September 28, 2012

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FILE: V23201487
Via Email: eirb@jointsec.nt.ca

Environmental Impact Review Board
204-107 Mackenzie Road
P.O. Box 2121, Inuvik, NT X0E 0T0

Attention: Eli Nasogaluak, Environmental Assessment Coordinator

Dear Mr. Nasogaluak,

Subject: Inuvik to Tuktoyaktuk Highway, Supplemental Cumulative Effects Assessment – Supplemental Analysis

On behalf of the Government of the Northwest Territories – Department of Transportation, Town of Inuvik and Hamlet of Tuktoyaktuk, Kiggiak-EBA Consulting Ltd. is pleased to submit this Cumulative Effects Assessment – Supplemental Analysis for the Inuvik to Tuktoyaktuk Highway. This document, including figures and tables, is attached and forms part of this letter.

We ask that you include this in the overall information for consideration of the proposed Inuvik to Tuktoyaktuk Highway in this project.

We trust this information meets your present requirements.

Sincerely,
Kiggiak-EBA Consulting Ltd.

Robyn V. McGregor, M.Sc., P.Eng.
Senior Transportation Engineer and Principal Consultant
Circumpolar/Arctic
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Attachment: Cumulative Effects Assessment – Supplemental Analysis

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Hamlet of Tuktoyaktuk, Town of Inuvik
Government of Northwest Territories

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CUMULATIVE EFFECTS ASSESSMENT - SUPPLEMENTAL ANALYSIS ENVIRONMENTAL IMPACT REVIEW BOARD FOR CONSTRUCTION OF THE INUVIK TO TUKTOYAKTUK HIGHWAY, NWT

EIRB FILE NO. 02/10-05

September 26, 2012

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1.0 INTRODUCTION

As a result of some of the cumulative effects-related concerns raised at the recently completed Technical Sessions held in Inuvik, August 22-23, 2012, the Developer has conducted supplemental work to assist in quantifying the potential cumulative effects associated with the development of the Inuvik to Tuktoyaktuk Highway in relation to past and reasonably foreseeable future projects within the cumulative effects study area selected for the Highway Project.

On September 04, 2012, the Developer provided to the EIRB a series of figures depicting a potential zone of influence (conservatively set at 1 km around all past and proposed projects assessed), and a complementary series of tables which summarize the estimated hectares and types of vegetation cover (based on the EOSD land cover classes developed by the Canadian Forest Service – Wulder et al. 2004). This initial documentation was subsequently replaced by an erratum submitted to the EIRB on September 12, 2012. The erratum was filed to adjust some of the information provided in the figures and tables to reflect the current configuration of those proposed borrow sites for which geotechnical drilling was completed in the winter of 2012.

These figures were updated from those previously provided to the EIRB in the Developers response to IR 114 to incorporate additional 1 km potential zone of influence footprints associated with the improved understanding of the proposed borrow sites to be used for construction of the Highway and the recently proposed South Parsons Lake Gas Supply Project. As a result, this most current set of figures and associated tables effectively supercede the figures provided in response to IR 114, but the cumulative effects discussion provided by the Developer for SARA listed species in IR 114 remains valid.

2.0 SUPPLEMENTAL CUMULATIVE EFFECTS ASSESSMENT

Cumulative effects are changes to the environment that “are likely to result from the project in combination with other projects or activities that have been or will be carried out” (Canadian Environmental Assessment Agency 2003). Overall cumulative effects are effects of all land or water uses on a Valued Ecosystem Component (VEC) or Valued Socio-economic component (VSC), including effects caused by the Project.

Typically, cumulative effects assessments address effects that:

- Extend over a larger area;
- Are of longer term duration;
- Act in conjunction with other projects/activities on the same VECs; and
- Are reasonably probable, considering possible future projects/activities and impacts.

Potential environmental effects of the proposed Highway project were discussed and assessed for all VECs in Section 4.0 (Impact Assessment) of the EIS. In general, the predicted residual effects on all VECs related to the relatively short term construction phase and longer term operations phase of the Highway were predicted to be low in magnitude and localized to the immediate project footprint area or the Local Study Area (500 m). For wildlife species, the majority of the predicted residual effects were also of a generally short term and rapidly reversible nature.

However, while individually no significant effects are anticipated, the purpose of the cumulative effects assessment (CEA) is to consider the potential additive and synergistic effects of overall residual effects, in combination with past, existing or known planned activities in the vicinity of the proposed Inuvik to Tuktoyaktuk Highway.

The proposed Inuvik to Tuktoyaktuk Highway will be constructed in an area that has had very few activities that have resulted in environmental effects that have extended beyond their local project footprint areas. The key activities that have resulted in project footprints that could potentially interact in a cumulative manner with the Highway include former hydrocarbon exploration activities in the vicinity of Parsons Lake, the buried Ikhil natural gas pipeline and the existing Tuktoyaktuk to Source 177 Access Road.

Proposed projects that may still occur at some time in the future include the Mackenzie Gas Project, the recently proposed South Parsons Lake Gas Supply Project and the proposed Tuktoyaktuk Harbour Project.

Potential cumulative residual environmental effects for past, existing and possible future projects were discussed and assessed in Sections 5.3.1 and 5.3.2, respectively of the EIS. The predicted residual environmental effects of these past, existing and possible future projects on all VECs were determined to be highly localized and no residual effects were identified that could operate in a potentially cumulative manner with any residual effects related to the construction and operation of the Highway.

Nevertheless, as indicated, the Developer has conducted supplemental work to assist in quantifying the potential cumulative effects associated with the development of the Inuvik to Tuktoyaktuk Highway in relation to past and reasonably foreseeable future projects within the cumulative effects study area selected for the Highway Project.

For the following supplemental cumulative effects assessment, the updated figures and tables provided for the public record were:

<u>**Figures**</u>

Figure 1: 1 km Zone of Influence of Past and Proposed Future Projects Assessed in the Cumulative Effects Study Area.

Figure 2: Boreal Caribou Northern Range Relative to the 1 km Zone of Influence of Past and Proposed Future Projects Assessed in the Cumulative Effects Study Area.

Figure 3: Winter Caribou Observations and Herd Ranges (December 1 to March 31)

Figure 4: Spring Migration and Pre-Calving Caribou Observations and Herd Ranges (April 1 to May 31)

Figure 5: Calving/Post Calving Caribou Observations and Herd Ranges (June 1 to 25)

Figure 6: Early Summer Caribou Observations and Herd Ranges (June 26 to July 15)

Figure 7: Mid Summer Caribou Observations and Herd Ranges (July 16 to August 7)

Tables

2.1 Potential Zone of Influence

For purposes of this supplemental cumulative effects assessment, as discussed during the Inuvik Hearings, given the generally low physical profile of the proposed Highway on the landscape, the low level of traffic expected to use the Highway (150 – 200 vehicles per day) and with the application of the available mitigation and management measures described in the EIS and updated commitments, a potential 1 km zone of influence, within which potential residual effects to wildlife species may occur, was selected.

This is considered to be an appropriate approach as most of the predicted direct and indirect residual environmental effects discussed in Section 4.0 of the EIS related to the construction and future operation of the Highway are expected to be limited to a zone of influence of 500 m or less.

In evaluating the potential zone of influence of the short-term construction and long term operation of the proposed Highway on the environment, it should be noted that this relatively conservative approach to the assessment has continued to be employed. In particular, although the actual estimated “toe to toe” footprint width of the Highway is expected to range from 20 to 28 m, for purposes of the EIS and this supplemental CEA, the 28 m length was selected and applied for the entire length of the proposed Highway.

In addition, although the footprint size of some of the proposed borrow sites (170, 173/305, 307 and 325/314) have been refined based on the results of the winter 2012 geotechnical drilling program, the remaining preferred borrow sites have not yet been verified (drilled up). Thus for these borrow sites, the total footprints of these potential borrow sites have continued to be used as a basis for deriving the 1 km potential zone of influence around these sites.

2.2 Temporal Considerations

As noted in the EIS and subsequent documentation submitted to the EIRB, subject to approval, the construction of the Highway is expected to occur over a four year period of time, hopefully commencing in the winter of 2012/2013.. The development of the borrow sites and associated activities, the construction of the Highway embankment and the construction/use of winter access roads will be limited to the annual winter period. The application of standard winter road construction and operational procedures are expected to ensure that the frozen underlying tundra vegetation and terrain will be protected.

Based on the Developers understanding of past, existing and foreseeable future projects, the only other projects that could conceivably interact in a potentially cumulative manner with the relatively short-term Highway construction project are the existing buried Ikhil Pipeline project and the proposed South Parsons Gas Supply project, which could potentially be approved and under construction during the period of Highway construction.

As discussed in Section 5.3.1 of the EIS, the buried Ikhil pipeline, which is located alongside and parallel to the southern-most 5 km of the proposed Highway alignment, has been successfully revegetated and no residual environmental effects have been identified that could interact in a potentially cumulative manner with the construction and operation of the Highway.

Assuming that the proposed South Parsons Gas Supply project is approved and implemented, the construction of this project could possibly coincide with the anticipated construction period for the proposed Highway. However, any potential construction-related interactions (e.g. disturbance to wildlife) would be primarily limited to the winter period, and would typically be of a short term and rapidly reversible nature which would not be expected to result in long term residual environmental effects that could operate in a potentially cumulative manner.

Thus, the focus of this supplemental CEA is primarily limited to the longer term operations phase of the Highway.

2.3 Spatial and Footprint Consideration Between the Proposed Highway, Past, Present and Proposed Future Projects

Figure 1 illustrates the spatial relationship between the proposed Inuvik to Tuktoyaktuk Highway and the key activities/projects considered in this supplemental cumulative effects assessment. As illustrated in Figure 1, the potential 1 km zones of influence of the Highway Project could potentially interact with similar zones of influence in the vicinity of the proposed Parsons Lake Gas Field, the proposed buried crossing of the Mackenzie Gas Pipeline in one location and the existing buried Ikhil gas pipeline which is located parallel to the proposed Highway from approximately KM 5 of the Highway south into Inuvik.

It should be noted that apart from the small well pad that would be associated with the South Parsons Lake Gas Supply Project and the production facilities associated with the main Parsons Lake Gas Field (anchor field for the MGP), all of the past (Ikhil) and proposed pipelines are or will be buried. Thus the potential zone of influence around each of these buried pipelines would be expected to be far more limited (5-20 m) than the potential 1 km zone of influence used in the current assessment.

Table 1 summarizes the current total estimated footprint of the Highway (378.67 ha) and proposed primary borrow sources (1,305.08 ha), comprising 0.06% and 0.22% of the cumulative effects study area (587,002.91 ha).

Following application of the potential 1 km zones of influence associated with the Highway and primary proposed borrow sources, the total estimated indirect potential zone of influence of the overall Highway Project footprint is 34,216.05 ha, representing 5.83% of the cumulative effects study area.

Table 2 summarizes the total estimated project footprints and 1 km potential zones of influence associated with the proposed Highway and the past, present and proposed projects examined in this supplemental CEA in relation to the total cumulative effects study area. The total estimated direct footprint areas of all of the past, present and proposed projects considered in this assessment is 2,132.84 ha, representing 0.36% of the cumulative effects study area.

Following application of the potential 1 km zones of influence associated with each of the past, present and proposed projects considered, the total estimated indirect potential zone of influence footprints is 71,049.18 ha, representing 12.10% of the cumulative effects study area. However, as previously indicated, this represents an overestimation of the more likely zone of influence around, in particular, each of the existing and proposed buried pipelines, which would be more reasonably be expected to be limited to the range of 5-20 m.

Tables 3 to 8 provide quantitative data on the actual/projected footprints and potential 1 km zones of influence associated with each of the past, existing and proposed projects considered in the CEA.

Tables 9 and 10 provide quantitative data on the areas of potential overlap (interaction) between the potential 1 km zones of influence considered for the Highway, the existing buried Ikhil Pipeline and components of the proposed MGP (buried pipeline and Parsons Lake Gas Field), respectively.

As indicated in Table 9, the total potential estimated zone of overlap (interaction) between the proposed Highway (based on the 1 km potential zones of influence) and the Ikhil pipeline corridor is 1,719.34 ha, representing 0.29% of the total cumulative effects study area. Similarly, as indicated in Table 10, the total potential estimated zone of overlap (interaction) between the proposed Highway (based on the potential 1 km zones of influence and components of the proposed MGP is 1,717.99 ha, representing 0.29% of the total cumulative effects study area.

Based on these rather conservative estimates of potentially overlapping zones of influence of residual environmental effects between the Highway and these two projects, it is predicted that there will be limited opportunity for a potentially cumulative environmental effect to occur between the proposed construction and operation of the Highway, the existing buried Ikhil Pipeline and components of the proposed MGP.

3.0 SUPPLEMENTAL CUMULATIVE EFFECTS ASSESSMENT FOR KEY WILDLIFE VECS

At the Technical Sessions held in Inuvik, August 22-23, 2012, additional details were requested regarding analysis of potential cumulative effects of the proposed Highway on caribou, grizzly bear and SARA-listed bird species that are or may be present in the project area. As a result, the Developer is pleased to provide the following supplemental assessment of potential cumulative effects related to to these key species.

It should be noted that much of the information provided was drawn from the EIS and the Developers response to IR 114, but supplemented as appropriate by the quantified project footprint data provided in this submission and updated field information reported by KAVIK-STANTEC (2012 a, b, c and d).

Potential spatial effects of the proposed Highway project were discussed and assessed for all VECs in Section 4.0 (Impact Assessment) of the EIS. In general, the predicted residual effects on all VECs related to the relatively short term construction phase and longer term operations phase of the Highway were predicted to be low in magnitude and localized to the immediate project footprint area or the Local Study Area (500 m). For wildlife species, including caribou, grizzly bear and SARA-listed species, the majority of the predicted residual effects were also of a generally short term and rapidly reversible nature.

Potential spatial effects for past, existing and possible future projects were discussed and assessed in Sections 5.3.1 and 5.3.2 (Cumulative Effects), respectively of the EIS. The predicted residual effects of these past, existing and possible future projects on all VECs were determined to be highly localized and no residual effects were identified that could operate in a potentially cumulative manner with any residual effects related to the construction and operation of the Highway.

Based on the potential residual effects identified for each of the VECs and the effective application of proposed mitigation measures, the cumulative effects assessment resulted in a determination of no significant residual effects for all but one component. The magnitude of effects for all components was deemed to be low with the exception of vegetation removal for the right of way, which was deemed to be low to moderate. For vegetation and wildlife effects at the local scale, and land use at a regional scale, the residual effects were determined to be unlikely to result in a potentially significant cumulative effect over the long term.

3.1 Barren-Ground Caribou

Barren-ground caribou herds within the NWT are identified by the location of their calving grounds (Thomas 1969; Gunn and Miller 1986). Barren-ground caribou are migratory and occupy different habitats during different seasons. Part of the annual range of the Cape Bathurst and Bluenose-West caribou herds overlap with the proposed Project area (Nagy et al. 2005a). Recent evidence shows that the most northerly portion of the Project area is also used by a herd of caribou called the Tuktoyaktuk Peninsula herd.

