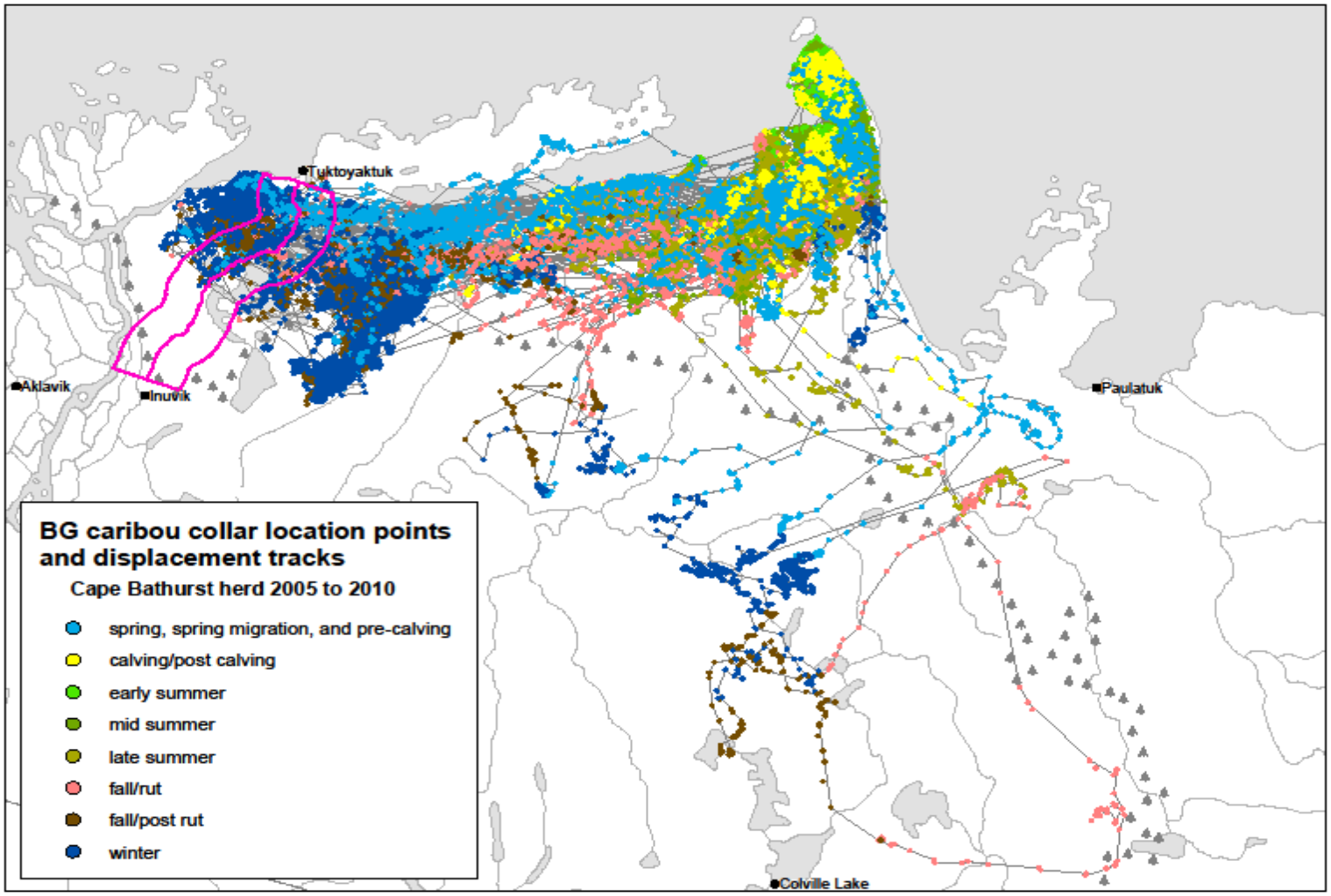


Figure 1.1. Movements of collared caribou of the Cape Bathurst Herd. This figure displays seasonal locations and movement tracks for 2005 – 2010. Data used in this figure ended October 2010.

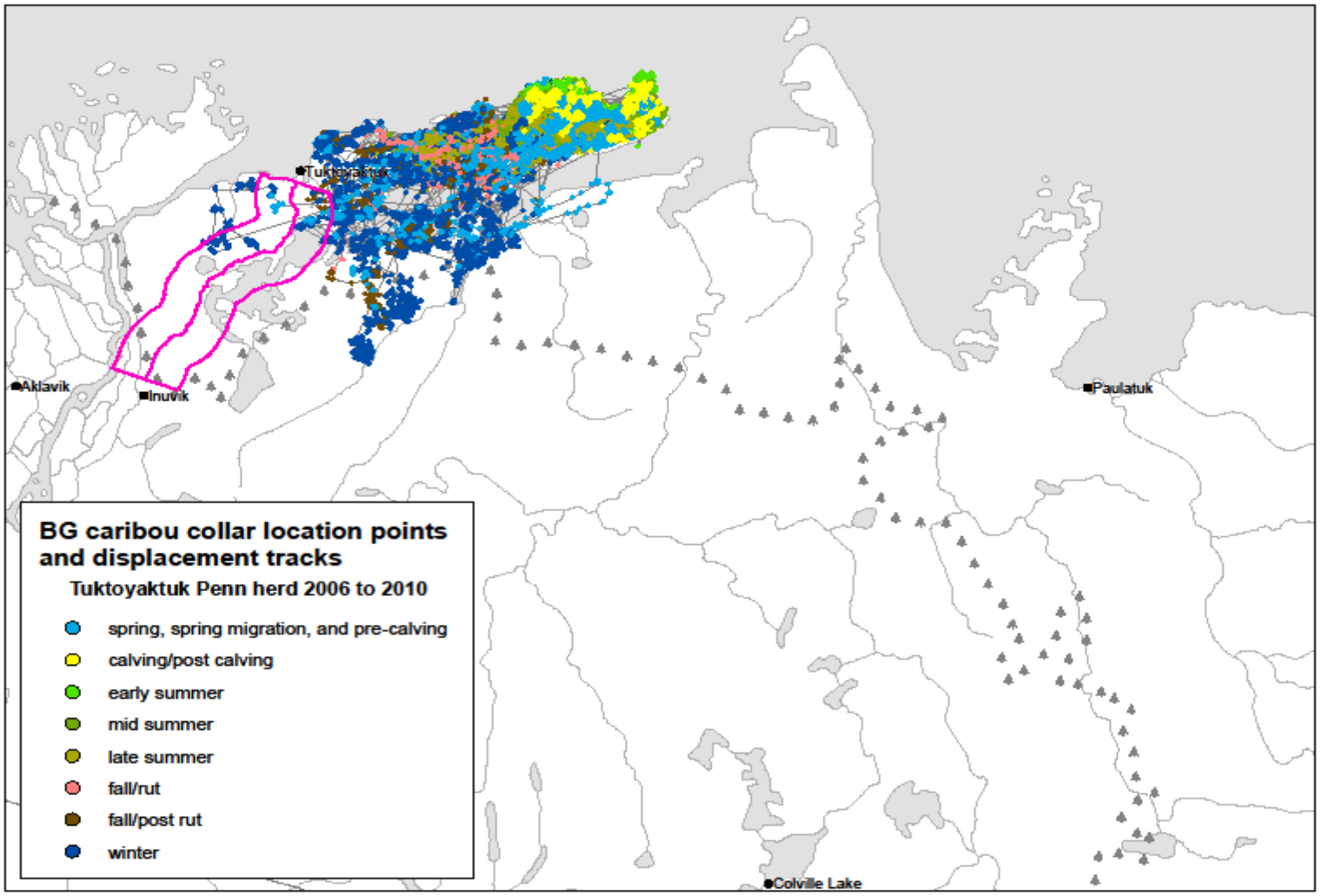


Figure 1.2 Movements of collared caribou of the Tuktoyaktuk Peninsula Herd. This figure displays seasonal locations and movement tracks for 2005 – 2010. Data used in this figure ended October 2010.

Individual Animal Movements

To determine the likelihood and timing of collared animals entering the Project area, the movements of individual collared females from both herds were analyzed to determine the number of occasions these animals might be found a) within 15 km of either side of the proposed alignment and b) west of the 15 km buffer on the west side. It should be noted that the extent to which the movements of individual collared animals reflect the movements of the whole herd would require further analysis.

The data confirmed the timing of caribou arrival in the Project area as early October to late October and departure from the area as March / April in all years. Only a portion of the Cape Bathurst herd winters to the west of Husky Lakes and in some winters, many collared animals remained well east of Husky Lakes. In most years, a portion of the herd occurs within 15 km of either side of the proposed alignment [although predominantly north of Hans Bay]. During these periods roughly an equal number were located west of the west 15 km buffer or were within the west buffer or east buffer. However, at least half of the collared animals remained east of the 15 km buffer. As anticipated, collared females from the Cape Bathurst herd occurred more frequently west of the proposed alignment than Tuktoyaktuk Peninsula herd animals. The results indicated considerable variation between years and limited samples of Tuktoyaktuk Peninsula collared caribou west of the proposed alignment.

To better determine potential crossing locations, maps were created of the individual movements of 7 GPS collared individuals (n=6 females, n=1 male) from the Cape Bathurst herd with relatively high use of the Project area between 2005 – 2011. All maps and analysis of individual caribou movements are provided in Appendix B. It is important to note that movement patterns among individuals vary between years and with population fluctuations. As such, these animals do not necessarily represent the “herd” movement patterns.

A general observation is that individual animals are extremely variable in their movements; likely in response to multiple factors that also are quite variable. The variability in movements can be dramatic between and within years. This variability is entirely consistent with radio tracking of other herds such as the Porcupine herd (discussed below). Although the radio-collaring used by GNWT ENR allows some interpretation related to timing and movement, this monitoring would not demonstrate clear ‘cause and effect’ of a highway even with the use of GPS collars. Many environmental factors including the avoidance of predators likely affect the timing and movement of animals.

In terms of “crossing locations” vis a vis the proposed alignment, a pattern to note is of fall use and crossing to the west side of Husky Lakes near the narrows where the south and north lakes join. A second pattern is that, animals might not move to the west side and the more northwest coastal winter area until January or February. However, animals that do use the northwest coastal winter range on the west side of Husky Lakes tend to migrate east by early April and use a corridor slightly north of the Husky Lakes. Also, while animals may move near

the proposed alignment in the fall or spring, the length of time near the proposed alignment is far less than the time spent 15 to 30 km to the northwest or 15 km or father to the east (although a much larger number of samples would be needed to confirm this trend).

Although only 1 collared male was mapping in this review, it is likely males range considerably farther than females. More review of males would be necessary to determine patterns in movement and timing of movement.

Implications for the construction phase

The most recent schedule provided by the Developer indicates the major activities of road construction, borrow site development and ice road access will occur predominantly from December to April over 3 winters. Each winter construction will proceed in two stretches from the north and south of about 23 km each [i.e. total of 40 – 45 km per winter]. Summer activities will include road surfacing and culvert/bridge installation following the previous two stretches.

In terms of timing, the Cape Bathurst animals are in the Project area from October 8 [or later] until spring [late April]. At its current population size, the Cape Bathurst herd uses less of the potential winter range than would be expected when the herd is at its maximum. As a result, the overlap of construction activities from the south is negligible until the construction reaches the Parson Lake area. The maximum overlap of winter construction with the individuals wintering west of Husky Lakes is in the third winter when the two construction sections will meet. Based on studies elsewhere, minimizing disturbance on caribou until they have set up for the winter may be important as a means of minimizing the behavioural effects that could arise in the final construction period when the maximum noise and visual disturbance of equipment will occur.

Implications for the operations phase

The published literature cited in the Developer's IR Response # 29 as well as the additional discussion of the results of Porcupine caribou radio collar monitoring in IR Response # 73.2 – Dempster Highway Studies (below), shows clearly that a single road with limited traffic is unlikely to be a complete barrier [although the degree of semi-permeability is unknown]. Depending on the timing and amount of vehicle use of the proposed road a Zone of Influence up to 4 - 5 km on either side may occur. Studies show that females with calves are most likely to demonstrate the greatest reduction in use of habitat close to developments. Larger groups or males show the least reduction particularly during migrations. Caribou will also react to different vehicle types. Horejsi (1981)[3] observed the behavioural response of caribou on the Dempster Highway to a ¾ ton pickup truck travelling between 56 to 81 km per hour showed considerable variability in individual response. It clearly demonstrates that the concept of a Zone of Influence for caribou is a reduction in use of habitat. It is not a complete 'loss of

[3]Horejsi, B. L. 2981. Behavioral response of barren-ground caribou to a moving vehicle. Arctic 34(2): 180-185.

habitat'. However, the influence of other human activities is likely a greater influence on the behaviour of caribou and this zone of influence and the effects on individual animals would be greater with off road activities and caribou harvesting.

Once the construction is completed and the road is open to public traffic, the stressors will change to include the road as a feature on the landscape, vehicle traffic which will include large to small vehicles generating noise and with lights travelling at speeds up to 90 km per hour and, possibly, snowmobile use accompanied by harvesting of caribou. The key issues for caribou management are for caribou to maintain access to the fall rut and winter range west of the highway [i.e. as the population rises and declines in future years, caribou will need to access the available range]. It appears that animals may cross the highway multiple times. Confirmation of specific areas for signage will be necessary, particularly to confirm a spring "migration corridor" north of Husky Lakes. As the herd numbers rise, it is likely more use of the area west of the highway will occur. While it is not likely caribou harvest for the Cape Bathurst herd will recommence until the operations phase, the amount of off road use and location of harvest will need to be considered by the wildlife co-management groups as part of mitigating the potential barrier effect of the highway.

Dempster Highway Studies

Though not reviewed in the Developer's EIS, the GNWT ENR has reviewed information related to the long-term effects of the existing Dempster Highway on the Porcupine Caribou Herd, as it is likely the most comparable road to use to estimate the potential effects of the Inuvik to Tuktoyaktuk Highway project on the barren-ground caribou herds in the Inuvialuit Settlement Region.

The Dempster Highway was built between 1958 and 1979 and has nearly identical design parameters as those proposed for the Inuvik to Tuktoyaktuk Road. Despite initial concerns raised regarding the impact of the road on caribou, Spotswood (2010)[4] states that "*Following a three-year study, the Canadian Wildlife Service reported in 1982 [GNWT ENR Note: likely Russell et al. 1985[5]] that the caribou would cross the road, even where the banks are steep. It also noted that they had started using the road themselves to travel, and even loafed around on it sometimes.*"

An impact study was conducted from 1976 to 1981 by the Yukon Fish and Wildlife Branch. Other data was collected during pipeline studies. The Canadian Wildlife Service compiled the results of the various aerial surveys and telemetry studies conducted between 1970 and 1990

[4] Source: Spotswood, K. 2010. Dempster Decision.http://yukoninfo.com/dempster/fromtrailtohighway.htm

[5] Russell, D. E. &Martell, A. M. 1985. Influence of the Dempster Highway on the activity of the Porcupine Caribou Herd. In A. M. Martell &D. E. Russell (eds.): Caribou and human activity. Proceedings of the First North American Caribou Workshop, Whitehorse, YT.,1983. Pp. 22-26. Canadian Wildlife Service.

and developed a map representation of the movements and distribution of the herd in the Yukon[6].[7].

The population census and monitoring information collected over the last 40 years demonstrates the herd has, like other herds in Canada, gone through fluctuations in population[8]; however the extent to which the road has contributed to this is undetermined. The first accurate census showed the herd at about 102,000 caribou in 1972. Photocensuses from 1989 to 2001 indicated a decline from 178,000 to 123,000. A census in July 2010 indicated the herd had increased to an estimated 169,000 caribou.