The Cape Bathurst caribou herd utilizes the Cape Bathurst and Tuktoyaktuk peninsulas and the range extends into the regional study area (Figure 3.1.9-1 of the EIS). The Cape Bathurst herd was first identified as a distinct herd in 2000. Data obtained during photocensus surveys in 1987, 1998, and 2000 on the "Bluenose" herd were re-analyzed to estimate population trends. The Cape Bathurst herd population in 1992 was estimated at approximately 19,400 animals. A photocensus conducted during the summer of 2005 showed the herd had declined to an estimate of 2,400 animals and, by July 2006, had declined further to an estimated 1,800 animals. A July 2009 survey indicated a stable trend from 2006 to 2009 (Adamczewski et al. 2009). Table 3.1.9-3 from the EIS summarizes the reported annual Cape Bathurst herd population estimates and ranges.

TABLE 3.1.9-3: CAPE BATHURST HERD CENSUS

Year	Population Estimate (non-calf)	Range (95% CI)
1987	12,512	9,012 - 16,020
1992	19,278	13,881 - 24,675
2000	11,089	9,333 - 12,845
2005	2,434	2,178 - 2,691
2006	1,821	1,672 - 1,971
2009	1,934	1,585 - 2,283

Source: GNWT ENR (2011a)

Based on comments during community consultations on the 2005 survey, ENR deployed collars on caribou on the lower Tuktoyaktuk peninsula in March 2006 and these animals were found to use calving grounds on the upper part of the Tuktoyaktuk Peninsula in June 2006 (Nagy and Johnson 2006). This herd, the Tuktoyaktuk Peninsula herd, was surveyed for the first time in July 2006 and estimated to comprise 3,078 non-calf animals (Nagy and Johnson 2006). A portion of this herd is considered to be feral reindeer that escaped from a semi-domestic reindeer herd and, at the request of the Inuvialuit Game Council and the Wildlife Management Advisory Council (NWT), is managed separately from the Cape Bathurst herd.

A collaring program was initiated in March 2006 and a new population estimate of 2,752 + 276 (95% CI) non-calf caribou was obtained in July 2009. The range of this herd, based on collared bulls and cows between 2006 and 2010, overlapped with the local and regional study area between October and May (ENR Unpublished Data).

The GNWT IR 73/74 presented the most recent 5 years of radio-collared results for the Tuktoyaktuk Peninsula Herd and the Cape Bathurst Herd. No Bluenose-West caribou were mapped as no radio-collared animals had used the project area in the last 10 years. However, it is expected that the area could be used when herd size increases or if some animals change their winter range use [i.e. there is considerable variability in caribou use of winter range].

As noted in the GNWT maps, the Tuktoyaktuk Peninsula Herd only uses the very northern portion of the RSA. The Cape Bathurst Herd is the predominant herd within the RSA, and again, collared animals have tended to stay to the northern half. The Bluenose-West herd is the largest herd which overlaps the proposed Highway (Figure 3.1.9-2 of the EIS). The herd was estimated at 112,360 in 1992 but declined by 84% to 18,050 by 2006. A July 2009 survey indicated a stable trend from 2006 to 2009 (17,897) (GNWT ENR 2011a).The patterns of decline in the Bluenose-West Herd in the early 2000s were similar to the patterns of decline in the Cape Bathurst Herd during the same period. Late calving and low calf: cow ratios on the calving ground indicated that the caribou were nutritionally limited and likely would have been declining naturally without hunting (Nesbitt and Adamczewski 2009).

As a result of the observed declines in the caribou herd populations, in 2006, all resident, non-resident, and commercial hunting was stopped. In 2007, the barren-ground caribou management area (I/BC/06) in the Inuvialuit Settlement Region (ISR) that covered the major portion of the range of these herds was divided to better reflect the current herd movements and allow management actions to be implemented by herd (Figure 3.1.9-14 of the EIS).

Thus, a new management area (I/BC/07) was created to cover the core area of the Cape Bathurst range. Wildlife Management Areas I/BC/07, which includes the land area between Tuktoyaktuk and Inuvik, and G/BC/02 have remained closed to all hunting of barren-ground caribou hunting since September 2007.

Hunting for the Tuktoyaktuk Peninsula Herd is still permitted between June 16 and March 31 in Area I/BC/08 located to the north and east of Tuktoyaktuk on the Tuktoyaktuk Peninsula. However, I/BC/08 is closed from April 1 to June 15 of each year to allow the Cape Bathurst Herd to migrate back to its calving grounds undisturbed.

Hunters require a tag to hunt in I/BC/06, the core area for the Bluenose-west herd in the ISR and 345 tags are given to the Inuvialuit Game Council and 22 to the Gwich'in Renewable Resources Board to be distributed annually. The Bluenose-West herd harvest is shared with users from the Inuvialuit, Gwich'in, and Sahtu Regions. The estimated hunter harvest for this herd was around 1,900 animals in 2003 (primarily cows) (Sahtu Harvest Study and ENR data). Currently the harvest of the Bluenose-West and East herds is restricted to subsistence harvesters for the Wildlife Management Areas I/BC/06, S/BC/01 and S/BC/03. By recommendation of the Wildlife Management Advisory Council (NWT) and the Gwich'in and Sahtu Renewable Resource Boards, GNWT ENR set a Total Allowable Harvest at 720 caribou (4% of the herd), with a target of at least 80% bulls.

<u>Important Habitat and Habitat Requirements</u>

- Barren-ground caribou typically overwinter in forested areas, within the treeline east, northeast and southeast of Inuvik (GNWT ENR 2011a; Community of Tuktoyaktuk et al. 2008; Community of Inuvik et al. 2008). Figure 3 illustrates the general winter ranges of the Cape Bathurst and Bluenose-West herds, and specific observations of caribou on their winter range in relation to the potential 1 km zone of influence of the proposed Highway and the other past, present, and possible future projects considered. The winter months, from December 1 to March 31, are the main period of time when Cape Bathurst caribou, and possibly Bluenose-West caribou, are likely to be present in that portion of their winter range located within the cumulative effects study area.

- It is apparent from Figure 3 that a number of Cape Bathurst caribou can be expected to be associated with and would be expected to cross the proposed Highway in the general area to the north of the proposed Parsons Lake Gas Field. However, relatively few Cape Bathurst caribou have been observed south of this area during the reported period of record. Figure 3 also shows that for this period of record, a larger number of caribou appeared to be concentrated in the larger portion of their winter range, located to the east of the Husky Lakes, approximately 100 km east of the proposed Highway.
- Cape Bathurst caribou typically begin to migrate out of the cumulative effects study area for the Highway towards their calving grounds in April and May and have typically left the cumulative effects study area by early June and migrate to the north in spring towards their calving grounds (Figures 4 and 5). Calving areas are non-forested and characteristic of high, rocky areas where there is little shelter from wind and driving snow. The Cape Bathurst herd calves and spends early summer on the Bathurst and Nicolson peninsulas (Figure 6).
- The Bluenose-West herd calves and spends its summer in the Brock, Hornaday and Horton river areas (Figure 7; Community of Tuktoyaktuk et al. 2008). The Tuktoyaktuk Peninsula Herd calves and spends early summer on the northern end of the Tuktoyaktuk Peninsula. The early to late summer ranges of the Cape Bathurst and Bluenose-West herds are typically located east of the Husky Lakes (Figure 8).
- The distance between calving and overwintering areas can be as great as 700 km. Fall rut and post-rut ranges relative to the potential 1 km zone of influence of the proposed Highway and the other past, present and existing projects considered in this CEA are shown in Figures 9 and 10. As noted in these figures, relatively few caribou have been observed within the cumulative effects study area during October and November for the period of record. Thus little interaction between these herds, the proposed Highway and the other projects considered would be expected to occur during the rut and post-rut periods.
- In summary, important habitat for barren-ground caribou occurring in the region includes:
  - Cape Bathurst herd – Bathurst peninsula for calving and insect relief; northeast of Inuvik for winter habitat;
  - Bluenose-West herd - Hornaday, Brock and Horton Rivers area for calving (Tuktut Nogait National Park) and potentially south end of Tuktoyaktuk peninsula for winter habitat and
  - Tuktoyaktuk Peninsula herd – north end of Tuktoyaktuk peninsula for calving and insect relief and south end of Tuktoyaktuk peninsula for winter habitat(Community of Tuktoyaktuk et al. 2008; Community of Inuvik et al. 2008).

<u>Seasonal Movements</u>

- Figures 7 and 8 show the seasonal distribution of the Cape Bathurst and Bluenose-west herds during the fall (rut and post-rut) period.

- Satellite tracking data obtained for female barren-ground caribou (Cape Bathurst herd) from March 1996 to May 2004 provide an estimate of the seasonal and cumulative ranges (Nagy et al. 2005b). The herd calves (June 1 to 25) and summers (June 26 to August 7) in the Cape Bathurst area. During late summer (August 8 to October 7), the herd moves southwest along Cape Bathurst but remains east of the Husky Lakes. The rutting/early fall range (October 8 to 31) occurs in concentrated areas east and west of Husky Lakes, while the post rut and late/fall ranges (November 1 to 30) increases the separation with a portion of the herd moving west of the southern Husky Lakes in the area of the proposed Project. The herd's winter range (December 1 to March 31) stretches from the Tuktoyaktuk Peninsula to the Mackenzie River in the west and the Husky Lakes in the south (Figure 2). Barren-ground caribou spring migration to calving grounds in Cape Bathurst (April 1 to May 31) results in the herd moving out of the proposed Project area typically by early April.
- In comparison to the Cape Bathurst herd, the annual range of the Bluenose-West herd is very large. The calving grounds are located in the western Melville Hills in Tuktut Nogait National Park, with high calving densities in the area west of the Hornaday River south to the Little Hornaday River.
- The post calving range of the Bluenose-West Herd includes the Melville Hills from the coastal areas near Paulatuk, east to Bluenose Lake, south to the Little Hornaday River, and in the areas east of the Hornaday River. Rutting occurs in this area and as far west as the Kugaluk River and south to the Simpson and Horton lakes areas. The winter range of this herd includes the area from Husky Lakes and the Anderson River to the north and Colville and Great Bear lakes and Fort Good Hope to the south.

Table 11, adapted from Nagy et al. 2005b and presented below, summarizes the estimated size of the seasonal ranges used by each of the Cape Bathurst and Bluenose-West caribou herds.

TABLE 11: THE SIZE OF SEASONAL RANGES USED BY THE CAPE BATHURST AND BLUENOSE-WEST CARIBOU HERDS

Season	Size of Seasonal Range (km^2) by Herd	
	Cape Bathurst	Bluenose-West
Calving/Post Calving	3,894	15,350
Early Summer	2,285	18,668
Mid Summer	11,627	44,112
Late Summer	7,965	43,167
Fall/Rut	12,557	111,481
xFall/Post Rut	7,820	99,524
Winter	7,339	78,151
Spring and Spring Migration	18,986	95,364

Source: adapted from Nagy et al. 2005b

Given that the winter period (December 1 to March 31) is the the main period of time when caribou of the Cape Bathurst, and possibly Bluenose-West herd appear to be present in the greatest numbers within the general area, including the cumulative effects study area (Figure 9), this timeframe is the primary focus for the following discussion of the potential for residual effects on caribou related to the Highway to interact in a cumulative manner with potential residual effects associated with past, present and potential future projects. The Tuktoyaktuk Peninsula herd has not been considered in this assessment because limited data are available for this more recently identified herd and this herd only uses the very northern-most portion of the CEA study area.

As previously discussed in Section 2.3 and as illustrated in Figure 1, the potential 1 km zones of influence of the Highway Project could potentially interact with similar zones of influence in the vicinity of the proposed Parsons Lake Gas Field, the proposed buried crossing of the Mackenzie Gas Pipeline in one location and the existing buried Ikhil gas pipeline which is located parallel to the proposed Highway from approximately KM 5 of the Highway south into Inuvik.

Table 1 summarizes the current total estimated footprint of the Highway (378.67 ha) and proposed primary borrow sources (1,305.08 ha), comprising 0.06% and 0.22% of the cumulative effects study area (587,002.91 ha). Relative to the overall estimated size of the Cape Bathurst and Bluenose-West caribou herd winter ranges as presented in Table 11, the combined footprint of the Highway and proposed borrow sources represents 0.0023% of the Cape Bathurst herd winter range and 0.0002% of the Bluenose-west herd winter range.

Following application of the potential 1 km zones of influence associated with the Highway and primary proposed borrow sources, the total estimated indirect potential zone of influence of the overall Highway Project footprint is 34,216.05 ha, representing 5.83% of the cumulative effects study area, 0.0466% of the Cape Bathurst herd winter range and 0.0043% of the Bluenose-west herd winter range.

Table 2 summarizes the total estimated project footprints and 1 km potential zones of influence associated with the proposed Highway and the past, present and proposed projects examined in this supplemental CEA in relation to the total cumulative effects study area. The total estimated direct footprint areas of the Highway and all of the past, present and proposed projects considered in this assessment is 2,132.84 ha, representing 0.36% of the cumulative effects study area.

Relative to the overall estimated size of the Cape Bathurst and Bluenose-West caribou herd winter ranges as presented in Table 11, the combined footprint of the Highway and all of the past, present and proposed projects considered in this assessment represents 0.0029% of the Cape Bathurst herd winter range and 0.00027% of the Bluenose-west herd winter range.

Following application of the potential 1 km zones of influence associated with the Highway and each of the past, present and proposed projects considered, the total estimated indirect potential zone of influence footprints is 71,049.18 ha, representing 12.10% of the cumulative effects study area. However, as previously indicated, this represents an overestimation of the more likely zone of influence around, in particular, each of the existing and proposed buried pipelines, which would more likely be expected to be limited to the range of 5-20 m.

Relative to the overall estimated size of the Cape Bathurst and Bluenose-West caribou herd winter ranges as presented in Table 11, the combined 1 km potential zones of influence of the proposed Highway and all of the past, present and proposed projects considered in this assessment represents 0.097% of the Cape Bathurst herd winter range and 0.0091% of the Bluenose-west herd winter range.

Based on this analysis it is apparent that very small percentages of the total estimated winter ranges of the Cape Bathurst and Bluenose-west herd could potentially be affected by the proposed Highway and all of the past, present and proposed projects considered in this assessment.

It is therefore concluded that the potential residual effects on caribou related to the Highway, and potential residual effects associated with past, present and potential future projects within a combined zone of influence of 1 km for each of these possible projects will not result in a potentially significant cumulative effect on either the Cape Bathurst or Bluenose-west caribou herds while they are on their winter range, when they are typically present in the greatest numbers within the general area, including the cumulative effects study area.

3.2 Woodland Caribou (Boreal Population)

Woodland caribou (Boreal population) are listed by COSEWIC and SARA as Threatened, and by the NWT General Status Rank as Sensitive.

Boreal woodland caribou are dispersed over a large area throughout the boreal forest (GNWT ENR 2011a), occurring along the Mackenzie Valley from the Northwest Territories/Alberta border north to the Mackenzie Delta. Based on traditional knowledge and scientific studies, there are an estimated 6,000 to 7,000 boreal caribou in the NWT, which still occupy much of their historic range (GNWT ENR NDe). They occur throughout their range in low numbers. In the Inuvialuit region, GNWT ENR reported an estimated density of about 1 per 100 km2 based on radio-collared caribou data during the period of 2005 and 2006 (GNWT ENR NDf).

The Town of Inuvik and the Husky Lakes are located on the northern edge of their distribution. Boreal woodland caribou typically prefer mature or old growth coniferous forests associated with bogs, lakes and rivers. GNWT ENR has collared boreal woodland caribou that have shown annual movements from south of the Highway to Husky Lakes verifying that some Boreal woodland caribou do live in the area, though this would not be considered year-round habitat.