Research and monitoring activities, guided by a Porcupine Caribou Management Plan, have continued. The Porcupine Caribou Herd Satellite Collar Program[9] is one component of the management program. This cooperative project between a number of wildlife agencies and Boards uses satellite radio-collars to document the seasonal range use and migration patterns of the herd. A review of the collared animal maps on the Management Board's website demonstrate that individual collared animals cross the highway in some years but not in others. They do not always cross in the same areas but use different parts of the available range over time. Some of the herd never crosses the highway at all. As the Porcupine Caribou Management Board notes on its website "*Most of this very large area is used quite often by the herd; however use of specific areas (other than during calving) is not always predictable*."

The key difference between the Porcupine and ISR herds that may lead to differences in the behavioural responses [i.e. degree of avoidance of available habitat or strength of barrier] of caribou between the two roads are likely related to level and type of human activities including harvesting and amount of traffic. The larger Porcupine herd likely receives greater harvest pressure. Much of this pressure occurs within 10 km of either side of the Dempster highway and could influence the use of habitat within the estimated 4-5 km zone of influence. Although the traffic level is light on the existing Dempster, it would likely continue to have higher traffic volumes than those expected on the Inuvik to Tuktoyaktuk Highway.

The question then becomes "how does *the localized effect of harvest or public activities on the portion of the population moving to winter range on the east side of the Dempster Highway affect to the zone of influence and/or connectivity effect?*".

Improved road access normally leads to higher hunter numbers. The experience with the Porcupine caribou herd and the Dempster Highway has been a difficult one with respect to managing the hunter harvest. The herd's migration pattern [i.e. range use] varies from year to

[6]Russell, D.E., K.R. Whitten, R. Farnell and D. van de Wetering. 1992. Movements and distribution of the Porcupine Caribou Herd, 1970 to 1990. Tech. Rep. Series No. 138. CWS, Pacific and Yukon Region.
[7] Fancy, S.G., L.F. Pank, and D.E. Russell. 1994. Demography of the Porcupine caribou herd, 1983 – 1992. C. J. Zool. 72: 840-846.
[8] Source: Porcupine Caribou Management Board. About the Herd – Population. Available at http://www.taiga.net/pcmb/population.html
[9]http://www.taiga.net/satellite/about.html

year. In some years there have been many thousands of caribou readily accessible from the all-weather road. Harvesting with pick-up trucks normally leads to higher harvest levels than hunting with snowmobiles. This demonstrates the importance of the implementation of the current PCMB Harvest Management Plan and, in particular, the need for co-operation by harvesters. When barren-ground caribou herds are at high numbers or growing, they can generally sustain a substantial hunter harvest, but in declining herds and at low numbers, the hunter harvest has the potential to accelerate a decline or prolong a period before herd numbers recover. Modeling suggested that under some conditions, a certain levels of hunter harvest might result in a continuing decline while a reduced female and male-biased hunter harvest might lead to a slow increase.

Miller (1983[10]) reviewed the springtime migration across the Dempster Highway by Porcupine Herd caribou in April 1981 by driving along the Highway and locating caribou trails that crossed the road. Between km 100 and 371, 1681 caribou trails in nine spring migration zones crossed the Dempster Highway. The overall width of those zones averaged 9.0±4.8 km standard deviation, range 2-18 km. Physical characteristics measured at 31 approaches and departures of caribou trails that crossed the Dempster Highway were among the most difficult physical obstructions that caribou would encounter when crossing the highway between km 100 and 371. Snow depth was shallow and did not impede caribou crossing the Highway in spring 1981. When caribou closely paralleled the Highway by travelling on the frozen Blackstone or Ogilvie rivers, they preferred leaving the streams to cross the Highway where the streams flowed against the road embankment or on open areas, muskegs, lateral streams, and gravel ramps. The openness and associated visibility at some caribou crossing sites along the Dempster Highway may be, however, more a function of the presence of the Blackstone and Ogilvie Rivers and the funnelling effect of adjacent terrain than active selection by the caribou. Caribou trails crossing the Dempster Highway appeared to be distributed in proportion to the relative occurrence of treed and open road side, although actual paths within an area may have occurred more often on relatively open sites. Miller recommended that caribou managers should strive to minimize the caribou's bad experiences with traffic, hunting, and predator activities in association with the Dempster Highway.

Traditional harvest occurs along the Dempster Highway in the Yukon and NWT. Instead of dispersed hunting using convential means (ATV or snowmachines or boats), it is estimated about 70%[11] of the harvest now occurs along the Highway. Unpublished aerial survey data for November 15, 1999 provided by Yukon Environment (Cooley, D. Unpublished file 2001) to the GNWT ENR shows a Zone of Influence on either side of the Dempster Highway in the Yukon of about 5 km. During this time, 84 % of the snow machines were within 10 km of the highway.

There is limited ability, however, to determine the degree of barrier effect resulting from the combined road/road usage and avoidance reaction of animals to harvesters. Some indication of the numbers of animals crossing the Dempster Highway is contained in a Gwich'in

[10] Miller, F.L. 1983. Some physical characteristics of caribou spring migration crossing sites on the Dempster Highway, Yukon Territory. In *Proceedings of theFirst North American Caribou Workshop,* ed. Martell, A.M. and D.E. Russel. Whitehorse, Yukon.
[11] Cooley, D. Pers. Comm. December 2008. Quoted in Padilla 2010.

Renewable Resource Report conducted in August 2000[12]. Group size varied from a few in number up to 400-500 to 2000. It is likely the barrier effect is low particularly with the harvest and off road restrictions placed on the Dempster in the Yukon and NWT. However, the continued changes in range use by individuals and the influence of environmental factors make it virtually impossible to understand how and why caribou change their use of their range.

73.3 Please identify when the results of the aforementioned caribou collaring program designed to look at impacts to Cape Bathurst and Tuktoyaktuk Peninsula caribou movement and habitat use in relation to the road as part of the Wildlife Effects Monitoring Program will be released to the Board.

A total of 46 GPS collars were deployed on these herds in March 2012. The spring calving population surveys will be complete in July 2012, with results likely available in fall 2012. As the animals will begin to move to calving grounds well away from the Project, data on caribou movements in the project area will not begin to be collected until October 2012. Results on the first full year of tracking in the vicinity of the Project may be available by fall 2013. It is expected the collars will last up to 3 years and new collars will be deployed. If collared animals approach areas of active construction, early results on behavioural effects may be known by fall 2014. However, it is likely that the individual collared caribou will not encounter the construction activities until the third winter.

73.4 Please explain how such information will be integrated into the follow-up programs so that the Board can make an informed decision regarding the potential impacts to caribou.

The Wildlife Effects Monitoring progam contemplated by ENR is intended to be a "follow-up" program at the high end of the 'follow-up program' spectrum [i.e. is research based and requires considerable resources to conduct over time]. Depending on the timing of construction of other developments, such as Parson Lake, this program will also allow the effects of the project in combination with other projects.

The GPS collars will begin tracking the fine movements of Cape Bathurst and Tuktoyaktuk Peninsula herds in spring 2012. This will be ahead of potential construction [currently proposed as beginning in February 2013]. The GPS collars will provide data accurate to 5 m to 25 m and will have more frequent locations during the winter period (3 locations a day) than acquired in the past. Both of these changes to barren-ground collaring are required to analyse changes, if any, from the effects of the Project over time. GNWT ENR deployed 10 Iridium

[12]Benn, B. 2001. Fall movements of the Porcupine Caribou Herd near the Dempster Highway, August 2000. Gwich'in Renewable Resource Board Report 01-07.

model collars that will provide 1 location per hour if they animals are within 15 km of the highway alignment.

In future years, GNWT ENR will collaborate on an operations mitigation and monitoring plan. The operations phase plan will incorporate the results of this more intensive caribou tracking study and include implementation of the Developer's mitigations that apply to operations only. The GNWT ENR recognizes that other parties [or even individuals] will provide advice and ideas to GNWT DOT through that department's public engagement processes.

The GNWT ENR is of the opinion that its barren-ground caribou portion of the WEMP will satisfy the CEAA requirements for a follow-up program for this species.

73.5 Will ENR require the Developer to develop a species-specific wildlife management and monitoring program for barren-ground caribou in consultation with ENR, prior to construction?

Barren-ground caribou management planning is a co-management effort among the GNWT and Aboriginal governments and renewable resource authorities such as the WMAC (NWT). GNWT ENR issued a management strategy in 2006 called *Caribou Forever – Our Heritage, Our Responsibility: A Barren-ground Caribou Management Strategy for the Northwest Territories 2006-2010*. That strategy has been instrumental in increasing the involvement of NWT residents in caribou management. The GNWT ENR issued a second strategy for the period 2011-2015 which provides a set of managment objectives, management actions, and a schedule for implementation of actions.

As part of the latest strategy, the GNWT ENR is implementing additional monitoring of the caribou herds in the NWT including the Cape Bathurst, Tuktoyaktuk Peninsula and Bluenose-West herds. After discussions with the Developer, the GNWT modified its intended collaring program for the Cape Bathurst and Tuktoyaktuk Peninsula herds to deploy GPS collars instead of satellite collars. The reason for the change is a satellite collar location is accurate within 250 m-1 km whereas a GPS collar location is accurate within 5-25 m. This increased accuracy will provide greater information on the fine scale behavioural response of the collared animals to the highway during construction and the initial years of operation. The GNWT ENR program also includes continued monitoring of the Bluenose-West herd with satellite collars. One purpose of the collars, regardless of the type, is to enable the monitoring of population changes in each herd.

The GNWT ENR cannot, as worded in the question, 'require' the Developer to prepare a species-specific wildlife management and monitoring program." The GNWT ENR, however, is building on the Developer's commitments to develop a wildlife management plan. During these discussions, the GNWT ENR and Developer have established that a single "wildlife plan" is required. The construction phase plan will include specific components related to caribou

but at this time it is not contemplated that a series of separate plans for each species will be required as there will be “mitigations or monitoring” that will apply to more than one species but other parts that will be species specific. There does not appear to be sufficient “caribou” only mitigations and monitoring” required to necessitate species specific plans. As the GNWT ENR continues to have wildlife management responsibilities, part of the construction plan will include clarification of the roles of the Developer and the Developer’s contractors versus the role and responsibilities of GNWT ENR. This will also include clarification on the processes for review of issues arising over time and how to implement new mitigations.

IR Number: 74

Source: MSES

To: Government of the Northwest Territories (ENR)

Subject: Caribou habitat loss (EIS Sections 3.1.9.5 p.281, Section 4.2.7.2 p. 520, Table 4.2.7-3; IR Responses Round 1 #33)

Preamble
When asked to provide and justify estimates of habitat loss in the LSA for caribou and incorporate an appropriate ZOI into the coarse calculations of habitat loss, the Developer, in part, stated:

A zone of influence could be suggested based on Cameron et al. (2005) of 2 km on either side of the 137 km road, which would amount to 548 km^2, or a larger one of 4 km on either side of the 137 km road, which would amount to 1,096 km^2, based on Cameron et al. (2005) and Nelleman et al. (2003). However, this would need to be understood as a zone of influence within which caribou behaviour might be affected, but the expectation would be that caribou would cross the road and would likely do so regularly, except if road traffic was very heavy (IR #33 Response, p.4).

As is, this argument requires additional explanation.

Request:

1) **Please explain and provide scientically defensible rationale in support of the Developer's expectation that caribou will not be affected in their regional movements except if road traffic is heavy.**
2) ***Please present a management plan that would alleviate impacts from heavy road traffic on caribou movements.***

Request/Response:

74.1 Please explain and provide scientically defensible rationale in support of the Developer's expectation that caribou will not be affected in their regional movements except if road traffic is heavy.

This request is partly answered in the Response to IR 73, in which regional movements of caribou were considered in the context of the Dempster Highway which is similar to the proposed road in design, the times of year when the caribou overlap the highway (i.e. fall

through spring), traffic volumes and types, and human activities and levels of development. Forty years of traffic as well as hunting of the Porcupine Caribou herd in the Yukon and NWT has not resulted in alienation of the herd from its winter range. As discussed elsewhere, traffic levels on the Inuvik to Tuktoyaktuk road are predicted to be very low in comparison to other NWT highways. Furthermore, caribou are projected to be in the area of the project only from mid-October until early – mid April. Winter traffic is likely to be lighter than during summer months and traffic speed is likely to be lower given winter driving conditions and lower levels of sunlight.

In a general sense, evidence from the literature indicates that while roads can be barriers to movement, they are not necessarily complete barriers. In other words, roads may be semi-permeable barriers, and while caribou may hesitate to cross a road and mill about on one side, they will usually eventually cross the road.

The level of traffic on the road plays a major part in how caribou will respond to a road. Roads with little traffic are likely to be crossed readily; roads with steady truck traffic are more likely to be barriers. In the literature, indications are that high rates of traffic (>1 vehicle/min) have probably created a barrier to caribou movements (Murphy 1988[13]), but caribou may avoid heavy traffic and hunters by crossing roads at night (Skoog[14] 1968; Surrendi&DeBock 1976[15]). Similarly, Dau and Caeron (1986[16]) and Murphy and Curatolo[17](1987) indicate that roads alone do not affect movement of caribou on their calving grounds but the addition of vehicles caused a reaction.

Literature reviewed by Wolfe *et al*. (2000[18]) clearly established that roads with heavy traffic (more than 1 vehicle/minute) have a much greater effect on caribou than roads used little. The following comments extracted from Wolfe *et al*. (2000) provide a review of cases for a variety of caribou ecotypes crossing roads *"... infrequently travelled transportation corridors resulted in low numbers of road-kills, did not deter road crossing by caribou, and had no observable effect on traditional migration routes, annual distribution or energetic costs (Klein 1971; Johnson &Todd 1977; Johnson 1985; Russell &Martell 1985). Traditional migrations have continued across constructed railways or roads in Newfoundland (Bergerud 1971), Yukon (Surrendi & DeBock 1976; Russell & Martell 1985), British Columbia (Johnson &Todd 1977) and Alaska (Skoog 1968), but have ceased after construction of a railway and a highway between summer and winter ranges in Norway (Nelleman et al. 2000).*"

[13]Murphy, ***S*.**M. 1988: Caribou behavior and movements in the Kuparuk Oilfield: implications for energetic and impact analyses. *Wildl. Tech.* ***Bull.*** *8,* 19C209.Alaska Dept. Fish &Game.

[14]Skoog, R. 0. 1968: *Ecology of the caribou (Rangifertarandusgranti) in Alaska.* Ph.D. diss., University of California Berkeley. Ann Arbor, MI

[15]Surrendi, D. C. &DeBock, E. A. 1976: *Seasonal distribution, population, status and behaviour of the Porcupine Caribou Herd.* Edmonton: Canadian Wildlife Service, Western and Northern Region.

[16]Dau, J.R. and R.D. Cameron. 1986. Effects of a road system on caribou distribution during calving. Rangifer, Special Issue 1: 95-101.

[17]Murphy, **S. M.** &Curatolo, **J.** A. 1987: Activity budgets and movement rates of caribou encountering pipelines, roads, and traffic in northern Alaska. *Can.* J. *Zool.* 65, 2483-2490.

[18]Wolfe, S.A., B. Griffith and C.A. Gray Wolfe. 2000. Response of reindeer and caribou to human activities. Polar Research 19(1): 63-73.

A very recent paper presented at the 2011 Arctic Ungulate Conference by Panzacchi et al. (2011; Abstract) found, with data from 10 GPS collars, that reindeer in Norway crossed a road that cut across their migrations twice annually, but their behaviour was altered by the road. Animals' rate of travel crossing the road increased, which parallels what has been shown for boreal woodland caribou crossing seismic lines in Alberta. Panzacchi et al. also state that the obstacle (road) delayed arrival to the calving ground.

One factor that is not addressed as frequently in the literature is the impact of harvest level on regional movements. Evidence from other roads in the NWT suggests that, while the behavioural response of caribou may differ near a road on which hunting is permitted compared to other roads where hunting is limited or permitted, caribou will continue to cross the road. For example, Porcupine caribou have been shot on or near the Dempster for years but they still cross the road.

Given the evidence along the Dempster Highway and in the literature, behavioural effects that may result in altered movements generally do not prevent broad regional movements. As such, the movement of caribou to and from wintering range in the vicinity of the Inuvik to Tuktoyaktuk road are not expected to be hampered significantly.

The GPS and GPS Iridium caribou collars that were deployed in March 2012 may yield a data set that can tell us much. However, while it is worth looking at the collared caribou and how they respond to the road during construction and operations there will remain a level of uncertainty at both the individual animal and herd level effects.

74.2 Please present a management plan that would alleviate impacts from heavy road traffic on caribou movements.

The GNWT agrees with the need for the Developer to monitor and report on its mitigation measures and commitments over time. However, the options for the operations phase within the mandate of the Developer will more likely to be as simple as, if/when there are many caribou crossing the road or near it, being ready to put up signs asking people to slow down and if, necessary, stop to give caribou the right of way. Both ground observations and/or radio-telemetry are more likely to lead to determining the effectiveness of public advisories before other approaches are considered.

At this time, ENR does not expect the Inuvik to Tuktoyaktuk highway to result in heavy road traffic. The EIS provides a number of ideas that the Developer will consider [such as signage and public education]. The Developer also provided the Porcupine Caribou Harvest Management Plan which contains a number of management approaches. In short, ENR does not intend to draft a management plan at this time and cannot provide one to the EIRB. However, ENR will work with the Developer during the preparation of the Developer's operations phase wildlife mitigation and monitoring plan.

The following example demonstrates an approach currently underway in the Yukon[19]:

ADVISORY

Safer driving to save Carcross caribou, reduce accidents

(March 14, 2012) -- Environment Yukon and the Department of Highways and Public Works are working together on a campaign to reduce caribou road kills in the Southern Lakes Area this winter and enhance driver safety.

Highways crews installed digital warning signs yesterday (March 13) to alert drivers to the presence of caribou in the area: one at Jake's Corner and one near Judas Creek Subdivision at about km1359 on the Alaska Highway.

The Department of Highways and Public Works advises drivers to reduce their speed and be alert to the presence of caribou to reduce the risk of a collision.

Environment Yukon is putting up posters in the area to let residents know the Carcross caribou herd will be near or crossing major highways until April in parts of its winter range in the Southern Lakes region.

Usually about six caribou from the Carcross herd are killed by vehicles each year – so far, six have been killed in 2012. Biologists are hopeful that increased awareness from this campaign will reduce accidents because the recovery of the caribou herd is an important local concern.

This is the first time an awareness campaign using digital signage has been undertaken for the Carcross herd, one of the three caribou herds that make up the Southern Lakes caribou herds.

Yukon drivers should always be on the lookout for wildlife when driving. If you see wildlife that have been hit by a vehicle, call the TIPP LINE at 1-800-661-0525 to report it.

[19] http://www.env.gov.yk.ca/documents/environment_yukon_advisory_carcross_caribou.pdf

IR # 73 Appendix A – Design Parameters and Caribou mitigation for four roads within the NWT

A. Dempster Highway (Existing)

Road structure – Dempster Highway

The Dempster Highway is designed to the following parameters[20]:

Cross-Section	
Desired Finish Top Shoulder Rounding to Shoulder Rounding	10 m
Minimum Finish Top Shoulder Rounding to Shoulder Rounding	7 m
Lane Cross Fall	5%
Superelevation	6%
Side Slopes – All Sections	3:1, 2:1 if fill exceeds 2.5 m
Embankment Height	
Dry (ice poor) Till and Outwash Deposits	1.4 m
Wet (ice medium to ice rich) Till and Outwash Deposits	1.4 m to 1.6 m
Wet Silts and Clays (ice rich)	1.6 m to 1.8 m
Thick Organic Peatlands and Ice Rich Permafrost	1.8 m
Thickness of Surfacing Gravel	200 mm (Compacted)

[20]Mr. G. Jagpal (GNWT DOT, Pers. Comm. 2012)

The photo[21]above shows the low profile and width/embankment characteristics of the Dempster Highway. The low and narrow width is similar to the proposed project

Mitigation of impacts to caribou – Dempster Highway

The Porcupine Caribou herd, which occurs along the Dempster Highway, is co-managed by the Porcupine Caribou Management Board (PCMB) and wildlife management agencies in Yukon, Alaska and NWT. The *Harvest Management Plan for the Porcupine Caribou Herd in Canada* was signed March 2010. The document was submitted to the EIRB as Attachment 1 of the Developer's Response to the WMAC's Conformity Review questions. Pertinent mitigations in the plan include highway patrols by government officers and other representatives, hunter education signage and programs, and signage on the highway warning drivers of caribou crossing areas.

In addition, Attachment 1 of the Developer's Response to Environment Canada's Conformity Review questions summarizes the current rights and responsibilities of all caribou hunters on the Dempster Highway, as well as applicable laws and restrictions that must be respected. This particular pamphlet was developed by a number of parties including the Inuvialuit Game Council, the Wildlife Management Advisory Council (North Slope), the Porcupine Caribou Management Board and the Yukon Department of Environment.

A section of the Plan is devoted to a discussion regarding the Dempster Highway and best practices regarding harvest. The best practices include:

[21]Photo scanned from the Vancouver Sun.

- Best ways to improve hunting success, which includes leaving the groups near the highway and hunting isolated groups further away
- Best ways to ensure all hunters are safe, which includes never shooting towards a road or down the travelled portion of a road, driving safely and parking vehicles in safe locations along the road and being visible to other hunters
- Best ways to allow caribou to use the Dempster area, which includes a goal of reducing the chance of caribou learning to associate the highway with danger by hunting on the east side of the highway in the fall and the west side of the highway in spring, make one shot kills away from the highway, field dress your caribou away from the highway, and slowing down when driving in areas with large numbers of caribou crossing.
- Best ways to reduce stress to caribou, which includes not chasing caribou with vehicles (such as snow-machines), make a one-shot kill from a reasonable distance, and immediately shoot a wounded animal.
- Best ways to protect caribou habitat, which includes avoiding the use of snow-machines until the ground is frozen and there is enough snow, and to use off-road vehicles in a manner that doesn't kick up plants and create trails
- Best ways to protect female caribou and their young, which includes taking bulls until rutting season, and avoiding disrupting breeding groups of caribou.
- Let the leaders pass, which includes allowing time for the caribou to reach the winter ranges east of the highway in the fall.
- Motor vehicles and habitat damage, which includes prohibiting the use of motorized vehicles (including snow machines) by hunters within 8 km of each side of the highway until the snow is at least six inches deep.
- Other best practices, which includes understanding that leaving gut piles along the highway is disrespectful to the caribou and attracts predators.

As the Dempster Highway is an existing highway, the GNWT Department of Transportation has mitigation measures identified related to highway maintenance. For general maintenance issues, such as a culvert replacement project, a number of mitigation measures are implemented (AECOM 2010[22]) and are presented below.

Mitigation Measures for Culvert Replacement Along the Dempster Highway	
Predicted Impacts	**Mitigation Measures**
Habitat Disturbance / Deterioration	- Project footprint has been minimized and previously disturbed areas will be used, wherever possible. - Project personnel will be provided with wildlife awareness training.

[22]AECOM. May 2010. Culvert Replacement –Km 146.8, Dempster Highway (No. 8). Prepared for the Government of Northwest Territories, Department of Transportation, Highways Division, Structures Section

Wildlife Encounters or Incidents	- Implementation of wildlife-human interaction procedures, which will include safe working distances from wildlife. - Workers must avoid all interactions with wildlife unless crew safety is at risk. - If nesting birds, nests and eggs are discovered directly near the construction site every practical effort will be made to avoid disturbance until birds have vacated the nests. - Field workers will not feed, harass or approach wildlife. - All human/wildlife conflicts and incidents will be reported to the Field Supervisor and documented. - All significant wildlife features, such as nests and dens will be documented and reported. - Firearms will be used on-site by authorized personnel only. - Personal firearms and fishing gear are not permitted on site. - No hunting or fishing by Project-related field workers will be permitted.
Wildlife attraction to Site and Waste Management	- Waste will be removed from the area surrounding the construction site. - No garbage will be incinerated on site. All garbage will be disposed of offsite daily from the site and disposed of at an approved facility in order to minimize wildlife attractants at the construction sites. - Minimize and dispose of attractants to wildlife such as garbage, food wastes and other edible and aromatic substances.
Wildlife mortality	- Immediate consultation with appropriate territorial (ENR) and federal (CWS) wildlife authorities will occur. Any key species mortality will be reported to ENR and CWS. - Situation and site will be assessed, including potential for further mortalities; consider increased wildlife deterrent mechanisms and security, including fencing and lights to ensure wildlife and personnel safety. - Ongoing or multiple mortalities of other species should be reported to CWS (i.e. birds regularly striking infrastructure over course of time, or single incident of a large flock of migratory birds striking infrastructure).

Spills of hydrocarbons or toxic substances resulting in injury to wildlife and wildlife habitat	- Best management practices and contingency plan will be implemented where necessary to prevent and address leaks and spills (details will be addressed in the Spill Contingency Plan). - Federal (CWS) and territorial (ENR) authorities will be contacted immediately to determine appropriate course of action, which may include capturing and relocating or appropriately treating contaminated wildlife. - The spill area will be monitored closely by the Environmental Monitor and appropriate deterrents (e.g., warning noises, flagging) employed to discourage wildlife from entering the affected area and ingesting toxic substances or being covered in spill material.

B. Tuktoyaktuk Source 177 Access

Road structure – Tuktoyaktuk Source 177 Access

The Tuktoyaktuk to Source 177 Access Road is constructed to a gravel access road standard[23]. The photo below (EIS Photo2.1.2-3) shows a typical view.

Cross-Section	
Desired Finish Top Shoulder Rounding to Shoulder Rounding	9 m
Minimum Finish Top Shoulder Rounding to Shoulder Rounding	7 m
Lane Cross Fall	3%
Superelevation	6%
Side Slopes – All Sections	3:1 or 2:1

[23]Source: W. Orr, Stantec, Pers.Comm 2012.

Embankment Height	
Minimum Embankment Finish Heights	9 m
Thickness of Surfacing Gravel	200 mm (Compacted)

Mitigation of impacts to caribou – Tuktoyaktuk Source 177 Access

The Tuktoyaktuk to Source 177 Project Description Report (GNWT DOT and Hamlet of Tuktoyaktuk 2008[24]) stated objectives of the mitigation measures were to:

- Minimize the loss of habitat and reduction of habitat effectiveness;
- Minimize direct mortalities due to collisions with vehicles;
- Minimize disruption of wildlife movements across the road;
- Minimize attractants through responsible waste management and effective environmental awareness programs;
- Work with the Tuktoyaktuk Hunters and Trappers Committee and regulatory agencies to monitor and control harvesting activities.

Predicted effects and corresponding mitigation measures are summarized as follows:

- Direct habitat loss – consideration of habitat quality during design of the road. Important habitats, where possible, will be avoided and habitat loss minimized. Progressive reclamation of quarries will occur to ensure that only areas with active quarrying will be disturbed. Mined out areas will be recontoured and revegetated to match the surrounding terrain upon completion of quarrying activities.
- Disturbance (indirect habitat loss) and Mortality (road kills) - environmental monitors will be instructed to note concerns or issues with speed limit compliance and instances of wildlife mortality and report their findings to the project manager and the superintendent. Project management will be responsible for addressing speed and safety concerns on the construction project.
- Habituation and food conditioning - effective waste handling and management practices, environmental and wildlife monitoring reports, and prohibiting all project personnel from feeding wildlife will help minimize the possibility of attracting wildlife to project facilities.
- Hunting - A public education program is recommended to be undertaken, such as the use of signage along the road alignment regarding hunting restrictions, to discourage excessive hunting along the corridor. Currently for the period July 1, 2008 to June 30, 2009 Area I/BC/07, which includes the area of the all-weather access road is closed to the hunting of barren-ground caribou for all hunters (ENR, 2008).
- Avoiding carnivore dens – areas were identified in the vicinity of the proposed road that provide suitable grizzly bear denning habitat. Monitors were made aware of these areas, and assisted with identifying habitat use for the purposes of avoidance and worker safety.

[24]GNWT Department of Transportation and Hamlet of Tuktoyaktuk. December 2008. Project Description Screening: Tuktoyaktuk to Granular Source 177 Access Road.

C. Tibbitt to Contwoyto Winter Road

Road structure – Tibbitt to Contwoyto Winter Road

The Tibbitt to Contwoyto Winter Road is a 600 km heavy haul ice road. Approximately 85% of the road is over lake ice and crosses approximately 60 portages. The road width is 50 m on lakes and 12-15 metres at portages. Road construction (using compacted snow and ice) usually takes 5-6 weeks and is open for approximately 8-10 weeks each year[25].

Based on the minimum ice thickness along the entire route, acceptable load weight limits are set[26]. With each additional inch of ice, the allowable weight increases. When a thickness of 70 cm is achieved over the entire road, very light loads known as 'hotshots' are dispatched. When the ice reaches 107 cm along the entire road, it is thick enough for a super B tanker[27] fully loaded with 48,000 to 50,000 litres of fuel.

Mitigation of impacts to caribou – Tibbit to Contwoyto

According to the Tibbitt to Contwoyto Joint Venture (2009[28]), various measures have been implemented to minimize energetic disturbance and collision mortality for caribou and other wildlife along the road:

- Under the Wildlife Plan, all wildlife has the right of way on the Winter Road. Vehicles are required to slow down or stop and wait to permit the free and unrestricted movement of wildlife across the Winter Road at any location.
- Under the Winter Road Driving Rules, the speed limits for commercial trucks travelling along the Winter Road are kept low. For example, the speed limit for trucks travelling on and off lakes is 10 km per hour; south of Lockhart Lake the speed limit for loaded trucks is 25 km per hour and 35 km per hour for empty trucks (basically speeds are similar to a school zone); and north of Lockhart Lake the speed limit for loaded trucks is 30 km per hour and 40 km per hour for empty trucks. In addition, drivers are required to maintain at least 500 m spacing when traveling in convoys. The slow speed limits and spacing between trucks provide the caribou with ample time to see the trucks from a distance, and give the drivers time to react to any caribou on the Winter Road.
- In areas and times of known caribou distribution and occurrence, snow bank height should be minimized to allow caribou passage.
- Education program developed for security personnel, truck drivers and camp operators, which includes wildlife protection.

[25]Tibbitt to Contwoyto Winter Road Joint Venture. 2012. Construction – Backed by Experience, Monitored with Science. Retrieved April 19, 2012 from http://www.jvtcwinterroad.ca/jvwr/

[26]Tibbitt to Contwoyto Winter Road Joint Venture. 2012. Facts. Retrieved April 19, 2012 from http://www.jvtcwinterroad.ca/jvwr/

[27]A super B is a tractor hauling two tanks of fuel weighs approximately 41-42 tonnes.

[28]Tibbitt to Contwoyto Joint Venture. December 18, 2009. Questions and Answers related to Caribou and the Winter Road. Retrieved April 19, 2012 from http://www.miningnorth.com/docs/Caribou%20and%20Winter%20Roads%20Q&A.pdf

It should be noted that the terms of the Licence of Occupation issued by the DIAND (now AANDC) to the Joint Venture Ltd. to operate the road does not allow for the restriction of public access. While Joint Venture Ltd. must provide public access Joint Venture Ltd. has no authority to regulate use.