Boreal caribou have been shown to be affected by linear development (GNWT ENR NDg); however, the density of linear development in the RSA is less than the threshold predicted to impact populations (Canadian Boreal Initiative 2007).

The most recent range map for this species was issued for review by the NWT Species at Risk Committee in March 2012 (as shown in Figure 2). The new map indicates about 25 km of the Highway alignment (approximately KM 26 to KM 49) crosses boreal caribou range

As illustrated in Figure 2 the only other potential development proposed for this area that could potentially interact with the proposed Highway is a single buried crossing beneath the proposed Highway by the proposed MGP pipeline in the vicinity of Jimmy Lake.

Although the NWT Species at Risk Committee (SARC) reports “scattered woodland caribou are seen on the barrens every year, the majority of which are males, and they are sometimes mixed with barren-ground caribou”, there is minimal overlap with the residual environmental effects predicted to be associated with the construction and operation of the Highway, and residual environmental effects anticipated to be associated with the short term (1 winter season) construction and long term operation of the proposed buried MGP pipeline. As a result, the Developer predicts that there will be minimal opportunity for a potentially cumulative environmental effect on Boreal caribou to occur between the proposed Highway and the proposed MGP pipeline within the area covered by most recent range map for Boreal caribou that was issued for review by the NWT Species at Risk Committee in March 2012.

3.3 Grizzly Bear

COSEWIC (2003) assessed the grizzly bear (Northwestern Population) as Special Concern. Its proposed inclusion on Schedule 1 of SARA is under extended public consultation.

The average home range size for barren-ground grizzly bear varies with sex, age, age class and reproductive status of individual bears (Nagy et al. 1983). Nagy et al. (1983) reported the home range for females varies from 238.7 km^2 for females with cubs to 725.5 km^2 for females with two-year-old young. For adult males the average range was 828.8 km^2 (Nagy et al. 1983). A later study (Edwards 2009), based on the home ranges of 36 grizzly bears studied from April 1 to November 30 between 2003 and 2006, indicates annual home range estimates for males and females were 1,215 km^2 (range: 1,475 km^2 to 6,735 km^2) and 680 km^2 (range: 80 km^2 to 4,965 km^2), respectively.

The location of the arithmetic mean centre of 54 annual home ranges for 36 bears was shown in Figure 3.1.9-16 of the EIS. This figure indicated that most of the centres of the home ranges mapped were located well to the west of the proposed Highway corridor, including in particular the Richards Island area. The study identified the actual distances between mean daily locations, 12 months apart, and grouped into spring, summer, and fall seasons, but found no significant difference in fidelity among the seasons.

Harding and Nagy (1980) reported active avoidance and disruption of bear foraging activities from 100 m up to 4 km from northern industrial developments (predominantly oil and gas exploration activities on Richards Island). The figure provide estimates of direct and potential indirect habitat loss for the ITH Project, existing projects and the MGP. This includes potential indirect losses for 100 m, 500 m, 1 km and 5 km.

In the EIS for the MGP, the proponents predicted that its Parsons Lake development would reduce the amount of effective barren-ground grizzly habitat. The EIS indicated, as a result of construction at the Parsons Lake LSA, a reduction in effective denning habitat of 1,638 ha, spring foraging habitat by 414 ha and fall foraging habitat by 286 ha. The MGP proponents, citing J. Nagy (Pers. Comm., 2003), stated that since denning habitat is not a limiting factor in the region, these effects would have little effect on the grizzly bear population. During operation of Parsons Lake, the proponents anticipated the effects of visual/auditory disturbances from vehicles and aircraft would be less but the reduction in effective denning habitat would remain.

Harvesting - Nagy and Branigan (1998) estimated 1,000 grizzly bears aged two or older in the ISR. IOL et al. (2004) reported a density estimate of 7 to 8 bears/1,000 km^2 (based on J. Nagy, Pers. Comm., 2003). The harvest of grizzly bears is managed through a tag system and is set at approximately 4% of the population (currently 13 bears in I/GB/04 and 9 bears in I/GB/03). Problem animals that are killed are deducted from the total tags for harvesters. The increased access to the Project area could change the harvest pressure on the two subpopulations overlapping the Project area. However, the current harvest is often less than the allowable harvest which limits the potential for this type of impact.

Cumulative Effects of Denning Disturbance – Grizzly bears begin to dig winter dens in mid to late August and enter dens in the Tuktoyaktuk Peninsula in mid to late September up to early October. Bears emerge from the dens in late April to mid May. The MGP proponents determined that the disturbance of a denning grizzly bear during construction of the gathering system or Parsons Lake would not affect the overall population.

No bear dens were observed in the 1 km study area during the KAVIK-STANTEC wildlife field surveys conducted in July 2012, nor during ENR surveys conducted in 2011.

The identification of areas suitable for dens for Grizzly bears by KAVIK-STANTEC (2012d) was based on slope, aspect, terrain and vegetation parameters, as discerned through project imagery (photos and LiDAR) and the terrain and vegetation mapping completed. These parameters were based on guidance from GNWT-Environment and Natural Resources and literature review, with a priority on Northwest Territories sources.

Historical den observations obtained from ENR are shown in KAVIK-STANTEC (2012b).Traditional knowledge indicates bear denning in the area of West Hans and East Hans Lakes, but no specific locations within the Project study area, although a degree of potential for denning exists over parts of the landscape throughout the RSA (KAVIK-STANTEC 2012b).

Figure 11 shows the general area identified by GNWT ENR for denning by Grizzly bear in the cumulative effects study area. Suitability of den sites for Grizzly bears is largely determined by aspect, soil type, moisture content, terrain features and vegetation type (Harding 1976). Sand-dominated materials with low moisture content, found on glaciofluvial landforms such as eskers, kames and drumlins are preferred denning habitat: rock and gravel-dominated surficial materials, and poorly drained areas generally have no den potential. Neither of these surficial material types or associated landforms are found in the Project study area, as determined through surficial mapping (KAVIK-STANTEC 2012c)

Den suitability as identified by surficial material, moisture content and landform is ultimately limited by slope and aspect (McLoughlin et al. 2002). Grizzly bears show a strong preference for denning on slopes that accumulate snow as insulation during winter. Flatter ground, as well as steep slopes tend to not be used for dens.

Vegetation type is less critical in defining Grizzly bear potential than for some other species, but shrub cover of at least 10% is generally preferred, typically dwarf birch or alder, as this provides some soil stability (Nagy et al. 1983). Vegetation mapping was completed for a 1 km wide corridor centred on the proposed route. To better understand the regional potential for Grizzly bear dens, limited analysis was extended to a 3 km wide corridor, with consideration for only slope and aspect beyond the 1 km corridor. The KAVIK-STANTEC (2012d) study indicated that while optimal denning habitat (as determined by aspect, soil type, moisture content, and landforms) is absent from the study area, there are potential denning locations of some suitability throughout much of the study area. However, the relatively lower suitability of denning habitat is reflected by the scarcity of historical den observations in the Project area, in both scientific studies and from traditional knowledge (KAVIK-STANTEC 2012d).

As the small population of Grizzly bears is dispersed over a large landscape, the number of bears that could den or be in the vicinity of the proposed Highway during the relatively short term seasonal construction period and long term operations period is expected to be low.

The only area where the potential 1 km zone of influence of the Highway Project is located within the GNWT ENR (2011a) delineated Grizzly bear denning area is in the vicinity of and to the north of the proposed Parsons Lake Gas project (Figure 11). No other potentially significant developments are currently located in the vicinity of the potential 1 km zone of influence of the proposed Highway in this area and none are anticipated to occur in this area for the currently foreseeable future.

Currently it remains uncertain when the MGP project and the associated Parsons Lake Gas project will be developed. However, it is apparent that the construction of the proposed Highway project will be completed and will be in operation well before construction of the Parsons Lake Gas project and associated infrastructure will possibly be initiated.

As a result, it is predicted that there will be minimal opportunity for potentially cumulative environmental effects on Grizzly bear to occur between the proposed short term construction and long term operation of the Highway, and the potential future development of the Parsons Lake Gas project and associated infrastructure.

3.4 Short-eared Owl – Special Concern

Short-eared Owl (*Asio flammeus*) is a medium-sized owl classified as Special Concern by COSEWIC and Schedule 1 of SARA (GC 2011); it is also considered Sensitive in the Northwest Territories (WGNWTS 2011). The Project study area is entirely within the breeding range of Short-eared Owl (Wiggins et al. 2006, GNWT 2012), and aerial waterfowl surveys between 1989 and 2008 recorded several incidental sightings of Short-eared Owls in the region south and west of Tuktoyaktuk (CWS, unpub. data).

Short-eared Owls occupy a wide variety of open habitats, ranging from grassland to tundra and also including a variety of wetlands such as bogs and marshes (Wiggins et al. 2006). They nest on the ground, often favoring locations that are somewhat concealed by taller grasses and slightly higher than surrounding areas (e.g. hummocks), and may feature dead and matted-down vegetation from the previous year (Holt 1992, Wiggins et al. 2006, Keyes 2011). In parts of its range, Short-eared Owl is quite nomadic in response to variability in prey populations, especially voles or lemmings, posing challenges for estimation of local and regional populations (Wiggins et al. 2006, COSEWIC 2008). There is some evidence that Short-eared Owls may desert their nests if disturbed during laying and incubation (Leasure and Holt 1991, GNWT 2012).

Most terrestrial habitat within the Project study area is open and therefore has some potential as breeding habitat for Short-eared Owl. The least suitable habitat type in the Project study area is riparian black spruce-shrub (comparable to EOSD land cover class – Coniferous, Mixedwood, Broadleaf), but even within patches of that habitat there may be open areas with some potential for nesting. Habitat suitability mapping takes into consideration the preference for open grassy habitat and slightly elevated patches.

Therefore cottongrass-tussock (comparable to EOSD land cover class – Wetland herbs, Herbs), and low-centred polygons (comparable to EOSD land cover class – Wetland-herbs, Wetland-shrub) vegetation classes are considered to have high potential for Short-eared Owl. Dwarf shrub heath (comparable to EOSD land cover class – Shrub low, Bryoids), high-centred polygons (comparable to EOSD land cover class – Wetland-herbs, Wetland-shrub), and riparian sedge-cottongrass (comparable to EOSD land cover class – Wetland herbs, Herbs) have moderate potential. Dry saxifrage tundra (comparable to EOSD land cover class – Exposed Barren Land), upland shrub (comparable to EOSD land cover class – Shrub Low) riparian shrub (comparable to EOSD land cover class – Shrub Tall, Wetland treed, Mixedwood, Broadleaf), and riparian black spruce-shrub (comparable to EOSD land cover class Coniferous, Mixed Wood, Broadleaf), have low potential. Lakes, ponds and slopes are not applicable for assessing habitat suitability for Short-eared Owls.

The habitat mapping conducted by identified high potential for Short-eared Owls in cottongrass-tussock and low-centred polygon vegetation classes, and moderate potential in dwarf shrub heath, high-centred polygons, and riparian sedge – cottongrass.

Field observations were collected during both the aerial waterfowl survey on 2 July 2012, and ground-based habitat assessment surveys on 3-6 July 2012. Thirteen Short-eared Owls were observed, all initially from the air, either already in flight or flushed by the approach of the helicopter. Nine of the owls were observed over dwarf shrub heath or upland shrub. However, since all owls were observed in flight, the habitat association cannot necessarily be linked to nesting suitability. The dominance of dwarf shrub heath and upland shrub (approx. 60% of the Project area) could account for the frequency with which these vegetation types were associated with sightings.

Ground-based habitat assessment confirmed initial expectations that dwarf shrub heath and upland shrub vegetation classes typically provide low suitability for Short-eared Owl nesting due to the density of shrubs in such vegetation types. Suitability of cottongrass-tussock habitat varied somewhat due to size of habitat patches and encroachment of shrubs, but overall appeared to provide the best potential for Short-eared Owl nesting habitat.

As a result, this was the only vegetation class to retain a high suitability ranking. The majority of low-centred and high-centred polygons visited provide moderate nesting suitability for Short-eared Owl, compromised to some extent by shrubs and excessive moisture. Riparian sedge – cottongrass was also initially expected to be of moderate suitability, but was observed to be generally too wet, although dry edges might offer nesting opportunities in some cases. The habitat suitability of sedge – cottongrass was therefore adjusted to low potential. Riparian shrub habitat is also considered to have low potential, as some patches of this vegetation class could include grassy patches potentially large enough for use by nesting Short-eared Owls. Riparian black spruce/shrub was confirmed as being unsuitable for this species. Revised habitat suitability rankings for Short-eared Owl are summarized in Table 3-7 of KAVIK-STANTEC (2012d).

As indicated in Table 1 of this supplemental CEA, approximately 20,174 ha of high suitability cottongrass-tussock habitat ((comparable to EOSD land cover class – Wetland herbs, Herbs) representing 3.44% of the CEA study area, is estimated to occur within the CEA study area. The estimated total footprint of the proposed Highway and associated infrastructure is predicted to directly impact approximately 78.86 ha of cottongrass-tussock habitat comprising 0.39% of the CEA study area.

Following application of the 1 km potential zone of influence around the proposed Highway and associated activities, approximately 1,243.5 ha, comprising 6.16% of the CEA study area may be affected by components of the Highway project. However this is considered to be a conservative number as construction of the Highway will primarily be limited to the winter period, when Short-eared Owl are not expected to be present, and the low traffic nature of the Highway (150-200 vehicles per day), is anticipated to result in primarily localized, short-term and rapidly reversible disturbance effects on Short-eared Owl that may be present in the immediate vicinity of the Highway.

As indicated in Table 2 the estimated total footprint of the proposed Highway and the past, present and proposed projects examined in this supplemental CEA in relation to the total cumulative effects study area is predicted to directly impact approximately 102.15 ha of cottongrass-tussock habitat comprising 0.51% of the CEA study area.

Following application of the potential 1 km zones of influence associated with the Highway and each of the past, present and proposed projects considered, approximately 2,081.98 ha of cottongrass-tussock habitat, comprising 10.32% of the CEA study area may be affected by the total estimated indirect potential zone of influence footprints associated with these projects.

However, as previously indicated, these numbers are considered to be conservative as all of the other proposed projects, if developed, will be constructed primarily in winter, when Short-eared Owl are not expected to be present. In addition, most of the proposed infrastructure ;within the CEA study area is or will consist of buried pipelines, which are not expected to generate potential residual effects such as localized, linear habitat alteration or sensory disturbance to Short-eared Owl.

Future surface infrastructure such as the proposed gas extraction and processing facilities associated with the proposed South Parsons Gas Supply project, the Parsons Lake Gas project and the MGP are anticipated to create localized short-term and rapidly disturbance effects on Short-eared Owl that may be present in the immediate vicinity of these facilties.

However, since there is no overlap between the potential 1 km zones of influence associated with the Highway and each of these proposed projects, there will be minimal opportunity for potentially cumulative environmental effects on Short-eared Owl to occur between the predicted residual effects of the proposed short term construction and long term operation of the Highway, and the potential residual environmental effects associated with the future development of the South Parsons Gas Supply project. the Parsons Lake Gas project and the MGP.