D. Ekati Mine – Haul Roads

Road structure – Ekati Mine Haul Roads

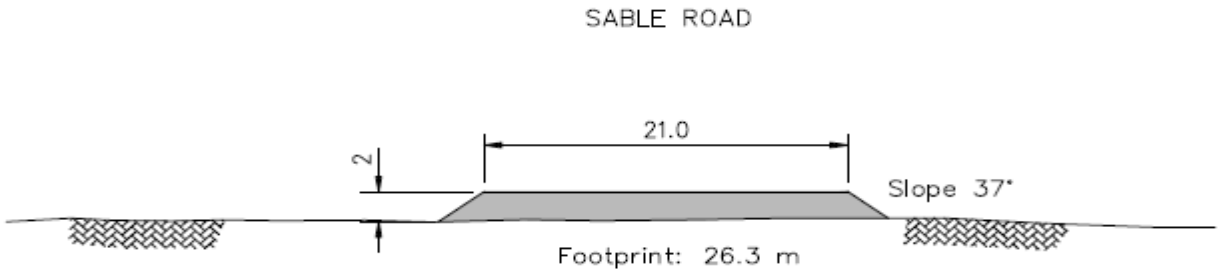
The Ekati mine haul roads discussed here refer to those that are reasonably long haul roads from the main mine processing facilities to a remote pit(e.g., Sable Road is approximately 20 km long).These are shown to illustrate the significant contrast to the Inuvik to Tuktoyaktuk Highway. Most significantly, the mine roads are constructed from waste rock resulting from the mine pits rather than gravel. Usually the material is composed of large, angular rocks and boulders. These are not public roads but are constructed for the movement of very large, heavy mine trucks (e.g., 100-218 tonne haul trucks).

The photo above shows small group of Bathurst caribou clambering up the side of the waste rock haul road to the top of the waste rock dump at Ekati. Although equipment can be seen in the background, the caribou may have been attempting to avoid harassing insects.

Design standards and criteria have been established based on operational requirements in conjunction with regulatory compliance (i.e. *Northwest Territories Mine Health and Safety Act* and Regulations). The embankment width is sufficient for two-lane traffic and will provide year-round access. The haul roads are a continuous fill structure placed on the existing tundra

surface with the necessary precautions taken to ensure the underlying permafrost remains undisturbed. The following photo shows the Sable Road.[29]

Design Cross Sections[30], [31], [32] for several sizes of haul roads at Ekati are shown in the figures below. The Sable Road[33] has a 21 m operating surface and a 26 m base width to accommodate two-way 100 tonne haul truck traffic. The Beartooth and Pigeon segments of the haul road have an operating crest width of 25 m to accommodate two-way 218 tonne haul truck traffic. The base width of Beartooth Road is typically 39 m, but is expanded to 46 m for a short segment, and includes a buried dewatering pipeline in the shoulder of the road. The base width of Pigeon Road is approximately 30 m. All base widths are determined based on the terrain conditions and the minimum fill thickness in conjunction with side slopes of 37° (i.e., 1.33H:1V). For some sections of the road, lower slopes have been designed to facilitate caribou crossing.



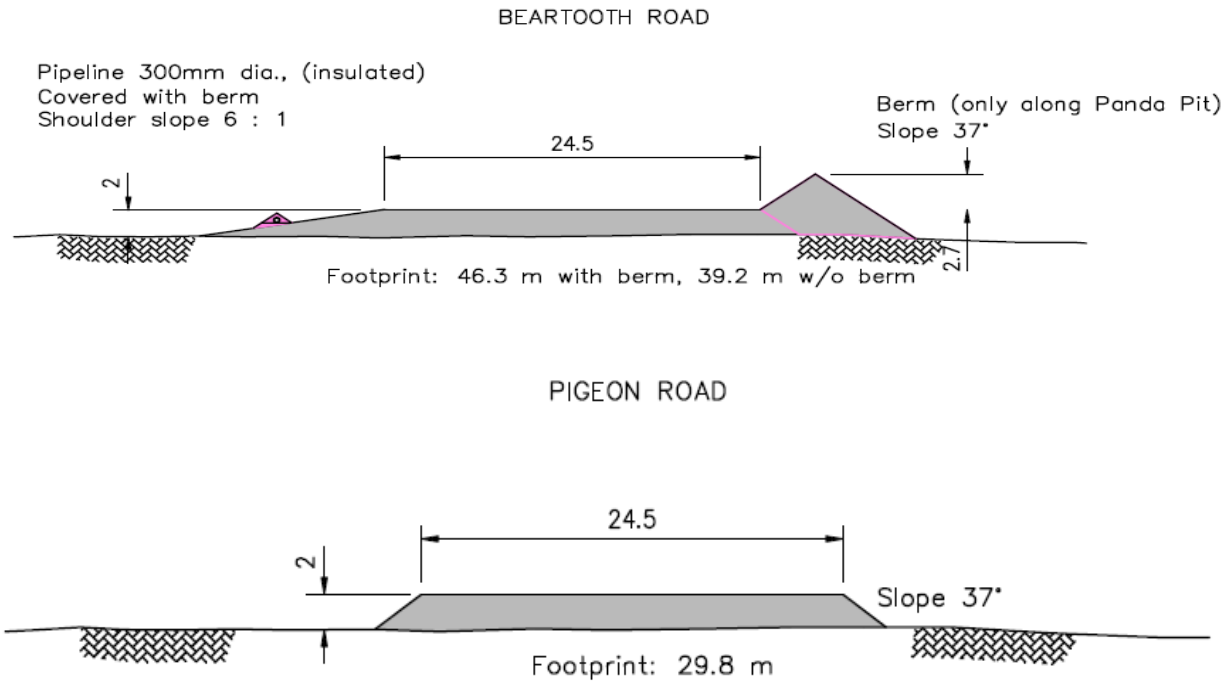
[29]Independent Environmental Monitoring Agency. 2012. Photo Gallery: New Sable Road. Retrieved April 19, 2012 from http://www.monitoringagency.net/PhotoGallery/tabid/93/Default.aspx

[30]Source: BHP Billiton Diamonds Inc. 2008

[31]Source: BHP Billiton Diamonds Inc. 2008

[32]Source: BHP Billiton Diamonds Inc. 2008

[33]BHP Billiton Diamonds Inc. September 2008. Addendum (March 31, 2008) - Preliminary Design Sable Haul Road, April 2001. Retrieved April 19, 2012 from http://www.mvlwb.ca/WLWB/Registry/2001/MV2001L2-0008/Renewal/app/Sable%20Road%20Report_April%202001%20with%20addendum%20Mar31.pdf



Mitigation of impacts to caribou – Ekati Mine Haul Roads

Operations standards can be summarized as follows:

- Maximum speed 60 km/hr
- Wildlife always have the right-of-way
- The road will be built low, wherever possible, in order to eliminate the need for safety berms, which may restrict caribou movements
- At the intersection of key caribou crossings, the slopes will be reduced and surfaced with crushed aggregate in order to facilitate caribou crossing, and
- Local communities will be consulted regarding the design of the road, especially the design of caribou crossing locations.

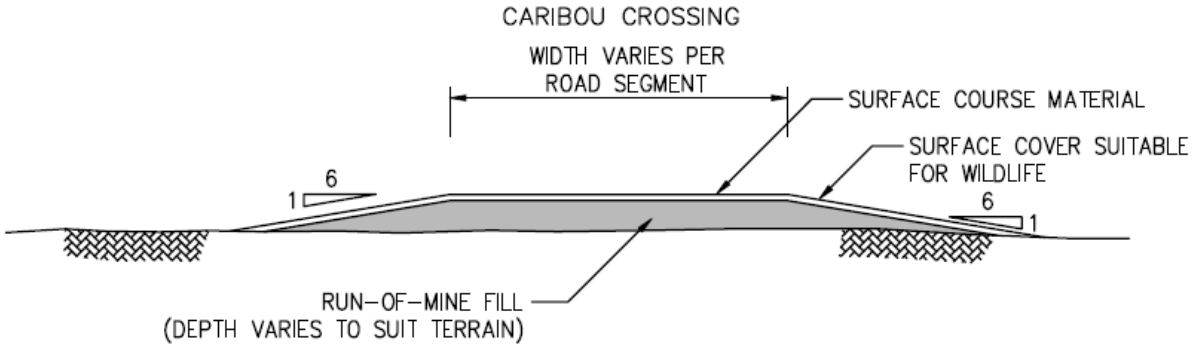
First, there is no hunting of caribou at the mines. To avoid vehicle collisions all vehicles give caribou the right of way. As seen in the following photo[34], the roads tend to have high, steep embankments. Additional concerns were raised after the initial mine road construction related to the risk of a caribou spraining or breaking a leg or damage to hooves or legs from the sharp rocks. To mitigate the effect of the road design and improve the safety of animals, crossing ramps have been added. The photo below compares a 'normal' road embankment and a caribou crossing embankment. The additional figure below provides a Design Cross Section.

[34]Source: BHP Billiton Diamonds Inc. 2008

Ekati Roads

Standard roadside

Caribou friendly roadside



IR # 73 Appendix B – Seasonal movements of individual collared animals in the Project area

Individual Collar Animal Tracking

The following maps and text were used to better determine movement patterns and locations relative to the proposed road alignment of 7 GPS collared individuals (n=6 females, n=1 male] from the Cape Bathurst herd with relatively high use of the Project area between 2005 – 2011. The number of years of samples varied from 1 up to 3 years. These collared animals were all fitted with GPS collars and the collars provided 3 locations per day. To simplify reading the maps, seasons are colour-coded and tracks are included between locations. The date of the location is provided as well. The mapped area includes the cumulative study area but a 15 km buffer distance is also shown to provide a "distance from the proposed alignment" reference. Initially, multi-year maps were produced. While these provided a useful visualization of overall patterns and it was clear that annual movements were quite different for each animal. As a result annual maps are included in this response for:

Cow 08/15 (2008-09, 2009-10, 2010-11)

Three years of locations are provided for this animal. In 2008-09, she moved across Husky Lakes (north) on October 27 -28 and crossed the proposed alignment. After spending a day near the alignment she re-crossed and moved back across Husky Lakes (between south-north lakes) on October 31 and spent the next few months east of Husky Lakes. She moved back across on January 1 and proceeded towards the coast where she spent the remainder of the winter. She re-crossed the proposed alignment on April 27 and rapidly moved east.

The next year she moved across Husky Lakes (north) on October 28 and crossed the proposed alignment by October 30. She moved to the coast but then wandered south and crossed and re-crossed the proposed alignment on November 23. She continued southwest and came in contact with the proposed alignment on December 1. She then moved back to the coast until she moved east across the proposed alignment on April 30. Her spring migration route was similar to the previous year.

In 2010-11 she made a radical change by remaining to the east of Husky Lakes until March 8 when she crossed Husky Lakes and mostly remained around the area of the proposed alignment until she migrated east on April 3.

Cow 07/12 (2007-08, 2009-10)

During the first year mapped, this cow crossed Husky Lakes (north) on November 5 and crossed the proposed alignment on November 6. She proceeded southwest near the proposed alignment and crossed and re-crossed on November 12. She eventually re-crossed on November 20 and moved east across Husky Lakes (south lake) on November 21. This cow then moved east for the winter.

However, the next year she dramatically changed her winter range. She moved into the area and stayed north of the Husky Lakes on October 31 and crossed the proposed alignment on November 3. She moved southwest and eventually crossed and re-crossed on November 10 – 11. She spent the remainder of the season moving widely in the area northwest of the proposed alignment. She eventually migrated east and crossed the alignment on April 20 just north of the Husky Lakes.

Cow 185 (2006-07, 2007-08, 2008-09)

This cow also spent limited time in 2006 – 2007 in the area. She crossed Husky Lakes (north lake) on November 1 – 2 and immediately crossed the proposed alignment. After moving west and south she re-crossed the proposed alignment of November 16 and re-crossed Husky Lakes (near south-north lakes) on November 16 and wintered to the east.

The next year, Cow 185 showed a very different pattern. She crossed Husky Lakes (south end of north lake) on October 26 and crossed the proposed alignment of October 27 on her way to the northwest. She re-crossed the alignment on November 21 and crossed Husky Lakes (at south-north lakes) on November 21 – 22. She spent early winter east of Husky Lakes before re-crossing Husky Lakes (north lake) on February 26. After spending part of the winter in the coastal area to the northwest of the proposed alignment, she moved east and spent March 23 to April 2 near the proposed alignment before migrating east north of Husky Lakes on April 4 – 6.

The third year, the timing of use of the area varied again. Cow 185 entered the area and crossed Husky Lakes on October 21 and moved across the proposed alignment by October 22. She moved northeast and crossed the proposed alignment on October 24 and again on October 25 on her way back across Husky Lakes (north lake) on October 26. After spending the next months east of Husky Lakes she re-entered the area and crossed Husky Lakes (north lake) on January 3. After crossing the proposed alignment on January 4, she moved toward a coastal wintering area. She migrated across the proposed alignment on April 16 on her way east staying north of the Husky Lakes.

Cow 183 (2007-08, 2008-09)

In 2007 – 08, Cow 183 moved across Husky Lakes (north lake) on February 6 and moved across the proposed alignment and winter to the northwest. She spent upwards of a week (March 23 26) around the proposed alignment. When she migrated east she crossed the proposed alignment on April 6-7 and dawdled considerably as she moved east to the north of Husky Lakes.

The next year, Cow 183 moved into the area by October 30 and circled the edge of Husky Lakes (north lake) until November 16 when she re-crossed Husky Lakes (north lake). By January 9 she moved back into the area and crossed Husky Lakes (north lake) on January 9 and immediately crossed the proposed alignment and wintered in the northwest coastal area. This

year she migrated more quickly across the proposed alignment on April 29 and rapidly moved east staying to the north of Husky Lakes.

Cow 172 (2007-08, 2008-09)

In 2007 – 08, Cow 172 moved across Husky Lakes (north) on January 27 and crossed the proposed alignment on January 28. This cow continued in a circuitous pattern eventually wintering in the coastal area. However she spent some time from March 23 until March 29 just to the west of the proposed alignment. She eventually crossed on her spring migration on April 2 – 3 as she moved east just north of Husky Lakes.

The next year, Cow 172 crossed Husky Lakes on January 3-4 and moved again northwest and spent most of the winter in the coastal area 15 km west of the proposed alignment. She migrated across the proposed alignment on April 26-27 as she moved east just north of Husky Lakes.

Bull 07/13 (2007-08)

Bull 07/12 illustrates the need to consider males and their movements when reviewing patterns for caribou. This male moved into the area on October 23 and crossed Husky Lakes (south-north lakes) by October 24. He crossed the proposed alignment and stayed 15 km northwest from October 26 until November 21 when he moved back across the proposed alignment and slowly continued around the eastern edge of the south Husky Lakes eventually moving back across Husky Lakes (south lake) on January 25. He moved across the proposed alignment and spent some time around Parsons Lake until moving to the proposed alignment around Hans Bay by February 11. By March 7, he was moving up to the coastal winter range until March 30 when he moved further west and stayed in a localized area until April 20 by which time he moved rapidly east crossing the proposed alignment on April 27 well north of Husky Lakes. He spent two week east of the proposed alignment before leaving the area on May 14.