3.5 Horned Grebe (Western Population) – Special Concern

Horned Grebe (Podiceps auritus) is a small waterbird classified as Special Concern by COSEWIC and pending status assignment under SARA (GC 2011); it is also considered Sensitive in the Northwest Territories (WGNWTS 2011). The Project area is just within the northern limits of the breeding range of Horned Grebe (Stedman 2000, GNWT 2012).

Aside from nesting, Horned Grebes are primarily aquatic, and their distribution is largely dependent on availability of suitable wetlands. Breeding sites are most commonly small wetlands with emergent vegetation (particularly cattails and sedges) along the margins and enough open water and depth to allow for diving (Stedman 2000). In a ten-year study around Yellowknife, Fournier and Hines (1999) found that ponds smaller than 0.1 ha were almost never occupied, whereas those between 0.3 ha and 2 ha were most frequently used, and occupancy dropped off noticeably again at ponds larger than 4 ha. Faaborg (1976) also noted a strong preference for ponds smaller than 1 ha in a broader review. Availability of residual emergent growth from the previous year, especially cattail and willow, appears to be preferred (Fournier and Hines 1999).

The Project imagery reviewed by KAVIK-STANTEC (2012d) allowed for the identification of ponds as small as approximately 0.1 ha, but smaller waterbodies were not mapped. Given the preferences for small ponds as described in the literature for Northwest Territories and elsewhere, habitat suitability for

Horned Grebe was therefore assessed as high for ponds (waterbodies up to 2 ha), moderate for lakes (waterbodies >2 ha), and nil for all terrestrial habitat classes.

The habitat mapping conducted by KAVIK-STANTEC (2012d) in early July 2012 identified wetland size as the only factor determining suitability for Horned Grebe, with waterbodies up to 2 ha considered to have high suitability, larger waterbodies moderate suitability, and all terrestrial habitat nil suitability. Three Horned Grebes were observed during the aerial surveys and all were located in the southernmost portion of the Project study area.

Field observations revealed that many wetlands within the study area originally identified to be of optimal size for Horned Grebes, have little or no emergent vegetation suitable for nesting by Horned Grebes. Conversely, some larger wetlands in the Project study area have extensive beds of emergent vegetation, which in some cases partially to completely delineated smaller pools that are of optimal size for Horned Grebes. Consequently, habitat suitability for Horned Grebes as identified during preliminary mapping was adjusted by taking into account whether wetlands were associated with vegetation class 8: riparian sedge – cottongrass, which is comparable to the Wetland-herb, Herbs EOSD land cover classification.

Results of the revised habitat mapping showed patches of moderate habitat suitability along the length of the Project, and 24 scattered wetlands considered to be high suitability for Horned Grebe. This revised potential habitat distribution should, however, take into consideration that the proposed Highway is located near the northern limits of the breeding range of Horned Grebe, so while moderate quality habitat occurs along the length of the Project study area, Horned Grebes are more likely to occur near the southern portion of the proposed Highway. This is corroborated by the low frequency and geographic location of observations within the overall study area. The edge of Horned Grebe range within the Project study area has not been defined in literature, and as such, there is no basis for which to define a latitude at which suitability drops off.

As indicated by KAVIK-STANTEC (2012d), all three observed sitings of Horned Grebe during their July 2012 field program were recorded in the southern-most portion of the CEA study area in the vicinity of the existing buried Ikhil pipeline and the adjacent proposed Highway (between KM 0 and KM 7 of the Highway). As previously indicated in Section 5.3.1.1 of the EIS, there are no potential residual environmental effects associated with the buried and revegetated Ikhil pipeline corridor that could potentially interact with the low residual environmental effects predicted to occur in relation to the construction and operation of the Highway on waterfowl, including Horned Grebe.

Based on the apparent limited use of ponds by Horned Grebe in the vicinity of the proposed Highway, combined with winter construction of the Highway embankment when waterfowl, including Horned Grebe are absent from the Project area, the low volume and frequency of vehicular traffic expected to use the Highway, and the range of additional mitigation measures to be employed to minimize potential impacts on Horned Grebe and other waterfowl, no potentially significant effects or residual impacts, including possible cumulative effects on this species are predicted to occur.

3.6 Rusty Blackbird – Special Concern

Rusty Blackbird (*Euphagus carolinus*) is a medium-sized songbird classified as Special Concern by COSEWIC and listed as Special Concern under Schedule 1 of SARA (GC 2011); it is also considered Sensitive in the Northwest Territories (WGNWTS 2011). The Project area is just within the northern limits of the breeding range of Rusty Blackbird (Avery 1995, GNWT 2012). Previous monitoring along the Mackenzie Valley (Machtans et al. 2007) and one incidental observation of Rusty Blackbird from aerial waterfowl surveys in the region, approximately 45 km southwest of Tuktoyaktuk have been reported (CWS, unpub. data).

Rusty Blackbird is predominantly found in boreal forest wetlands; while its breeding range extends a bit to both the north and south, it is rare beyond the tree line (Avery 1995, COSEWIC 2006). Bogs, fens, swamps, riparian corridors, and shrubby meadows all provide suitable habitat, as the key requirements are easy access to aquatic invertebrates as prey, and dense shrubs or small trees for nesting and shelter (Avery 1995, COSEWIC 2006). Upland habitat may be used during migration, but does not offer breeding potential (COSEWIC 2006).

The MGP Proponents provided their summer observation records (i.e., bird surveys and casual observation records) to GNWT ENR. A review of these observation records provided no sightings at all for any part of their Project in the NWT.

The GNWT ENR on behalf of the Developer, acquired observational data from Environment Canada and pooled it with other records in WMIS. Environment Canada provided observations recorded during helicopter aerial surveys for breeding waterfowl during 1989-1993, 1995-1998, and 2002-2008. One observation was recorded north of Parsons Lake. These surveys were not specifically designed to detect Rusty Blackbird and as such should not be used to make inferences about their abundance or areas where they are absent within the larger area covered by the surveys. Other observations are known from around Inuvik and on Richards Island.

Given the abundance of water bodies in the Project study area, proximity of water is assumed to not be a limiting factor for Rusty Blackbirds. Habitat suitability is instead determined by availability of shrubs for nesting. Therefore riparian shrub and riparian black spruce-shrub vegetation classes (comparable to EOSD land cover class – Coniferous, Mixedwood, Broadleaf) are considered high potential habitat for Rusty Blackbird because they combine nesting habitat with proximity to water, while dwarf shrub heath/upland shrub (comparable to EOSD land cover class – Shrub Low, Bryoids), low-centred polygons (comparable to EOSD land cover class – Wetland herb, Wetland shrub), and riparian sedge-cottongrass (comparable to EOSD land cover class – Wetland herbs, Herbs), have low potential because nesting options are likely to be present, but limited. Other terrestrial habitats that lack shrubs are rated nil for habitat suitability. Slopes are not used to assess habitat suitability.

In preliminary habitat suitability modeling conducted by KAVIK STANTEC (2012d), Rusty Blackbird was expected to potentially occur in five of the nine vegetation types within the Project study area. However, no Rusty Blackbirds were observed during either the aerial survey on 2 July 2012 or the ground-based habitat assessments 3-6 July 2012. Furthermore, shrub height and density in most vegetation types were found to be too low to be suitable as nesting habitat. The only vegetation classes that appear to actually be suitable habitat for Rusty Blackbird are riparian shrub and black spruce riparian/shrub (comparable to EOSD land cover class – Coniferous, Mixedwood, Broadleaf). Given that the Project study area is near the limits of the Rusty Blackbird's range, and no blackbirds were observed during the field surveys, the relative suitability of these habitat types was not assessed; rather they were considered suitable, while all others were rated as unsuitable.

Past, present and proposed developments that could potentially interact with the proposed Highway within potentially suitable habitat for Rusty Blackbird (riparian shrub and black spruce riparian/shrub - comparable to EOSD land cover class – Coniferous, Mixedwood, Broadleaf) include the existing buried

Ikhil pipeline, the proposed buried South Parsons Gas Supply project pipeline and a small section of the proposed buried MGP pipeline.

As previously indicated in Sections 5.3.1.1, 5.3.2.1 and 5.3.2.2 of the EIS, no potential residual environmental effects associated with the buried and revegetated Ikhil pipeline corridor and the future potential buried and reclaimed South Parsons Gas supply and MGP pipelines are anticipated to occur that could potentially interact with the low residual environmental effects predicted to occur in relation to the construction and operation of the Highway.

Given that the Project study area is near the limits of the Rusty Blackbird's range, combined with winter construction of the Highway embankment when most bird species, including Rusty Blackbird are absent from the Project area, the low volume and frequency of vehicular traffic expected to use the Highway, and the range of additional mitigation measures to be employed to minimize potential impacts on Rusty Blackbird and other bird species, no potentially significant effects or residual impacts, including possible cumulative effects on this species are predicted to occur.

3.7 Peregrine Falcon (*Anatum-Tundrius Complex)* – Special Concern

Peregrine Falcon (*Falco peregrinus*) – anatum/tundrius is a raptor classified as Special Concern by COSEWIC and Schedule 1 of SARA (GC 2011); it is also considered Sensitive in the Northwest Territories (WGNWTS 2011). The entire Project area is well within the breeding range of Peregrine Falcon, and the anatum subspecies is considered dominant in this area (White et al. 2002, GNWT 2012).

Among the most widely distributed birds in the world, Peregrine Falcons are associated with a wide variety of habitats, but nest sites are consistently on cliffs or other elevated ledges, and often near water (White et al. 2002). In the arctic, Peregrine Falcons often nest on cliffs much lower than they would use elsewhere, sometimes 10 m or less (Jenkins and Hockey 2001). Northern nest sites often include river banks and other steep slopes, as well as rock outcrops. In a five-year study around Rankin Inlet, 29 cliff nests ranged from 4 to 26 m above ground, all were within 300 m of significant water bodies, and the majority had a southerly exposure (Court et al. 1988). Peregrine Falcons in the Northwest Territories often occupy stick nests previously built by Common Ravens (*Corvus corax*) or Rough-legged Hawks (*Buteo lagopus*), as these may offer flat surfaces otherwise scarce on some slopes (Calef and Heard 1979; Court et al. 1988). Notwithstanding these requirements for nesting, Peregrine Falcon often hunt over large territories and can therefore be seen far from breeding habitat (White et al. 2002).

The abundance of water bodies within the Project area is attractive to Peregrine Falcons and provides an abundance of potential prey, but their distribution is limited by availability of potential nesting sites, namely steep river and lake banks. As a result, terrestrial and aquatic habitat classes do not contribute to the identification and ranking of habitat. Instead, habitat potential was estimated by slope class as discerned from terrain mapping and LiDAR imagery (KAVIK STANTEC 2012d). Steep slopes (above 85%) are considered to provide high suitability habitat; very strong to extreme slopes (45-85%) are moderate; moderate to strong slopes (15-45%) are low, and flat to gentle slopes (0-15%) are not considered to provide any potential nesting habitat for Peregrine Falcons.

GNWT ENR reviewed the proposed Highway alignment in 2011 and indicated there were no known nest sites within 1.5 km of the alignment (S. Matthews, Pers. Comm., 2011). The MGP proponents did not observe Peregrine Falcons during aerial or ground surveys in the regional study area (RSA) of the Inuvik to Tuktoyaktuk Highway.

Habitat potential for nesting Peregrine Falcons identified during the preliminary habitat mapping conducted by KAVIK STANTEC (2012d) was limited to a few low, but relatively steep slopes. Each of these specific locations were visited during the aerial survey on 2 July 2012. No Peregrine Falcons were observed at any of these locations, nor was any evidence of their presence noted (i.e. whitewash below frequently used perches). In all cases, the slopes also appeared to lacking suitable ledges for nesting, and were somewhat unstable as evidenced through recent or active erosion.

Peregrine Falcons may occasionally nest on the ground in arctic regions, but this is poorly documented in Canada, so, while possible ground-nesting habitat could occur within the Project study area, it would be speculative to identify any areas other than steep slopes as suitable habitat given the rarity of ground nests and the low density of Peregrine Falcon observations in the area generally. Therefore, while Peregrine Falcons could occasionally nest within the Project study area, there appears to be no particularly suitable habitat for them, and as such no habitat suitability was mapped for this species.

Three individual Peregrine Falcons were observed during field surveys. All were second-year (immature) birds, unlikely to be occupying breeding territories this year.

The proposed Highway and all past, existing and potential future developments are located well within the breeding range of Peregrine Falcon, and the anatum subspecies is considered dominant in this area (White et al. 2002, GNWT 2012). However, as previously discussed, to date no potentially suitable nest sites (cliffs, elevated ledges, steep slopes, etc) have been documented within the Project study area or the CEA study area.

As a result, it is apparent that there is essentially no opportunity for a Peregrine Falcon nest site to be potentially affected by the proposed construction and operation of the Highway or any of the other past, existing and potential future developments proposed for the area. Thus, no potentially significant residual impacts, including possible cumulative effects on this species are predicted to occur.

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FIGURES

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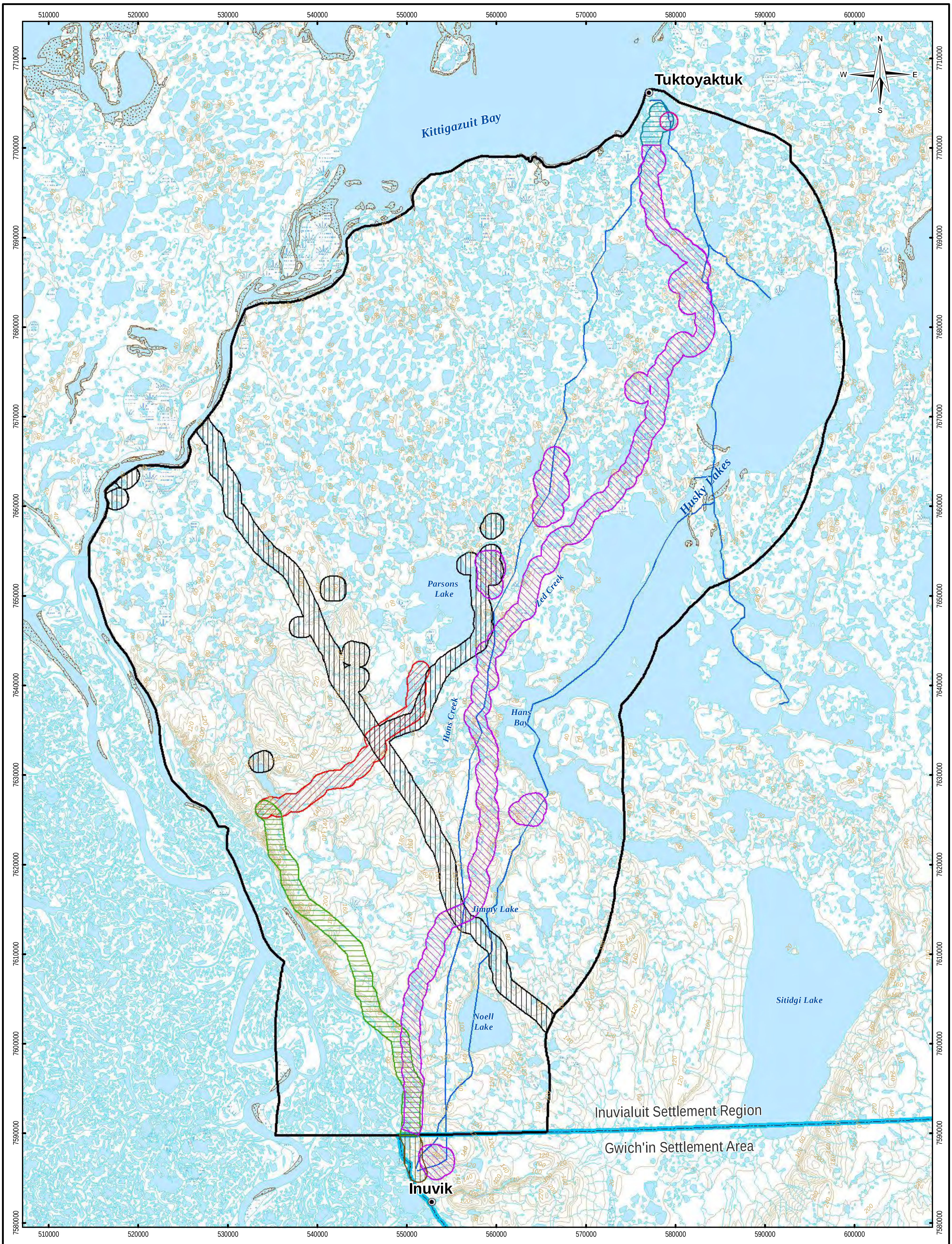