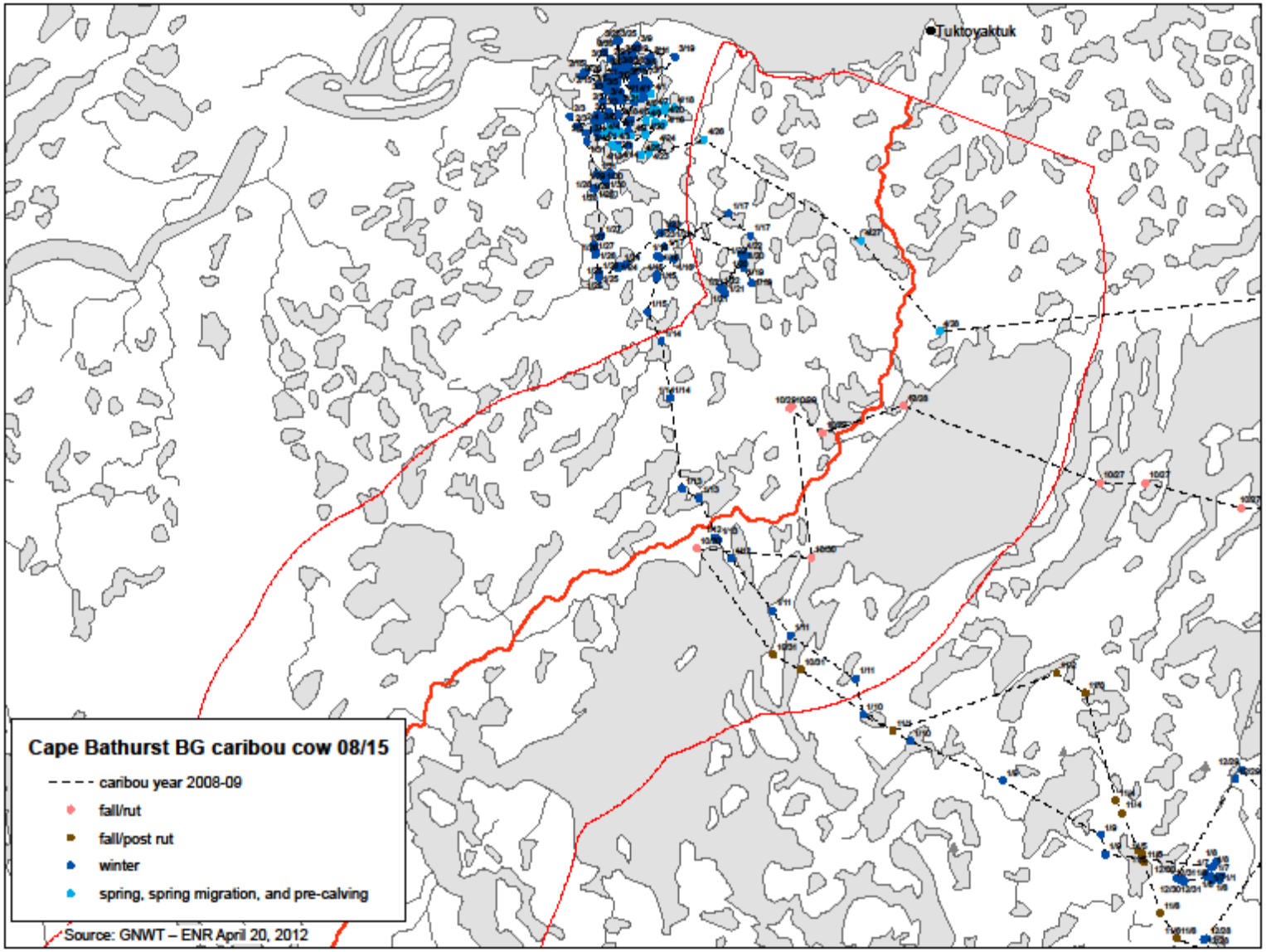
Cow 171 (2006-07, 2007-08, 2008-09)

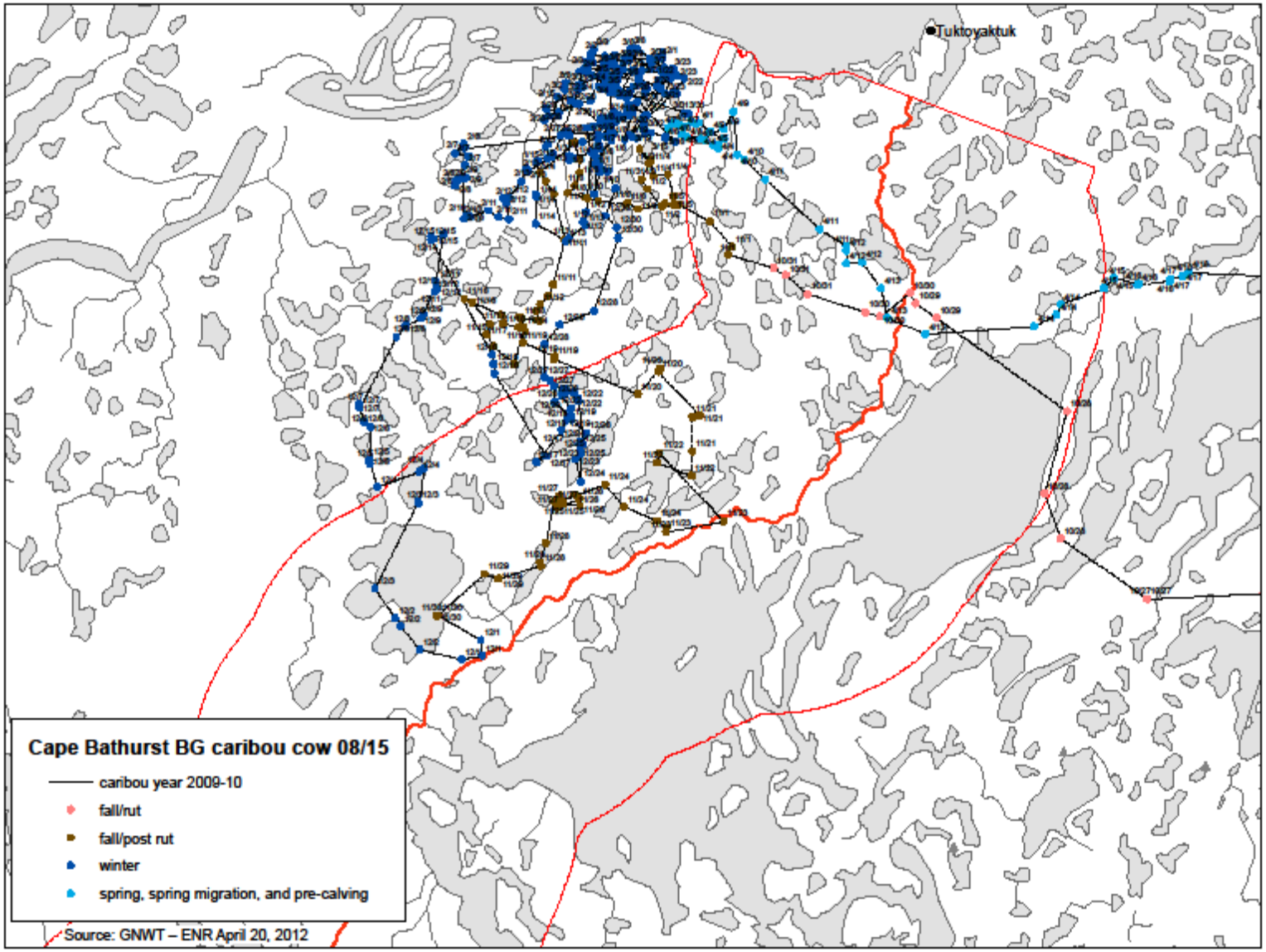
Cow 171 entered the area on October 30 and by October 31 had crossed Husky Lakes (south-north lakes) and the proposed alignment. She ranged more than 15 km to the west and north before crossing the proposed alignment on November 19 near north Husky Lakes. She immediately re-crossed and moved west and south to re-cross the proposed alignment and Husky Lakes (south-north lakes) on November 30. She moved to the east winter range but on February 22 re-entered the area and had re-crossed Husky Lakes and the proposed alignment by February 23. She spent the remaining winter from 10 km or so west of Parsons Lake and progressively moved east. By April 18 she continued her spring migration across the proposed alignment and continued north of Husky Lakes and was out of the area by April 20.

In 2007-08, she spent only the fall months in the area. She moved across Husky Lakes (north lake) on October 26 and across the proposed alignment of October 27. She continued up to 25

km west and north. By November 14 she had moved south and re-crossed the proposed alignment. By November 17 she had crossed Husky Lakes [south-north lakes] and quickly moved east to the eastern winter range.

In 2008-09, Cow 171 returned to the area on October 21 and moved across Husky Lakes by October 22. After moving 15 km to the west and then north, she re-crossed the proposed alignment on October 27 and crossed Husky Lakes (north-south lakes) and wintered in the eastern winter range.


Tuktoyaktuk
Cape Bathurst BG caribou cow 08/15
caribou year 2008-09
fall/rut
fall/post rut
winter
spring, spring migration, and pre-calving
Source: GNWT – ENR April 20, 2012