LEGEND

Zone of Influence (1 km buffer)

- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road
- Cumulative Effects Study Area
- Gwich'in / Inuvialuit Boundary
- Snowmobile Trails
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES

1. Zone of Influence was determined by a 1 km buffer on either side of the respective project footprint.
2. Alternative 3 buffer includes the alignment and the primary borrow sources.
3. Mackenzie Gas Project buffer includes the pipeline, MGP infrastructure and MGP borrow sources.
4. Tuktoyaktuk Harbour Project location is approximate.
5. The pipeline route of the Proposed South Parsons Lake Gas Supply Project is approximate, based on Appendix A, Figure 1 of the EIA (2012).
6. The former NCPC power pole (removed) is not shown.
7. Some buffer areas overlap, as noted by the cross-hatching.
8. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

1 km Zone of Influence of Past and Proposed Future Projects Assessed in the Cumulative Effects Study Area

PROJECTION		DATUM	
UTM Zone 8		NAD83	
Scale: 1:400,000 (5 – 2.5 – 0 – 5 – 10 Kilometres)			
FILE NO. V23201322_CEA_Map001_OverviewZOI.mxd			
PROJECT NO. V23201322	DWN SL	CKD TS	REV 0
OFFICE EBA-VANC	DATE September 12, 2012		

Town of Inuvik

Northwest Territories

KIGGIAK - EBA

Figure 1

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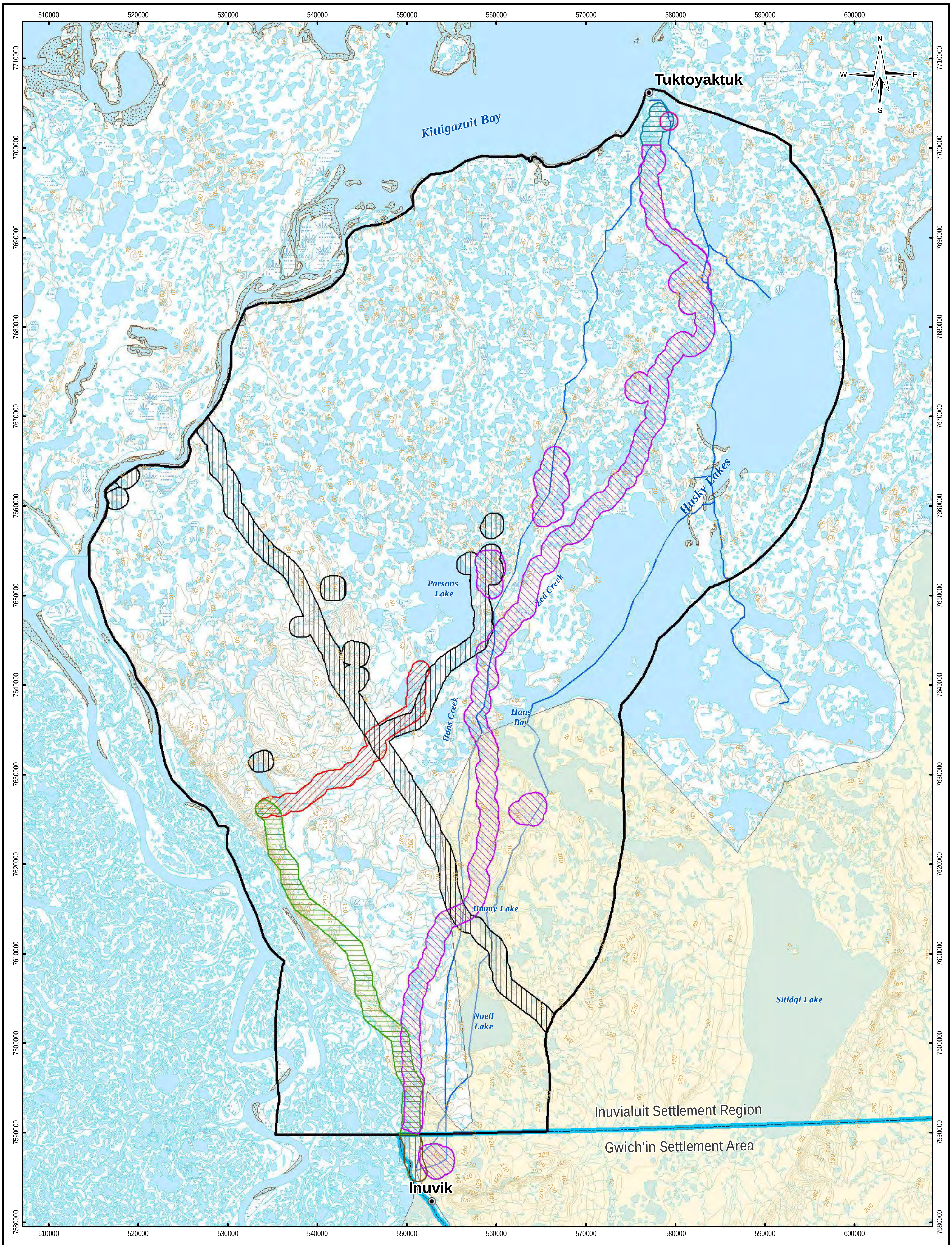

LEGEND

Boreal Caribou Northern Range

Zone of Influence (1 km buffer)

- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road
- Cumulative Effects Study Area
- Gwich'in / Inuvialuit Boundary
- Snowmobile Trails
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Boreal Caribou Northern Range from NWT Species at Risk Committee Draft. March 2012.
3. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Boreal Caribou Northern Range Relative to 1 km Zone of Influence of Past and Proposed Future Projects Assessed in the Cumulative Effects Study Area

PROJECTION: UTM Zone 8
DATUM: NAD83

Scale: 1:400,000
5 2.5 0 5 10
Kilometres

FILE NO.: V23201322_CEA_Map002_BorealCaribou.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE: EBA-VANC
DATE: September 12, 2012

Town of Inuvik
Northwest Territories
KIGGIAK - EBA

Figure 2

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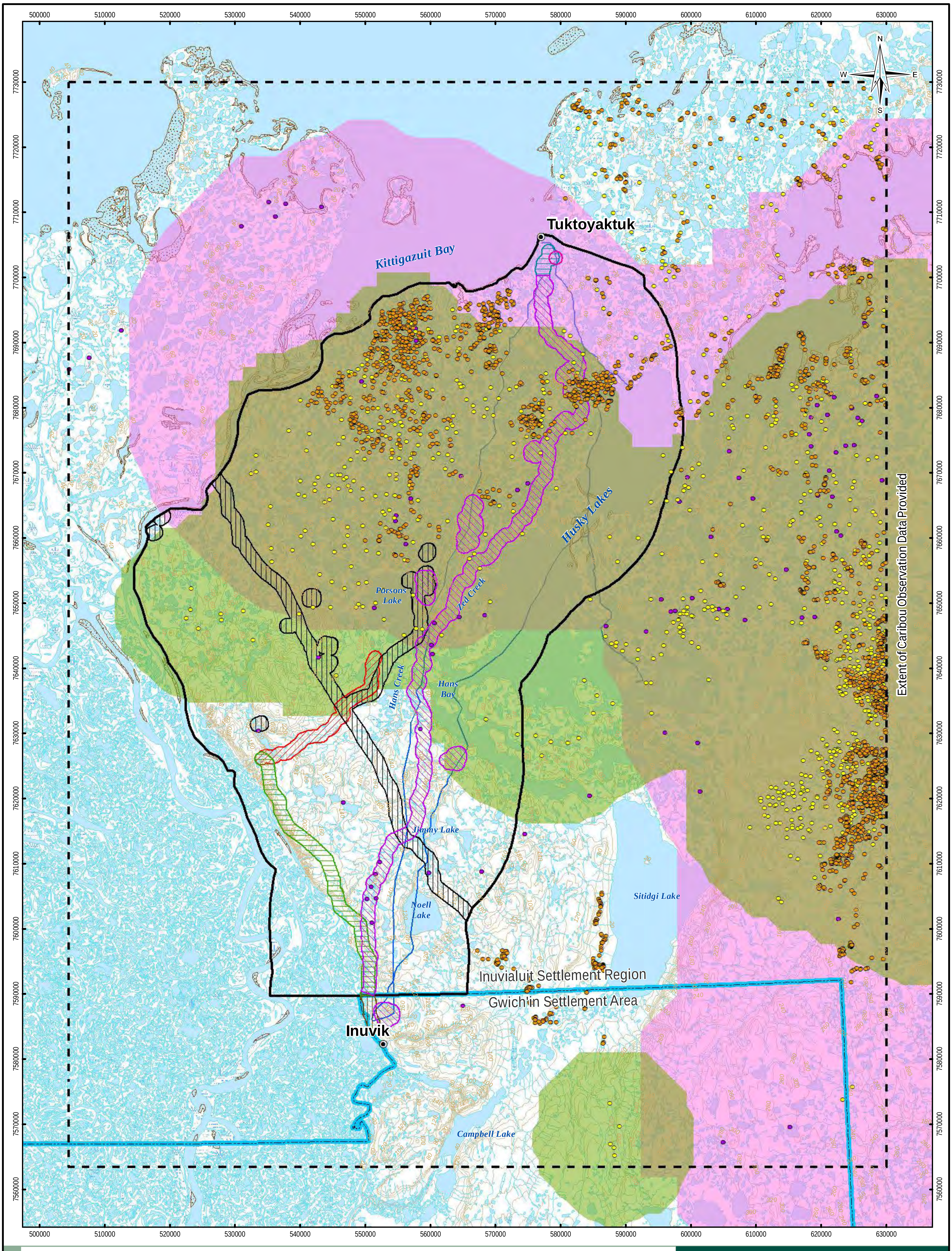

LEGEND

Bluenose West Herd
Cape Bathurst Herd
Both Herds

Barren-ground Caribou Observations
- GPS Telemetry
- Satellite Telemetry
- Spring Composition Surveys

Extent of Caribou Observation Data

Zone of Influence (1 km buffer)
- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road

Cumulative Effects Study Area
Gwich'in / Inuvialuit Boundary
Snowmobile Trails
Contour
Watercourse
Waterbody
Wetland
Sand

NOTES
1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Caribou Herd Ranges: GNWT ENR, February 2011.
3. Caribou Observations: GNWT ENR 2011. NWT Wildlife Management Information System (Projects 02, 44 & 46).
4. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Winter
Caribou Observations and Herd Ranges
(December 1 to March 31)

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:550,000
5 2.5 0 5 10 15
Kilometres

FILE NO.
V23201322_CEA_Map003_CaribouWinter.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	September 12, 2012

Figure 3

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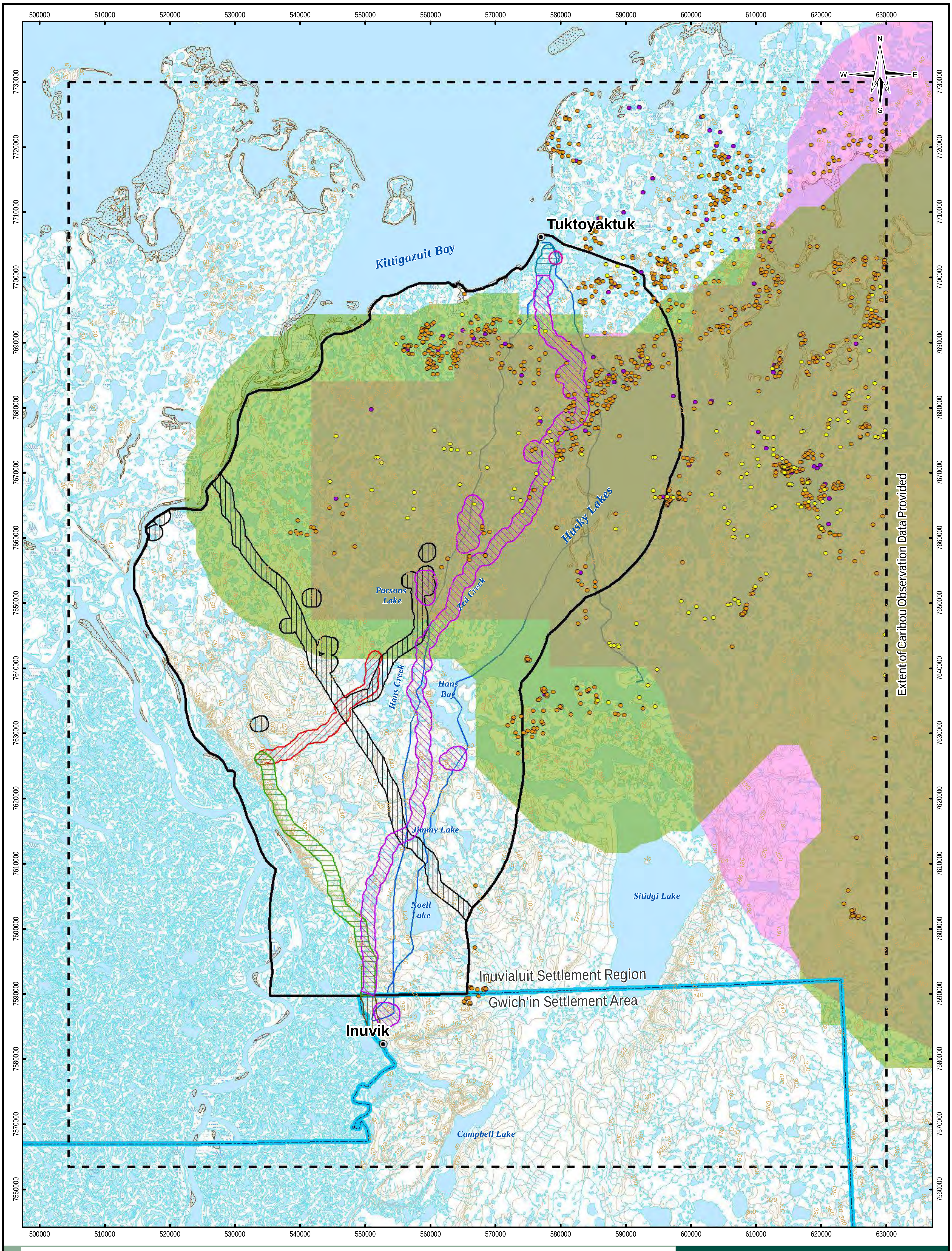