Tuktoyaktuk
Cape Bathurst BG caribou cow 08/15
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fall/rut
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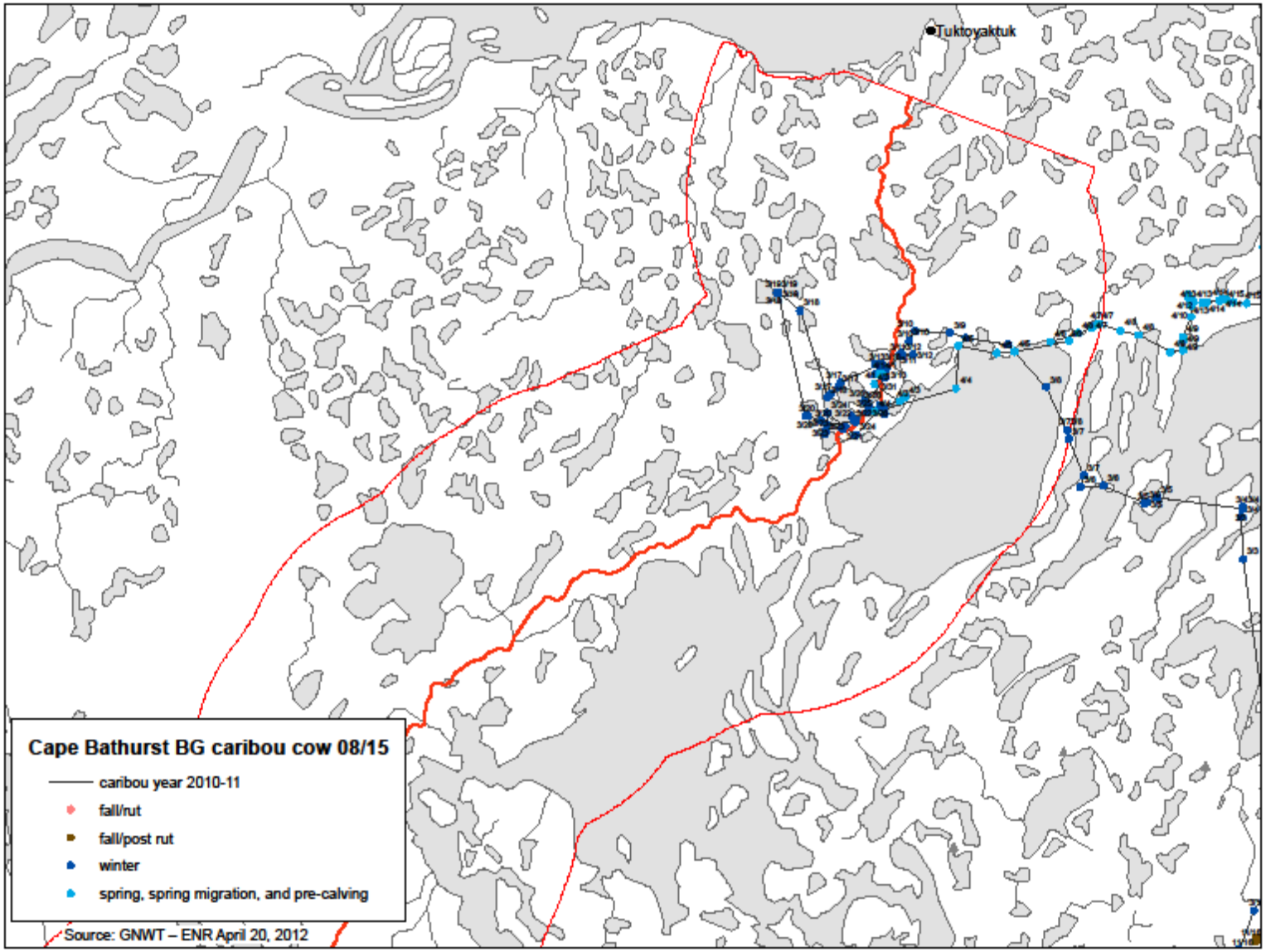
spring, spring migration, and pre-calving
Source: GNWT – ENR April 20, 2012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Cape Bathurst BG caribou cow 08/15
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winter
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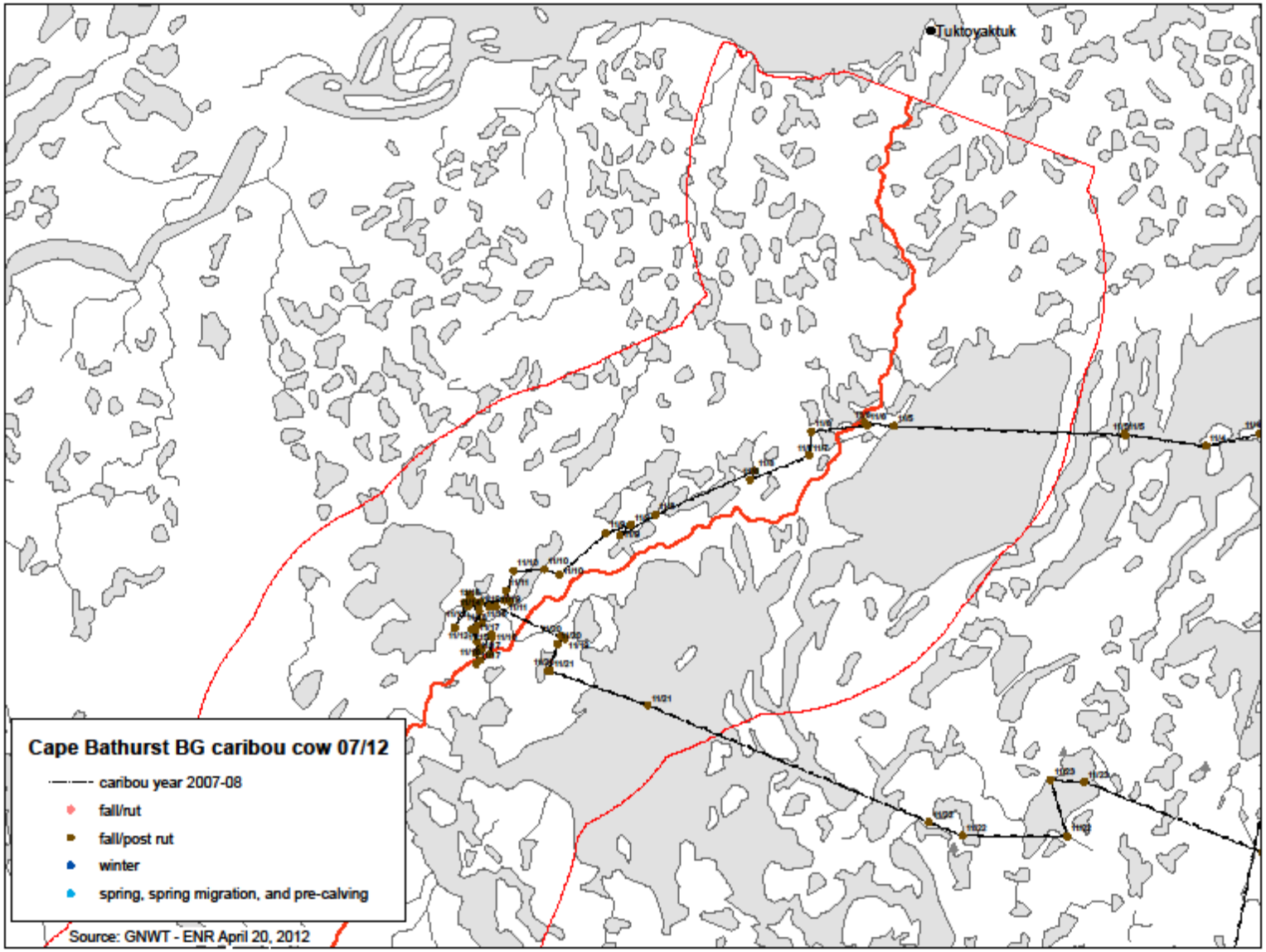
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caribou year 2007-08
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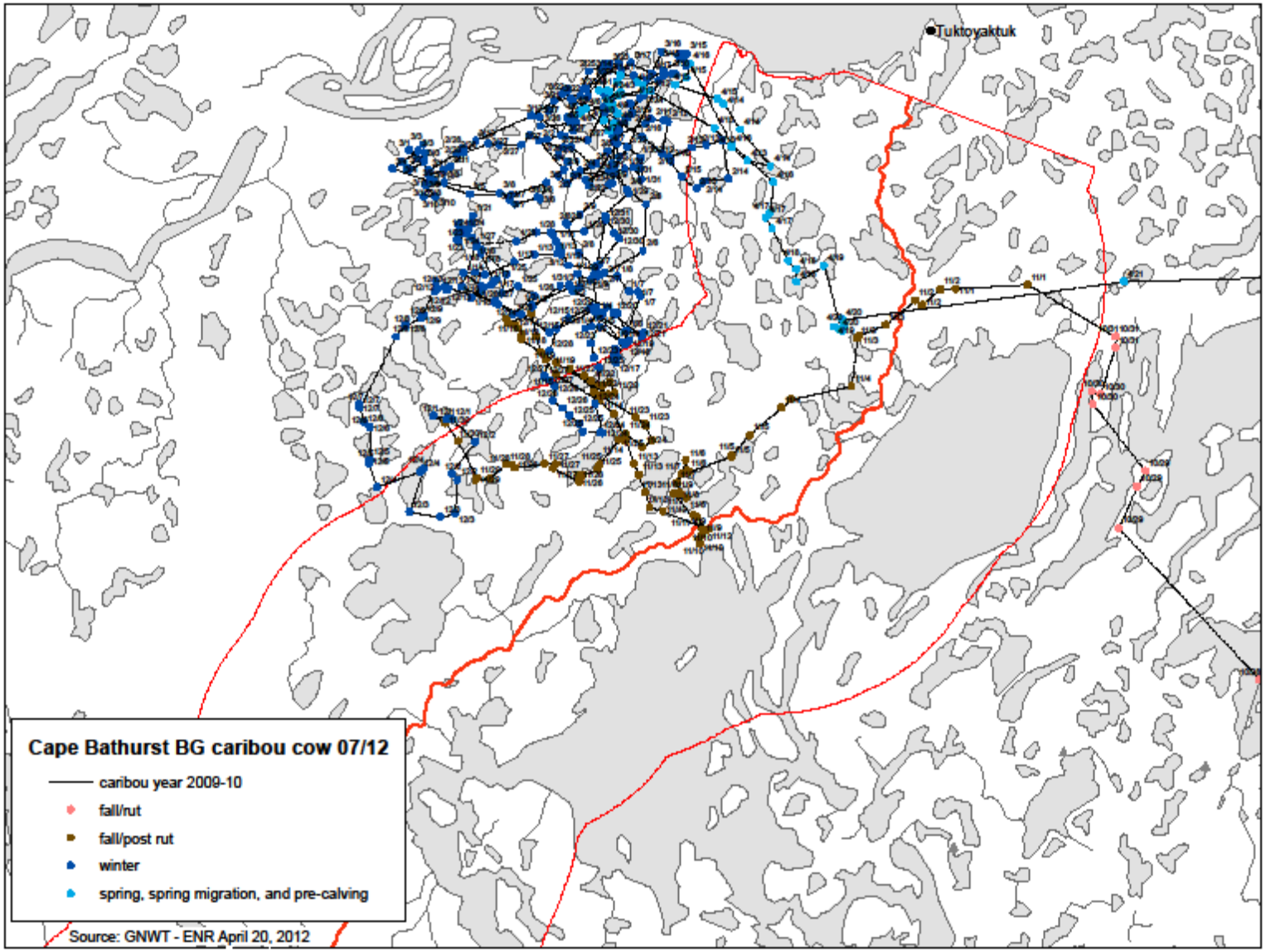
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caribou year 2009-10