LEGEND

- Bluenose West Herd
- Cape Bathurst Herd
- Both Herds

Barren-ground Caribou Observations
- GPS Telemetry
- Satellite Telemetry
- Spring Composition Surveys
- Extent of Caribou Observation Data

Zone of Influence (1 km buffer)
- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road

- Cumulative Effects Study Area
- Gwich'in / Inuvialuit Boundary
- Snowmobile Trails
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Caribou Herd Ranges: GNWT ENR, February 2011.
3. Caribou Observations: GNWT ENR 2011. NWT Wildlife Management Information System (Projects 44, 46, 133 & 191).
4. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Spring, Spring Migration and Pre-Calving Caribou Observations and Herd Ranges (April 1 to May 31)

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:550,000
10 5 0 10
Kilometres

Town of Inuvik
Northwest Territories
KIGGIAK - EBA

FILE NO.
V23201322_CEA_Map004_CaribouSpring.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	September 12, 2012

Figure 4

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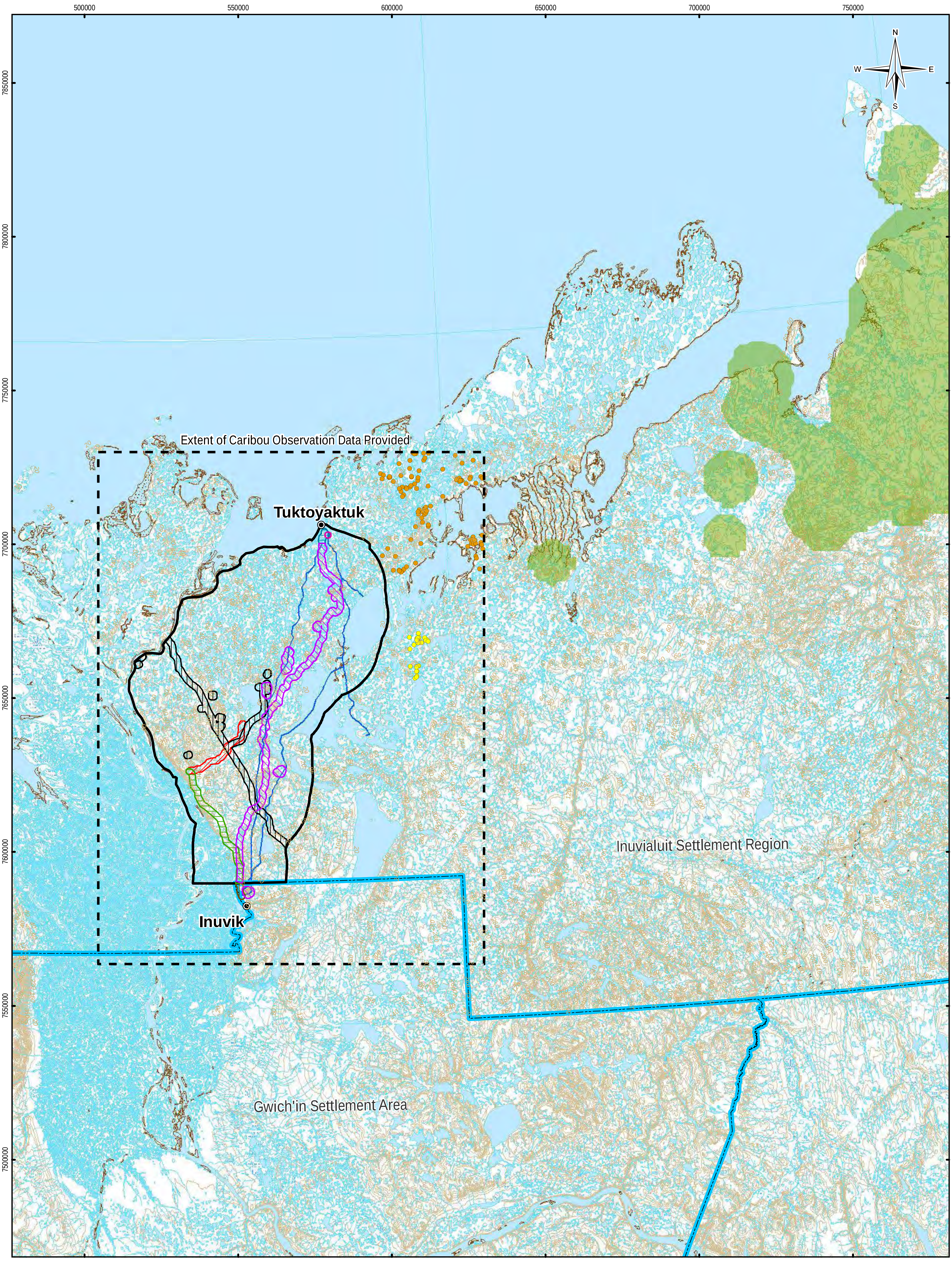

LEGEND

Cape Bathurst Herd

Barren-ground Caribou Observations

- GPS Telemetry
- Satellite Telemetry
- Extent of Caribou Observation Data

Zone of Influence (1 km buffer)

- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road

- Cumulative Effects Study Area
- Gwich'in / Inuvialuit Boundary
- Snowmobile Trails
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Caribou Herd Ranges: GNWT ENR, February 2011.
3. Caribou Observations: GNWT ENR 2011. NWT Wildlife Management Information System (Projects 44 & 46).
4. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Calving/Post Calving Caribou Observations and Herd Ranges (June 1 to 25)

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:1,200,000

20 10 0 20

Kilometres

FILE NO.
V23201322_CEA_Map005_CaribouCalving.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	September 12, 2012

Town of Inuvik

Northwest Territories

KIGGIAK - EBA

Figure 5

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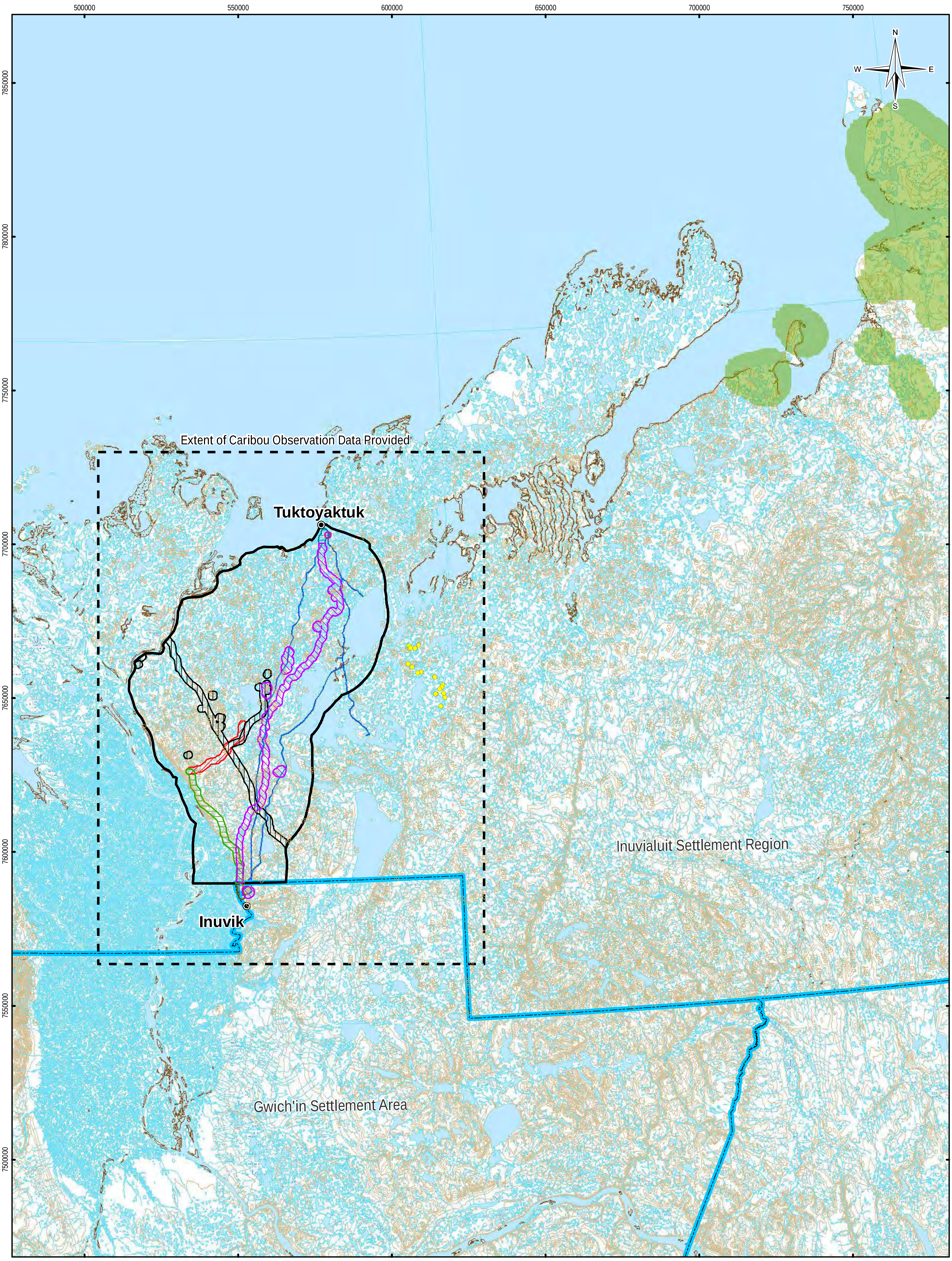

LEGEND

Cape Bathurst Herd

Barren-ground Caribou Observations
- Satellite Telemetry
- Extent of Caribou Observation Data

Zone of Influence (1 km buffer)
- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road

- Cumulative Effects Study Area
- Gwich'in / Inuvialuit Boundary
- Snowmobile Trails
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Caribou Herd Ranges: GNWT ENR, February 2011.
3. Caribou Observations: GNWT ENR 2011. NWT Wildlife Management Information System (Project 44).
4. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Early Summer
Caribou Observations and Herd Ranges
(June 26 to July 15)

PROJECTION: UTM Zone 8
DATUM: NAD83

Scale: 1:1,200,000
20 10 0 20
Kilometres

FILE NO.: V23201322_CEA_Map006_CaribouEarlySum.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE: EBA-VANC
DATE: September 12, 2012

Town of Inuvik
Northwest Territories
KIGGIAK - EBA

Figure 6

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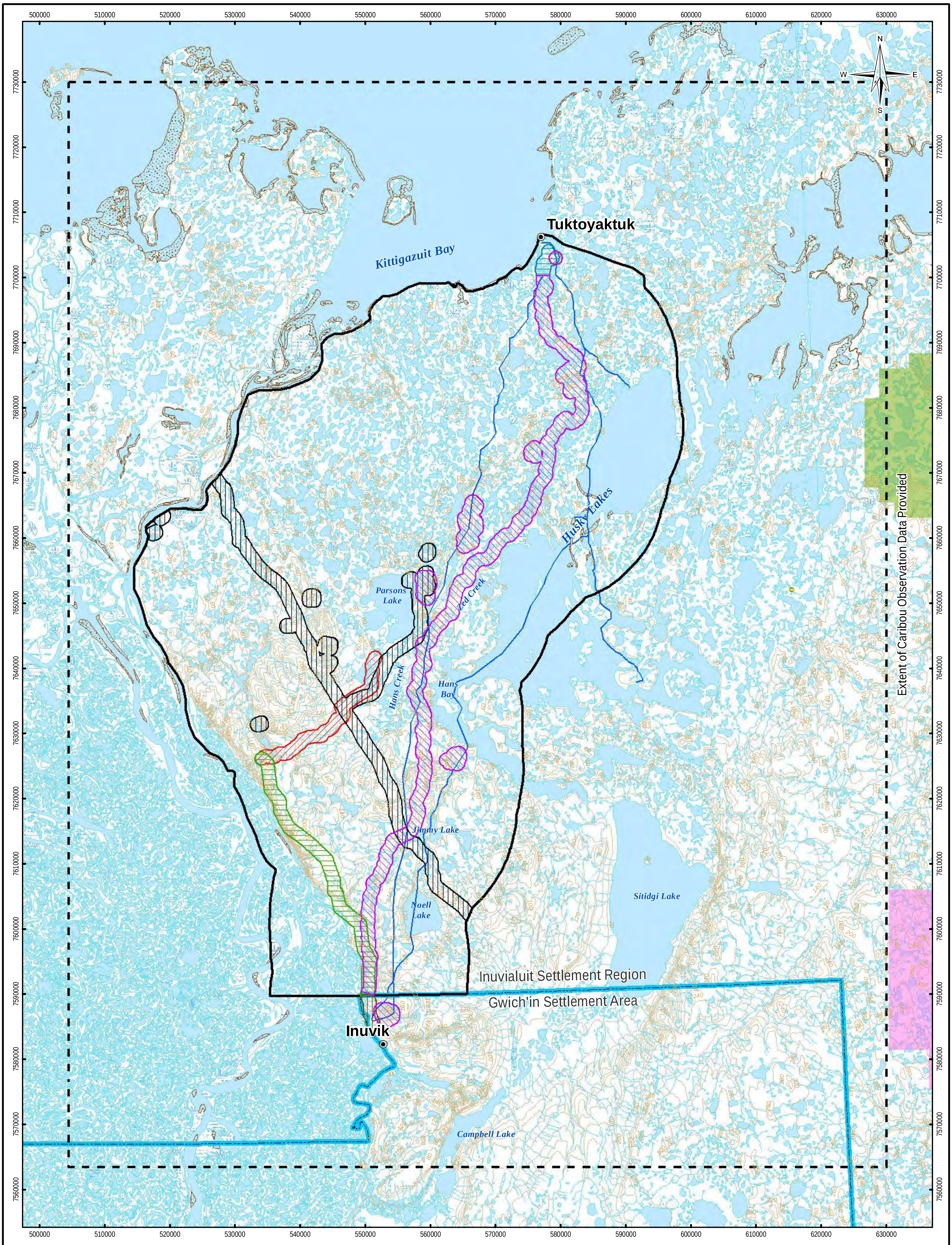

LEGEND

- Bluenose West Herd
- Cape Bathurst Herd

Barren-ground Caribou Observations

- Satellite Telemetry
- Extent of Caribou Observation Data

Zone of Influence (1 km buffer)

- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road

- Cumulative Effects Study Area
- Gwich'in / Inuvialuit Boundary
- Snowmobile Trails
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES

1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Caribou Herd Ranges: GNWT ENR, February 2011.
3. Caribou Observations: GNWT ENR 2011. NWT Wildlife Management Information System (Project 44).
4. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Mid Summer
Caribou Observations and Herd Ranges
(July 16 to August 7)

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:550,000

10 5 0 10

Kilometres

FILE NO.
V23201322_CEA_Map007_CaribouMidSum.mxd

Town of Inuvik

Northwest Territories

KIGGIAK - EBA

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	September 12, 2012

Figure 7

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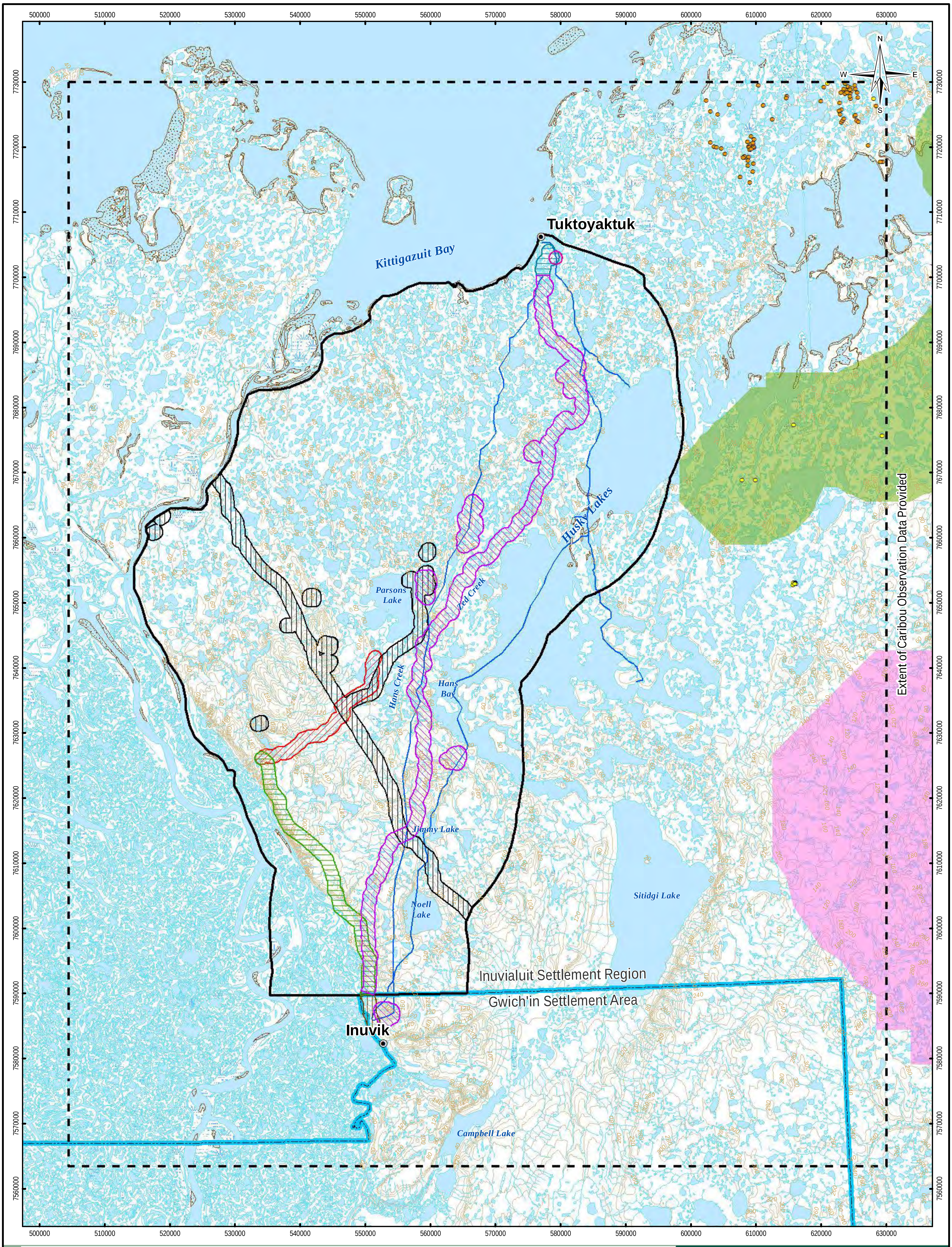

LEGEND

Bluenose West Herd
Cape Bathurst Herd

Barren-ground Caribou Observations
- GPS Telemetry
- Satellite Telemetry
- Extent of Caribou Observation Data

Zone of Influence (1 km buffer)
- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road

- Cumulative Effects Study Area
- Gwich'in / Inuvialuit Boundary
- Snowmobile Trails
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Caribou Herd Ranges: GNWT ENR, February 2011.
3. Caribou Observations: GNWT ENR 2011. NWT Wildlife Management Information System (Projects 44 & 46).
4. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Late Summer
Caribou Observations and Herd Ranges
(August 8 to October 7)

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:550,000
10 5 0 10
Kilometres

FILE NO.
V23201322_CEA_Map008_CaribouLateSum.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	September 12, 2012

Town of Inuvik
Northwest Territories
KIGGIAK - EBA

Figure 8

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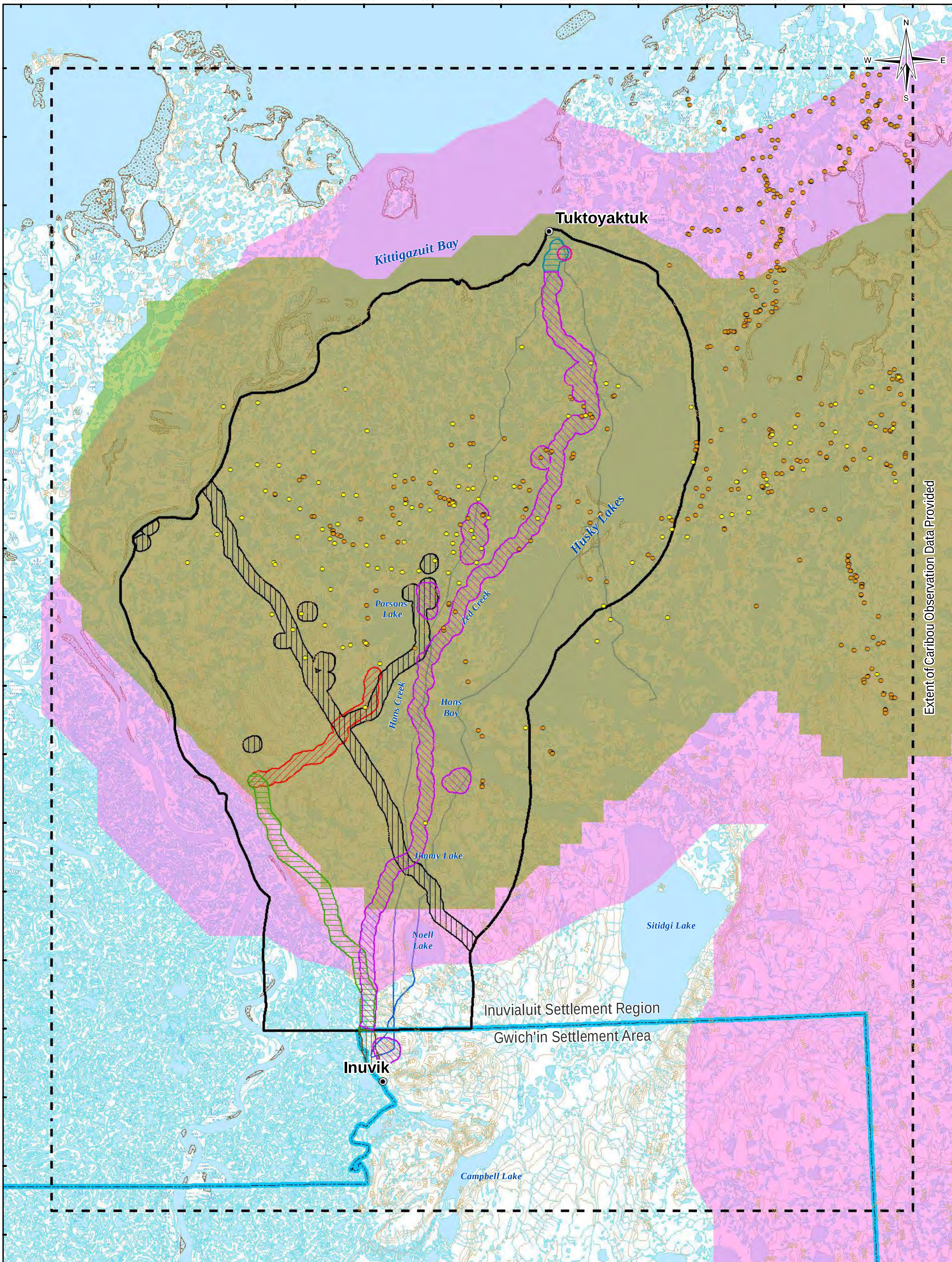

LEGEND

- Bluenose West Herd
- Cape Bathurst Herd
- Both Herds

Barren-ground Caribou Observations

- GPS Telemetry
- Satellite Telemetry
- Extent of Caribou Observation Data

Zone of Influence (1 km buffer)

- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road

- Cumulative Effects Study Area
- Gwich'in / Inuvialuit Boundary
- Snowmobile Trails
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Caribou Herd Ranges: GNWT ENR, February 2011.
3. Caribou Observations: GNWT ENR 2011. NWT Wildlife Management Information System (Projects 44 & 46).
4. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Fall/Rut
Caribou Observations and Herd Ranges
(October 8 to 31)

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:550,000
10 5 0 10
Kilometres

FILE NO.
V23201322_CEA_Map009_CaribouFallRut.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	September 12, 2012

Town of Inuvik
Northwest Territories
KIGGIAK - EBA

Figure 9

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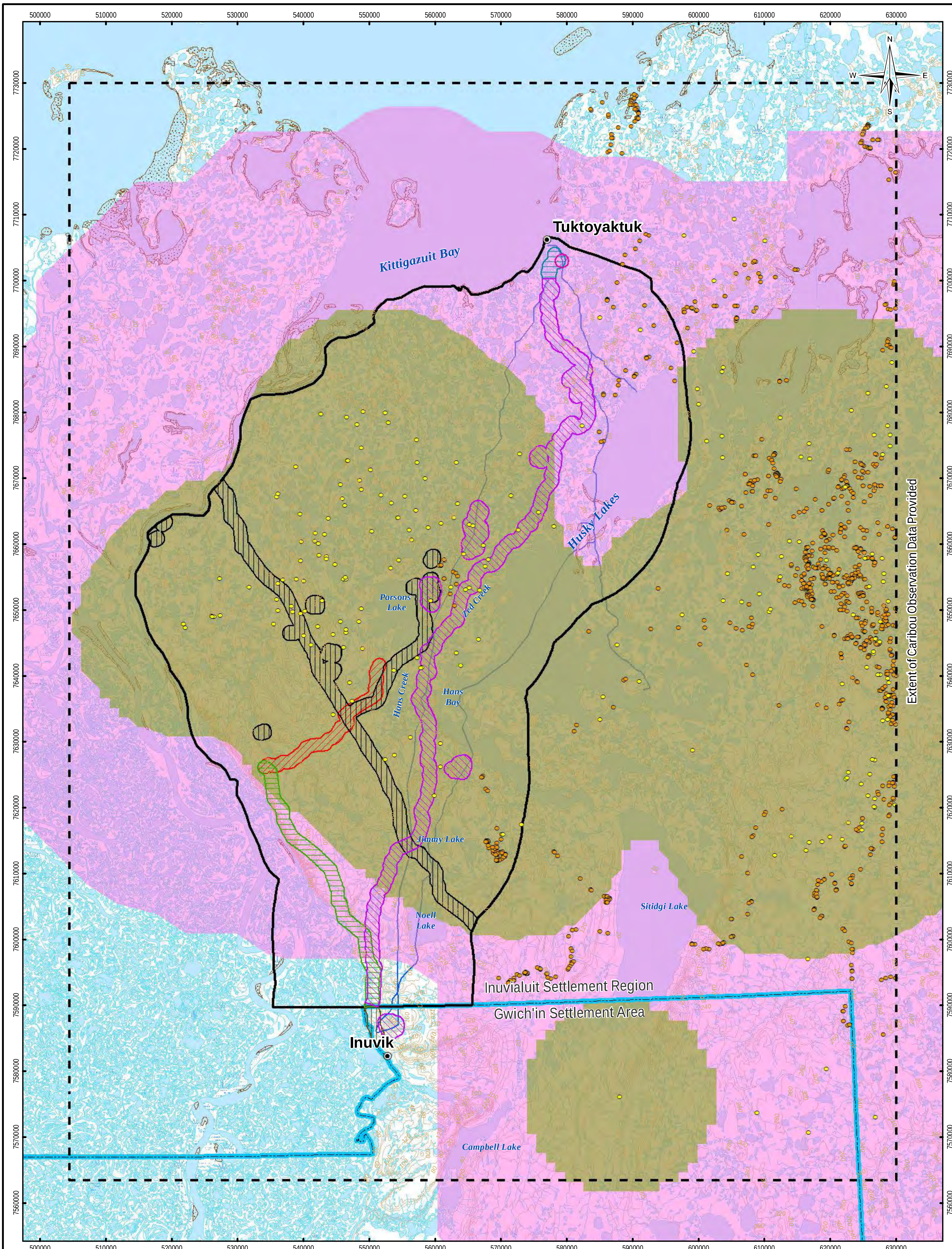


LEGEND

Bluenose West Herd

Cape Bathurst Herd

Both Herds

Barren-ground Caribou Observations

- GPS Telemetry
- Satellite Telemetry

Extent of Caribou Observation Data

Zone of Influence (1 km buffer)

- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road

Cumulative Effects Study Area

Gwich'in / Inuvialuit Boundary

Snowmobile Trails

Contour

Watercourse

Waterbody

Wetland

Sand

NOTES
1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Caribou Herd Ranges: GNWT ENR, February 2011.
3. Caribou Observations: GNWT ENR 2011. NWT Wildlife Management Information System (Projects 44 & 46).
4. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Fall/Post Rut Caribou Observations and Herd Ranges (November 1 to 30)

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:550,000

10 5 0 10

Kilometres

FILE NO.
V23201322_CEA_Map010_CaribouPostRut.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	September 12, 2012