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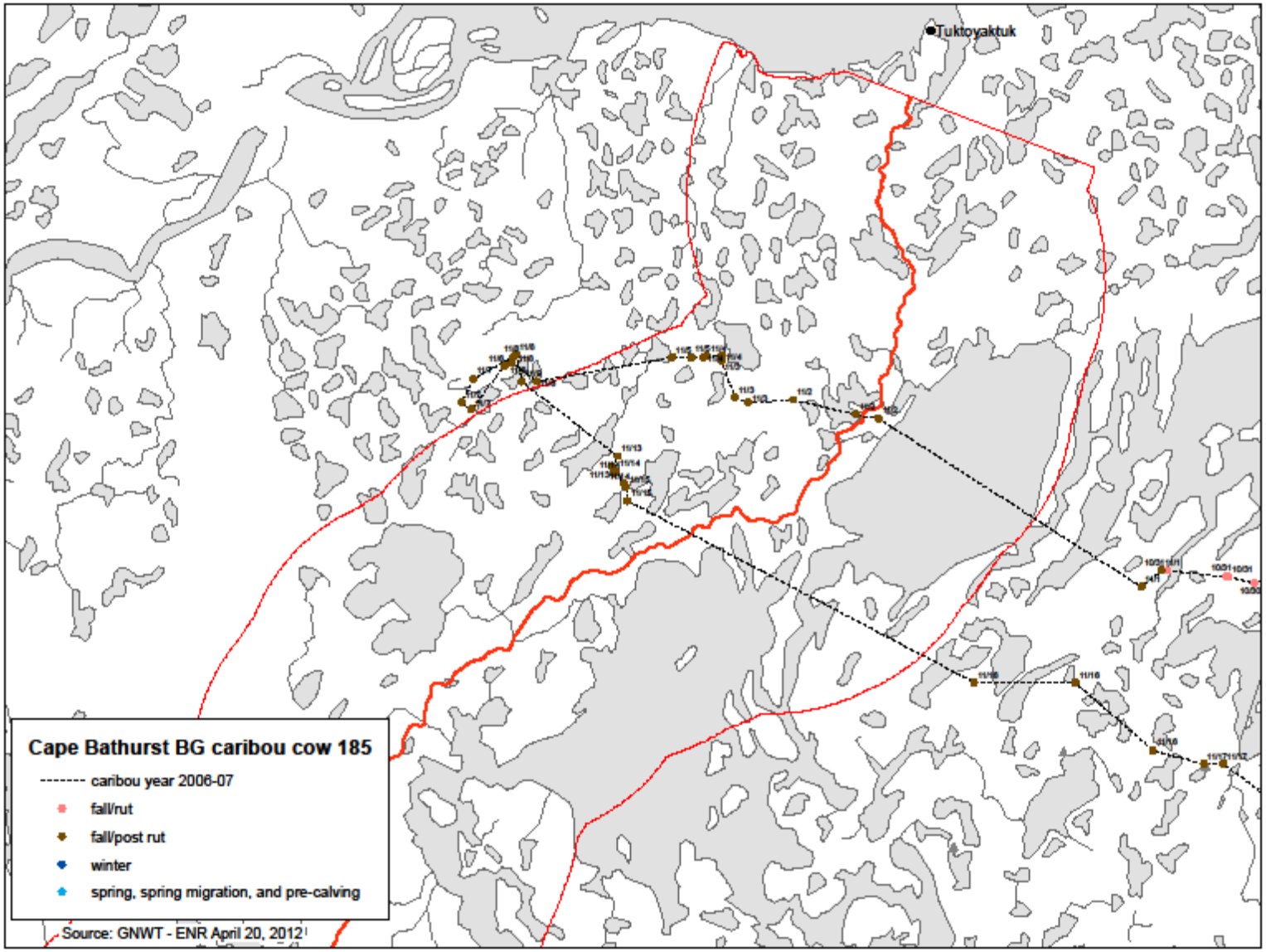
Tuktoyaktuk
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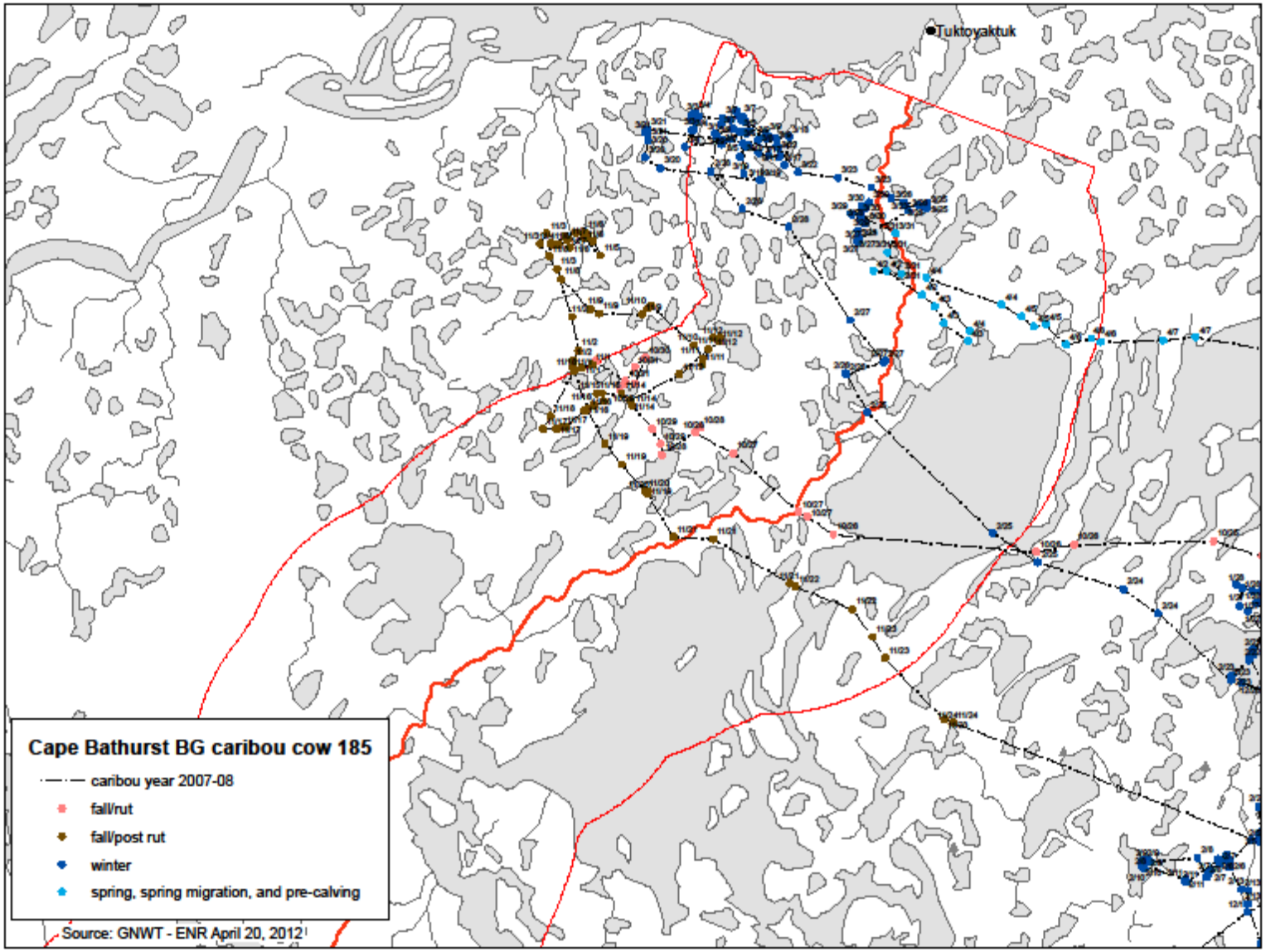
fall/rut
fall/post rut
winter
spring, spring migration, and pre-calving
Source: GNWT - ENR April 20, 2012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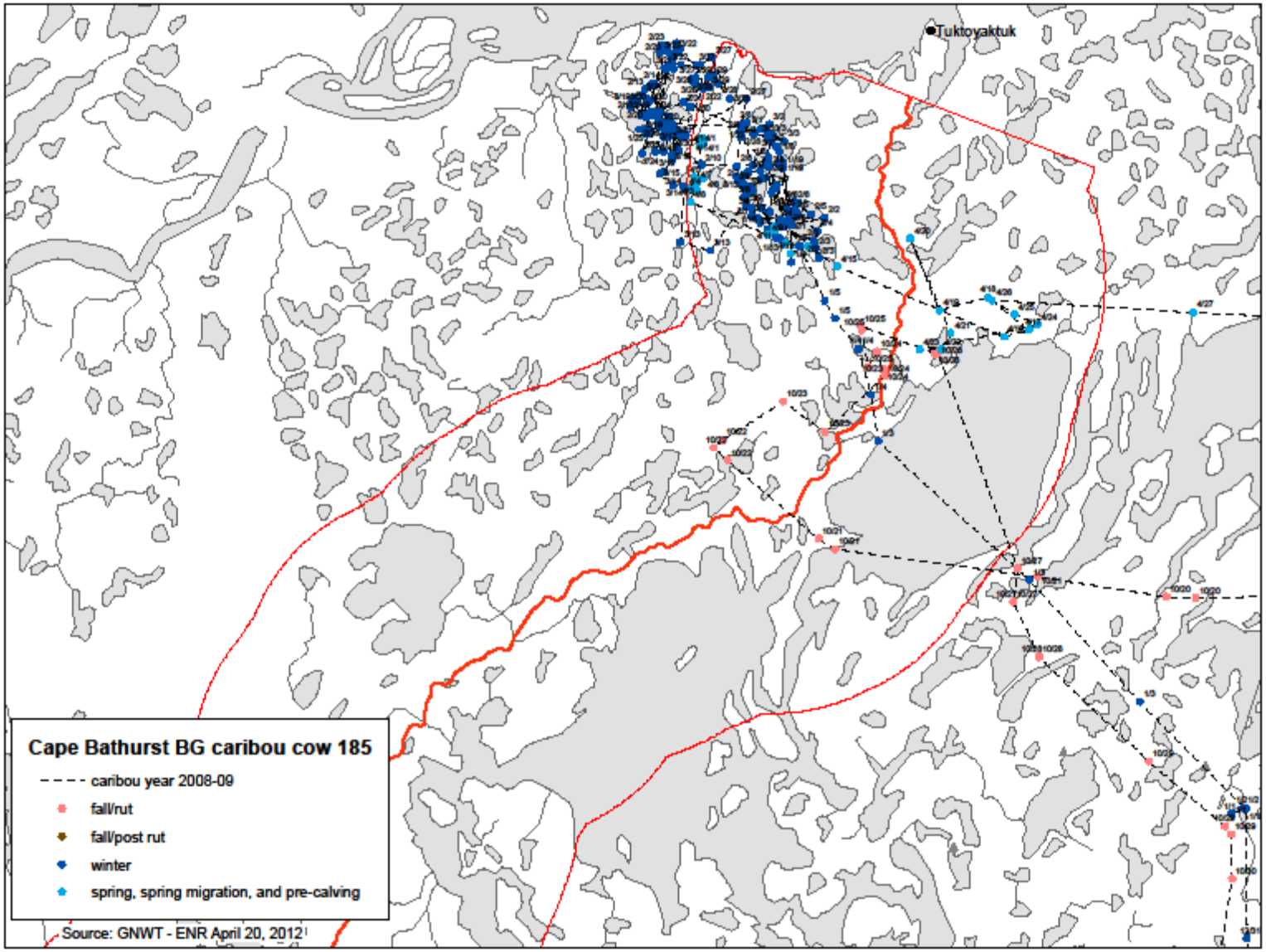
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caribou year 2008-09
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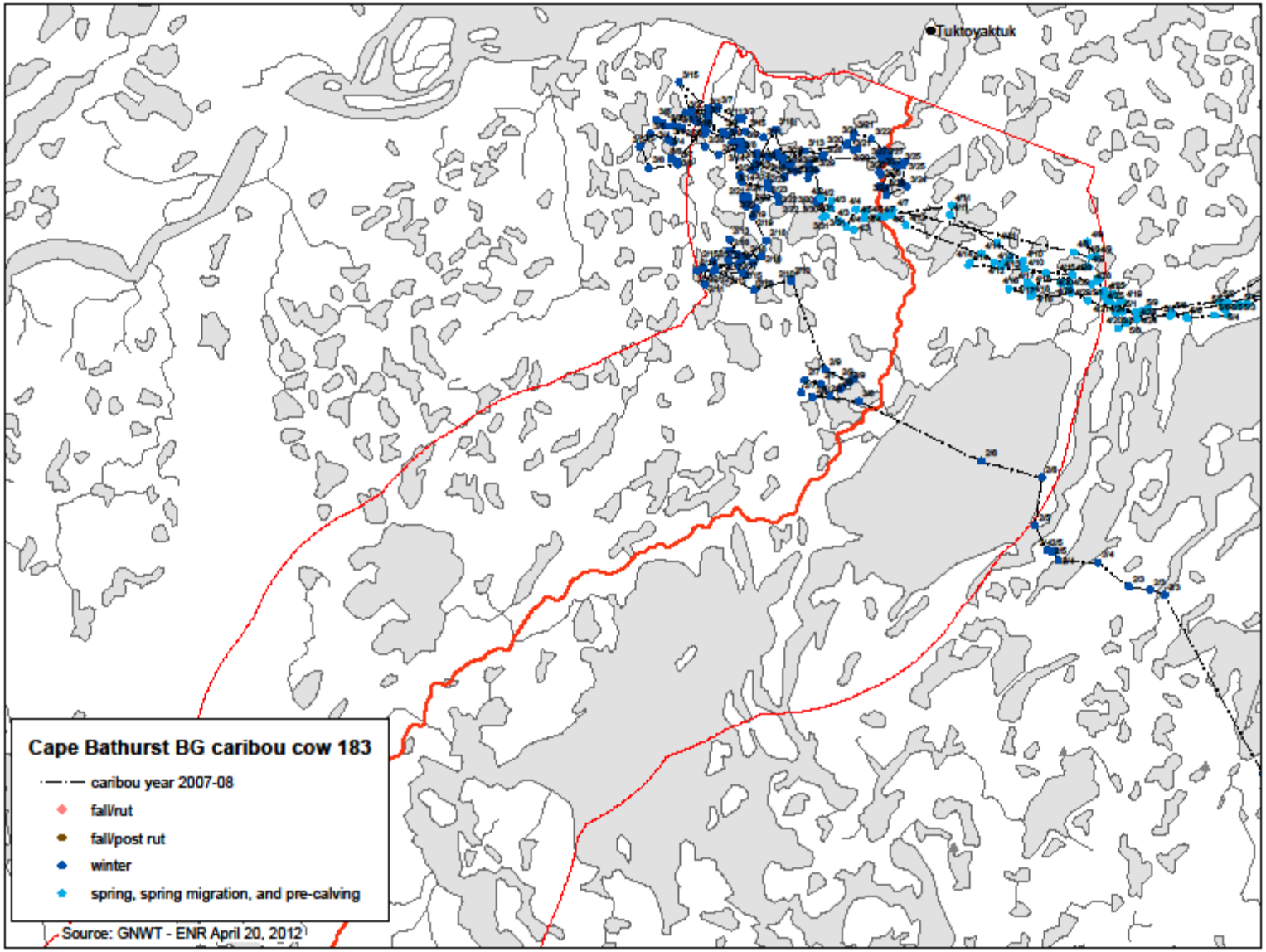
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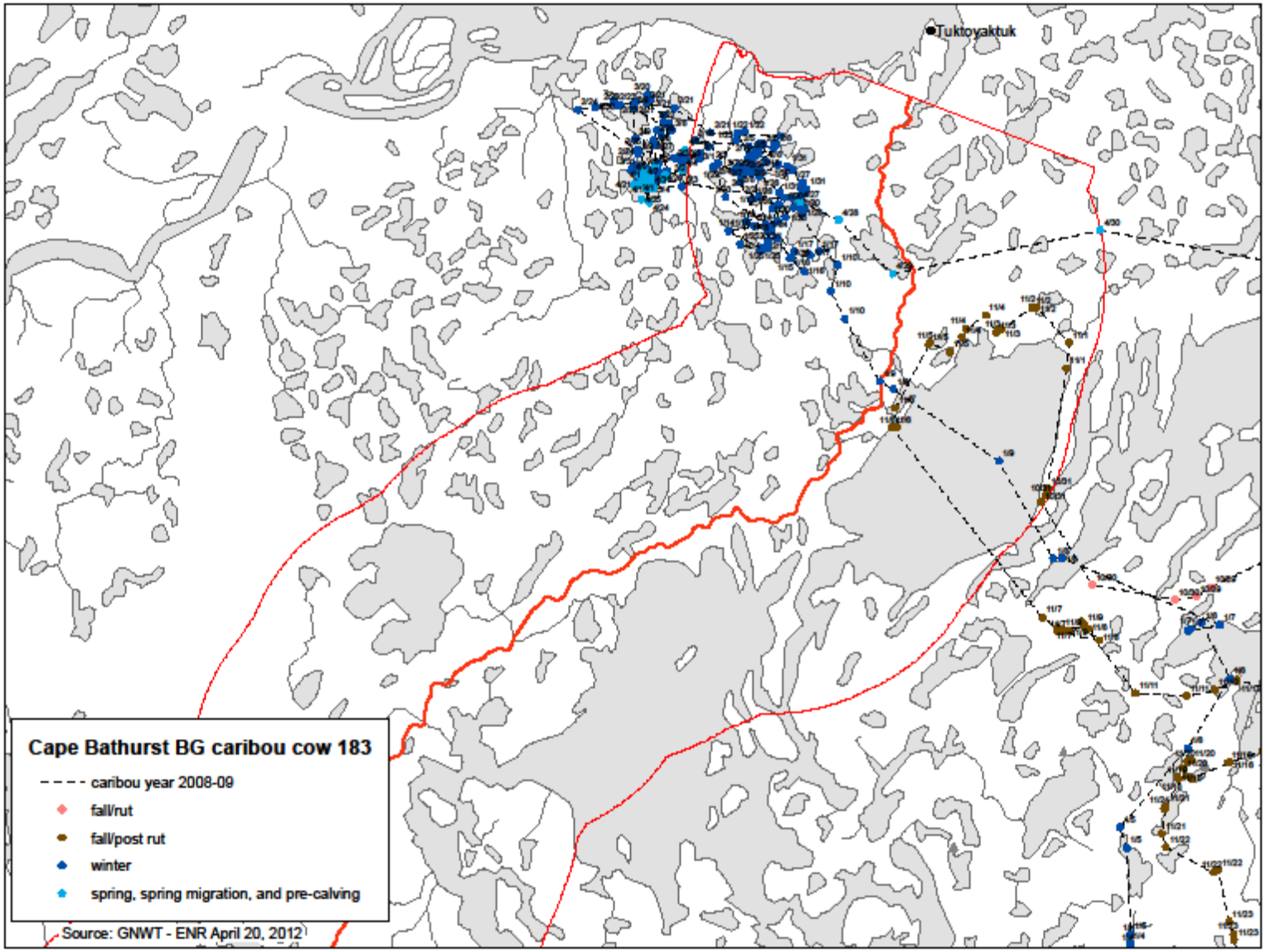
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caribou year 2008-09
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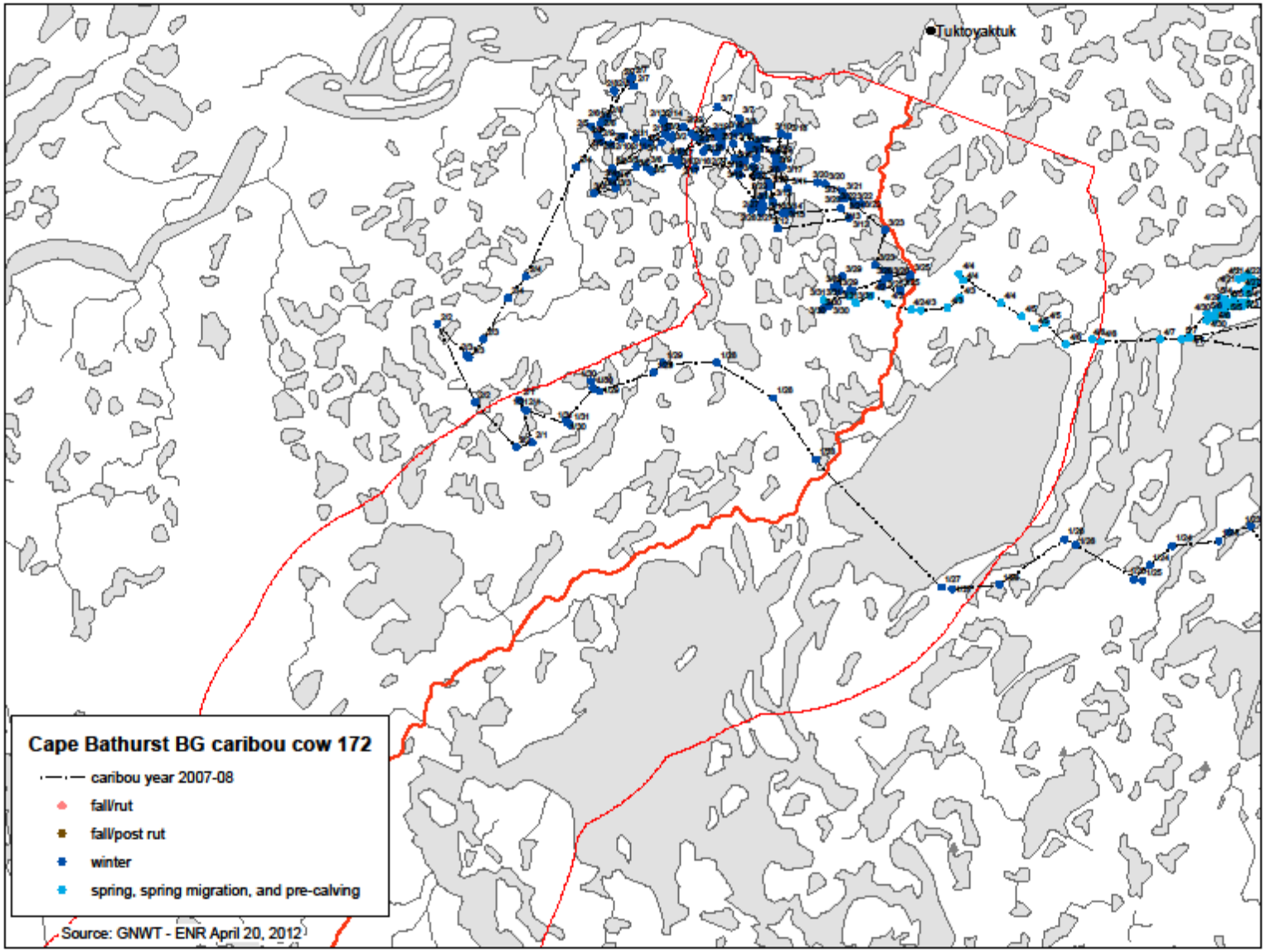
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caribou year 2007-08
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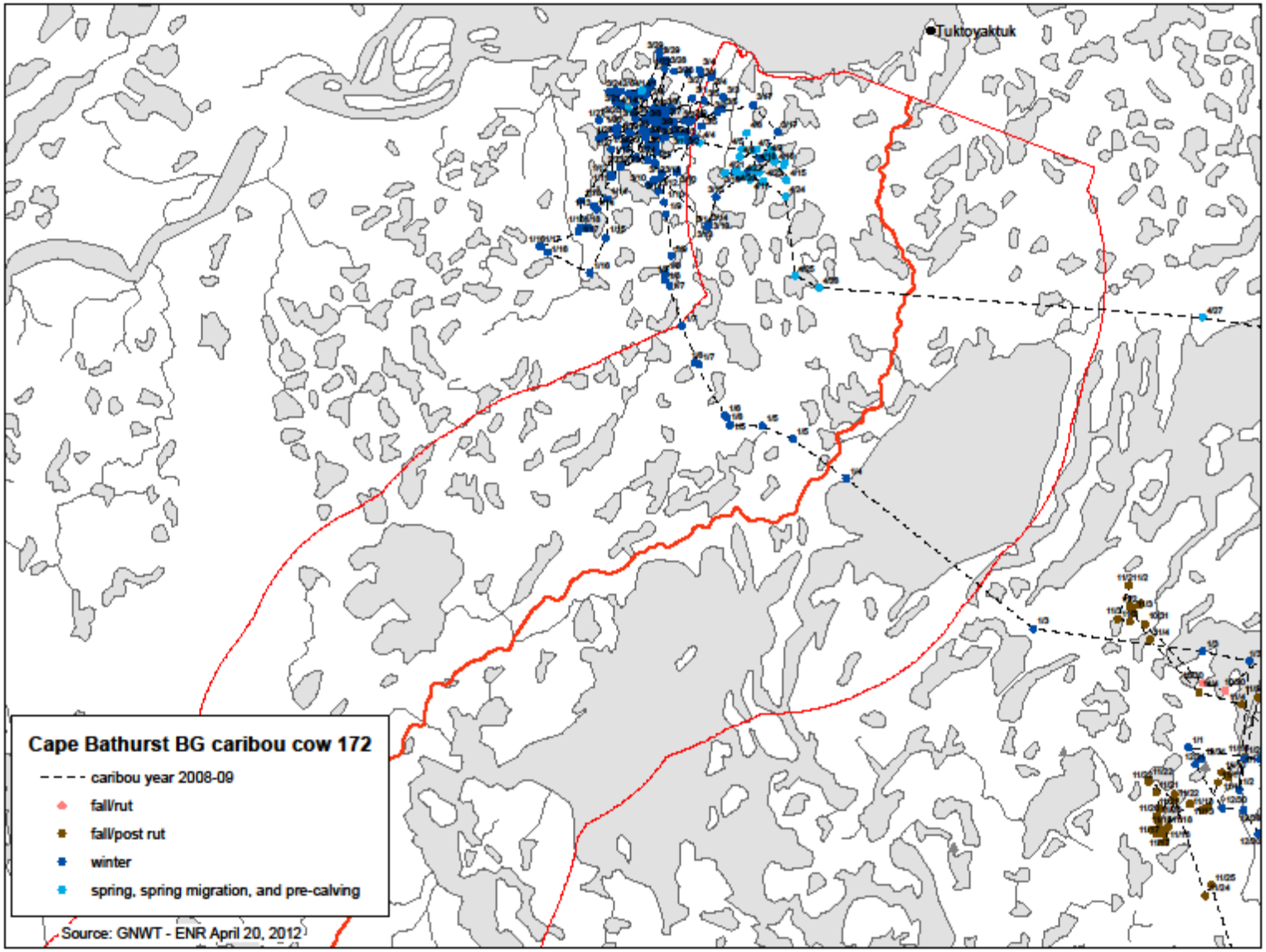
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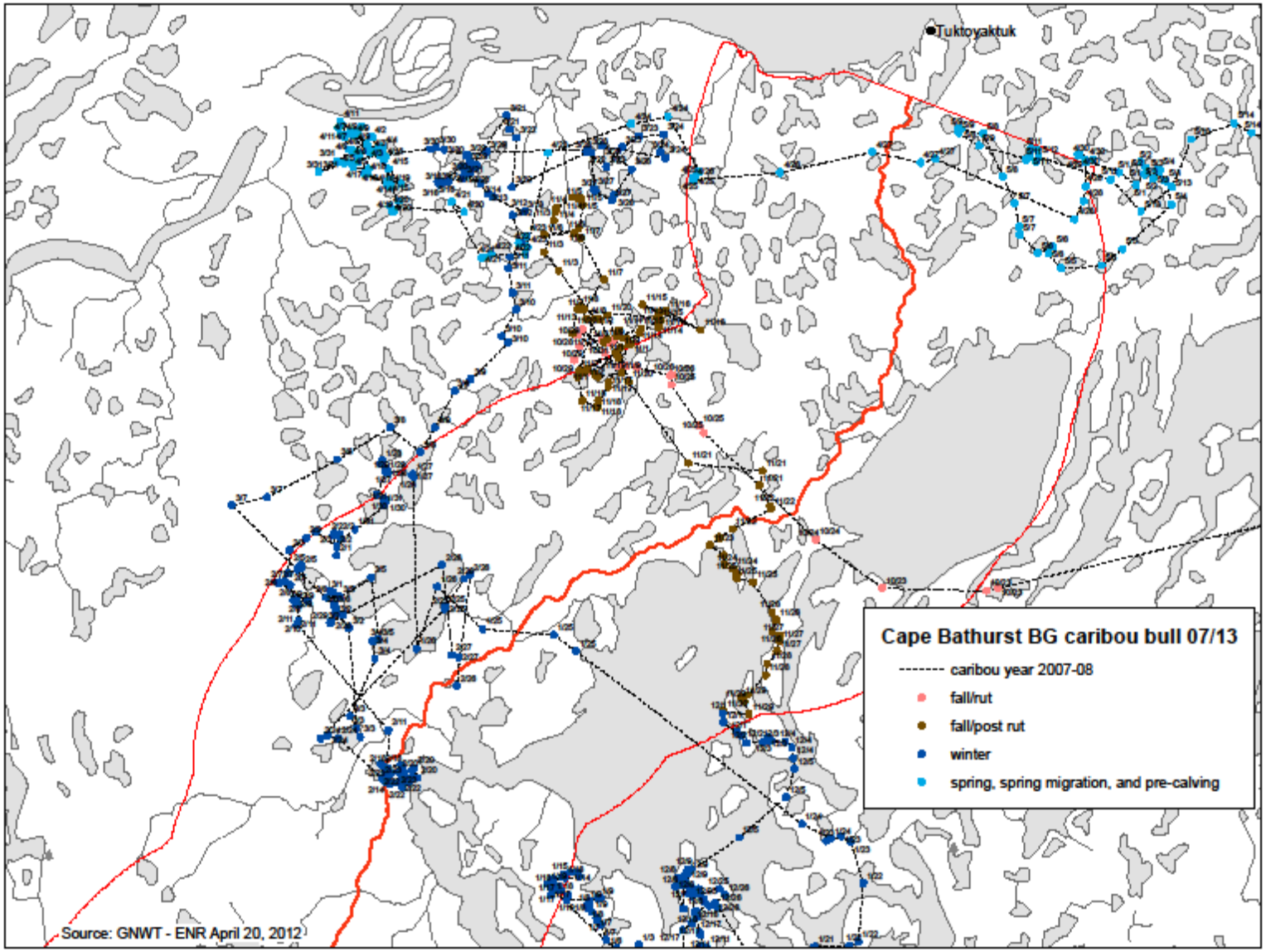
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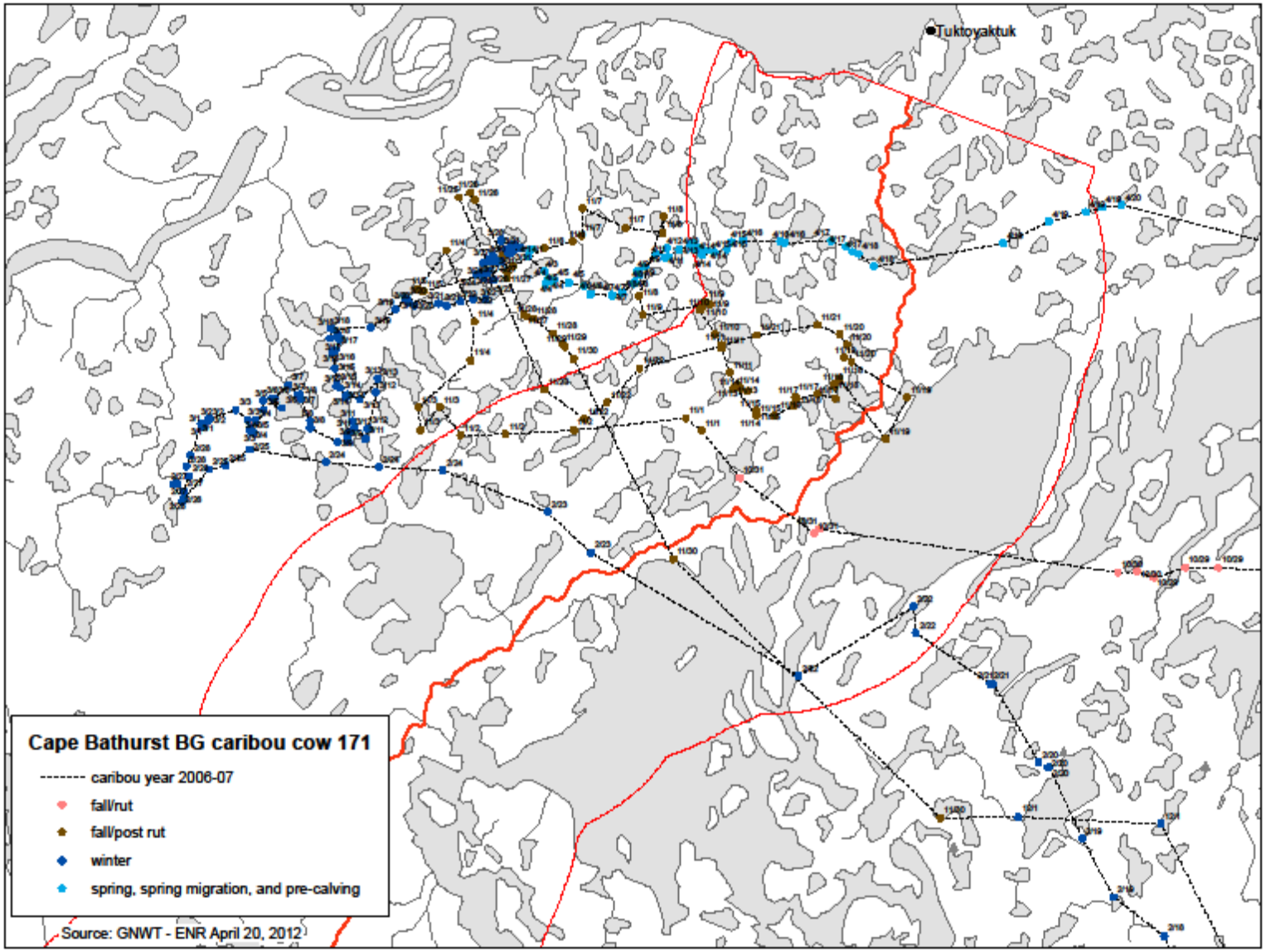
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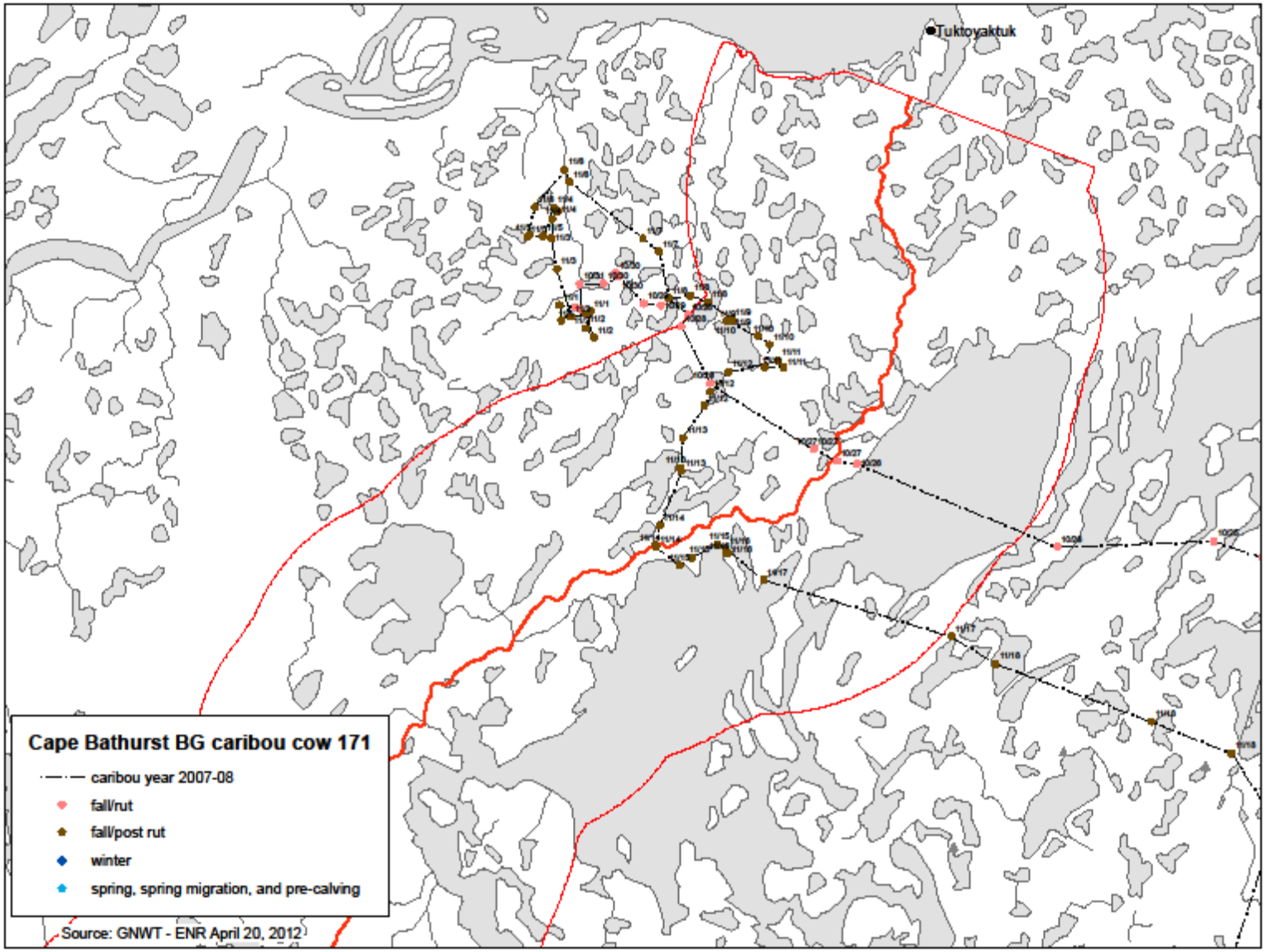
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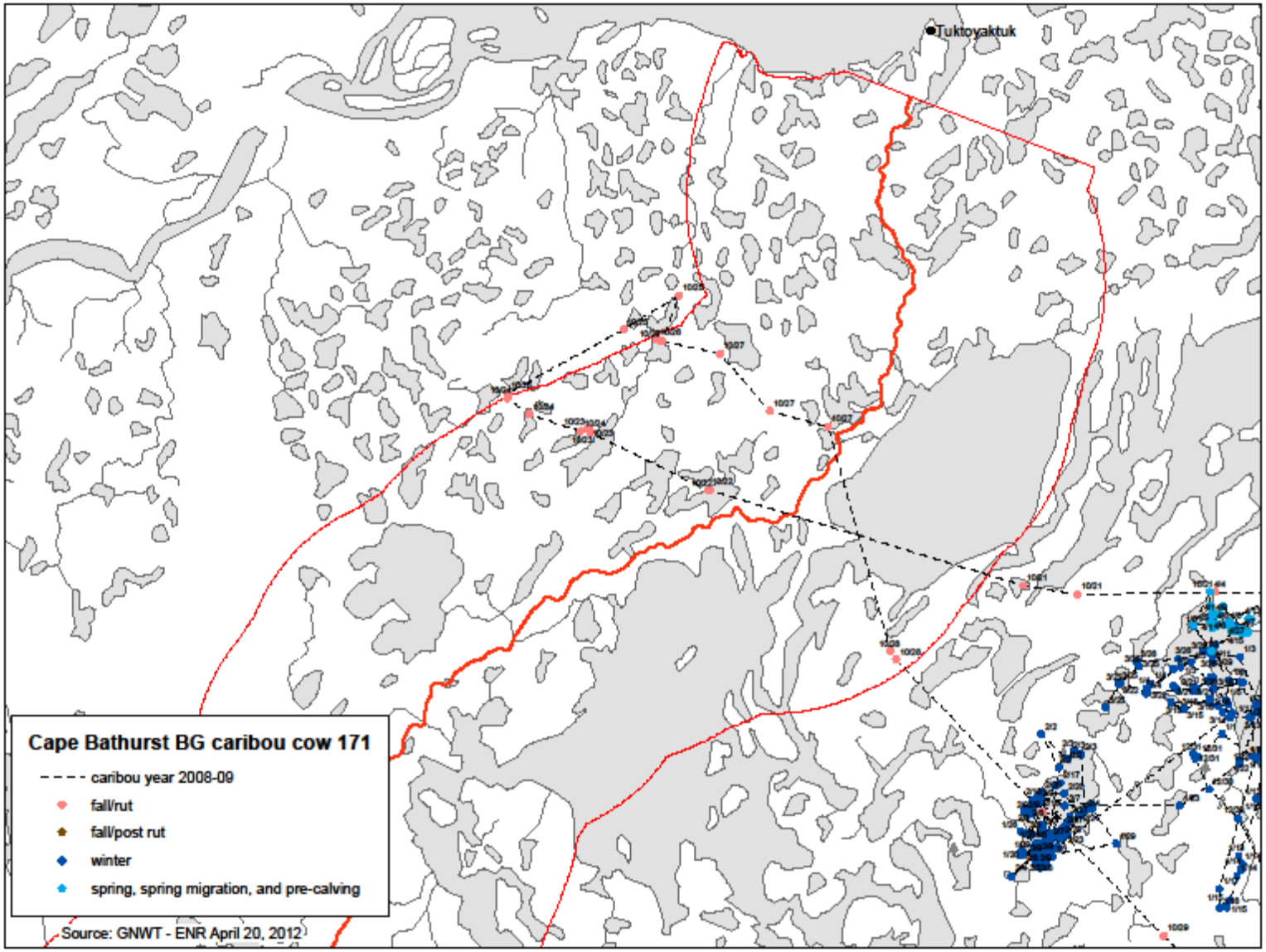
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