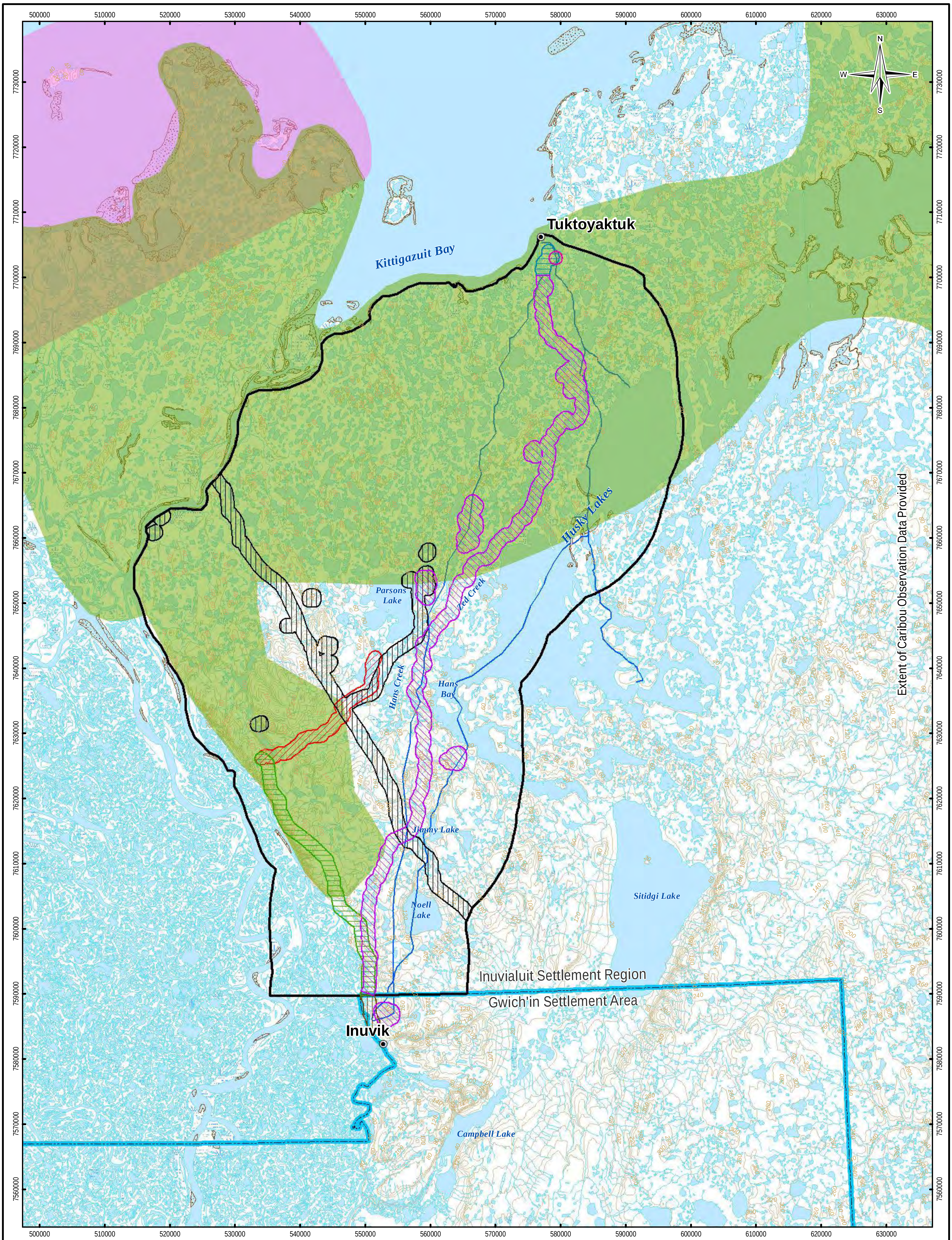
Town of Inuvik

Northwest Territories

KIGGIAK - EBA

Figure 10

Q:\Vancouver\GIS\ENVIRONMENTAL\V232\V23201322_TukRoad_EIS\Maps\CEA\V23201322_CEA_Map011_BearDenAreas.mxd modified 9/12/2012 by stephanie.leusink



LEGEND

- Mainland Coastal Polar Bear Denning Area
- Critical Grizzly Bear Denning Area
- Both Denning Areas

Zone of Influence (1 km buffer)

- Preferred Route (Alternative 3)
- Mackenzie Gas Project
- IKHIL Gas Pipeline
- Proposed South Parsons Lake Gas Supply Project
- Tuktoyaktuk Harbour Project
- Tuktoyaktuk to 177 Access Road
- Navy Road

- Cumulative Effects Study Area
- Gwich'in / Inuvialuit Boundary
- Snowmobile Trails
- Contour
- Watercourse
- Waterbody
- Wetland
- Sand

NOTES
1. For Zone of Influence notes, please see Figure 1, Notes 1-7.
2. Bear Denning Areas: GNWT ENR, February 2011.
3. Base data source: NTS 1:250,000

ISSUED FOR USE

PROPOSED INUVIK-TUKTOYAKTUK HIGHWAY

Grizzly and Polar Bear Denning Areas

PROJECTION	DATUM
UTM Zone 8	NAD83

Scale: 1:550,000

10 5 0 10

Kilometres

FILE NO.
V23201322_CEA_Map011_BearDenAreas.mxd

PROJECT NO.	DWN	CKD	REV
V23201322	SL	TS	0

OFFICE	DATE
EBA-VANC	September 12, 2012

Town of Inuvik
Northwest Territories
KIGGIAK - EBA

Figure 11

TABLES

Table 1: Alternative 3 (Preferred Route) Footprint Components and Zone of Influence (1 km buffer)

Inside the Cumulative Effects Study Area

	Alternative 3 (28 m)		Borrow Sources[1]		Total Alternative 3 Footprint[2]		Alternative 3 ZOI[3] (1 km buffer)		Cumulative Effects Study Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	24.13	0.31	0.00	0.00	24.13	0.31	1,220.31	15.57	7,839.53	1.34
Broadleaf Open	5.33	0.20	0.00	0.00	5.33	0.20	321.72	12.20	2,636.80	0.45
Bryoids	119.34	0.10	465.69	0.38	585.03	0.48	8,155.93	6.69	121,865.61	20.76
Not Classified	0.04	0.00	0.00	0.00	0.04	0.00	123.52	2.76	4,480.70	0.76
Coniferous Dense	0.48	0.01	0.11	0.00	0.59	0.01	140.02	2.53	5,524.19	0.94
Coniferous Open	2.82	0.03	10.93	0.13	13.75	0.16	422.89	5.04	8,398.39	1.43
Coniferous Sparse	15.53	0.06	4.47	0.02	20.00	0.07	1,254.93	4.51	27,816.67	4.74
Exposed/Barren Land	18.42	0.08	50.87	0.21	69.29	0.28	1,440.93	5.87	24,530.40	4.18
Herbs	9.39	0.08	56.03	0.47	65.42	0.55	1,023.95	8.57	11,948.96	2.04
Mixedwood Dense	11.90	0.10	0.19	0.00	12.09	0.10	778.84	6.67	11,683.16	1.99
Mixedwood Open	0.78	0.04	0.71	0.04	1.49	0.09	46.44	2.68	1,734.62	0.30
Rock/Rubble	3.23	0.10	11.11	0.35	14.34	0.45	223.97	6.98	3,208.02	0.55
Shrub Low	117.18	0.13	249.80	0.28	366.98	0.41	7,206.89	7.99	90,253.20	15.38
Shrub Tall	36.46	0.09	143.91	0.34	180.37	0.42	3,184.20	7.49	42,520.72	7.24
Water	0.25	0.00	214.18	0.12	214.43	0.12	6,246.60	3.41	183,237.79	31.22
Wetland-Herb	3.50	0.02	75.36	0.37	78.86	0.39	1,243.54	6.16	20,174.71	3.44
Wetland-Shrub	9.70	0.06	17.40	0.12	27.10	0.18	1,027.61	6.85	15,005.99	2.56
Wetland-Treed	0.20	0.00	4.32	0.10	4.52	0.11	153.76	3.71	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00
Total	**378.67**	**0.06**	**1,305.08**	**0.22**	**1,683.75**	**0.29**	**34,216.05**	**5.83**	**587,002.91**	**100.00**

[1]Borrow Sources included are 170, 174, 177, 309 and 325/314 inside the CEA

[2]The Alternative 3 footprint overlaps with the Mackenzie Gas Project and the IKHIL Gas Pipeline footprints inside the CEA

[3]The Alternative 3 ZOI overlaps with the Mackenzie Gas Project and the IKHIL Gas Pipeline ZOIs inside the CEA

Table 2: All Projects - Inside Cumulative Effects Study Area

	All Projects (project footprint; no overlaps)		All Projects ZOI (1 km buffer; no overlaps)		Cumulative Effects Study Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	24.52	0.31	2,121.20	27.06	7,839.53	1.34
Broadleaf Open	6.04	0.23	660.69	25.06	2,636.80	0.45
Bryoids	778.07	0.64	19,956.09	16.38	121,865.61	20.76
Not Classified	1.51	0.03	958.80	21.40	4,480.70	0.76
Coniferous Dense	1.58	0.03	280.76	5.08	5,524.19	0.94
Coniferous Open	17.31	0.21	881.02	10.49	8,398.39	1.43
Coniferous Sparse	43.97	0.16	3,711.27	13.34	27,816.67	4.74
Exposed/Barren Land	107.09	0.44	4,063.85	16.57	24,530.40	4.18
Herbs	85.69	0.72	2,045.98	17.12	11,948.96	2.04
Mixedwood Dense	16.29	0.14	1,648.59	14.11	11,683.16	1.99
Mixedwood Open	2.50	0.14	144.37	8.32	1,734.62	0.30
Rock/Rubble	23.82	0.74	577.19	17.99	3,208.02	0.55
Shrub Low	448.63	0.50	13,316.67	14.75	90,253.20	15.38
Shrub Tall	220.59	0.52	5,707.57	13.42	42,520.72	7.24
Water	217.82	0.12	10,748.34	5.87	183,237.79	31.22
Wetland-Herb	102.15	0.51	2,081.98	10.32	20,174.71	3.44
Wetland-Shrub	30.00	0.20	1,766.99	11.78	15,005.99	2.56
Wetland-Treed	5.28	0.13	376.90	9.10	4,142.51	0.71
Snow/Ice	0.00	0.00	0.94	100.00	0.94	0.00
Total	**2,132.84**	**0.36**	**71,049.18**	**12.10**	**587,002.91**	**100.00**

Table 3: Tuktoyaktuk to 177 Access Road Footprint and Zone of Influence (1 km buffer)

Inside the Cumulative Effects Study Area

	Tuk to 177 Access Road (28 m)		Tuk to 177 Access Road ZOI[1] (1 km buffer)		Cumulative Effects Study Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.00	0.00	0.00	0.00	7,839.53	1.34
Broadleaf Open	0.00	0.00	0.00	0.00	2,636.80	0.45
Bryoids	0.93	0.00	109.82	0.09	121,865.61	20.76
Not Classified	0.00	0.00	0.00	0.00	4,480.70	0.76
Coniferous Dense	0.00	0.00	0.00	0.00	5,524.19	0.94
Coniferous Open	0.00	0.00	0.00	0.00	8,398.39	1.43
Coniferous Sparse	0.02	0.00	12.82	0.05	27,816.67	4.74
Exposed/Barren Land	10.74	0.04	327.58	1.34	24,530.40	4.18
Herbs	0.00	0.00	1.99	0.02	11,948.96	2.04
Mixedwood Dense	0.00	0.00	0.00	0.00	11,683.16	1.99
Mixedwood Open	0.00	0.00	0.00	0.00	1,734.62	0.30
Rock/Rubble	0.60	0.02	8.07	0.25	3,208.02	0.55
Shrub Low	0.95	0.00	65.91	0.07	90,253.20	15.38
Shrub Tall	0.14	0.00	22.49	0.05	42,520.72	7.24
Water	0.07	0.00	538.44	0.29	183,237.79	31.22
Wetland-Herb	1.56	0.01	41.70	0.21	20,174.71	3.44
Wetland-Shrub	0.05	0.00	20.12	0.13	15,005.99	2.56
Wetland-Treed	0.00	0.00	0.38	0.01	4,142.51	0.71
Snow/Ice	0.00	0.00	0.87	93.33	0.94	0.00
Total	**15.07**	**0.00**	**1,150.19**	**0.20**	**587,002.91**	**100.00**

[1]The Tuktoyaktuk to 177 Access Road ZOI overlaps with the Tuktoyaktuk Harbour Project ZOI inside the CEA

Table 4: IKHIL Pipeline Footprint and Zone of Influence (1 km buffer)

Inside the Cumulative Effects Study Area

	IKHIL Pipeline[1] (1 m)		IKHIL Pipeline ZOI[2] (1 km buffer)		Cumulative Effects Study Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.33	0.00	1,506.44	19.22	7,839.53	1.34
Broadleaf Open	0.22	0.01	424.25	16.09	2,636.80	0.45
Bryoids	0.87	0.00	1,321.53	1.08	121,865.61	20.76
Not Classified	0.56	0.01	951.99	21.25	4,480.70	0.76
Coniferous Dense	0.01	0.00	95.67	1.73	5,524.19	0.94
Coniferous Open	0.04	0.00	82.14	0.98	8,398.39	1.43
Coniferous Sparse	0.75	0.00	943.71	3.39	27,816.67	4.74
Exposed/Barren Land	0.27	0.00	353.18	1.44	24,530.40	4.18
Herbs	0.02	0.00	220.61	1.85	11,948.96	2.04
Mixedwood Dense	0.44	0.00	766.68	6.56	11,683.16	1.99
Mixedwood Open	0.00	0.00	43.74	2.52	1,734.62	0.30
Rock/Rubble	0.01	0.00	5.09	0.16	3,208.02	0.55
Shrub Low	0.67	0.00	1,029.95	1.14	90,253.20	15.38
Shrub Tall	0.08	0.00	382.85	0.90	42,520.72	7.24
Water	0.00	0.00	286.30	0.16	183,237.79	31.22
Wetland-Herb	0.00	0.00	73.68	0.37	20,174.71	3.44
Wetland-Shrub	0.01	0.00	117.42	0.78	15,005.99	2.56
Wetland-Treed	0.00	0.00	84.43	2.04	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.94	0.00
Total	**4.28**	**0.00**	**8,689.64**	**1.48**	**587,002.91**	**100.00**

[1]The IKHIL Gas Pipeline footprint overlaps with the Alternative 3 and Navy Road footprints inside the CEA

[2]The IKHIL Gas Pipeline ZOI overlaps with the Alternative 3, Navy Road, and South Parsons Lake Gas Supply Project ZOIs inside the CEA

Table 5: Mackenzie Gas Project Footprint Components and Zone of Influence (1 km buffer)

Inside the Cumulative Effects Study Area

	Pipeline[1]		Borrow Sources[2]		Infrastructure[3]		Total MGP Footprint[4]		MGP ZOI[5] (1 km buffer)		Cumulative Effects Study Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.01	0.36	7,839.53	1.34
Broadleaf Open	0.18	0.01	0.31	0.01	0.00	0.00	0.49	0.02	102.45	3.89	2,636.80	0.45
Bryoids	19.29	0.02	196.87	0.16	6.40	0.01	222.56	0.18	9,213.66	7.56	121,865.61	20.76
Not Classified	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61	0.04	4,480.70	0.76
Coniferous Dense	0.08	0.00	0.91	0.02	0.00	0.00	0.99	0.02	81.03	1.47	5,524.19	0.94
Coniferous Open	0.66	0.01	3.69	0.04	0.54	0.01	4.89	0.06	412.58	4.91	8,398.39	1.43
Coniferous Sparse	3.30	0.01	19.56	0.07	0.31	0.00	23.18	0.08	1,497.27	5.38	27,816.67	4.74
Exposed/Barren Land	4.30	0.02	25.13	0.10	1.50	0.01	30.93	0.13	1,629.17	6.64	24,530.40	4.18
Herbs	1.09	0.01	25.43	0.21	1.56	0.01	28.08	0.24	779.70	6.53	11,948.96	2.04
Mixedwood Dense	1.02	0.01	2.72	0.02	0.00	0.00	3.74	0.03	455.46	3.90	11,683.16	1.99
Mixedwood Open	0.07	0.00	1.07	0.06	0.00	0.00	1.15	0.07	57.15	3.29	1,734.62	0.30
Rock/Rubble	0.28	0.01	8.72	0.27	0.19	0.01	9.18	0.29	284.26	8.86	3,208.02	0.55
Shrub Low	8.59	0.01	82.09	0.09	10.00	0.01	100.68	0.11	4,791.25	5.31	90,253.20	15.38
Shrub Tall	3.19	0.01	44.78	0.11	9.10	0.02	57.07	0.13	2,198.64	5.17	42,520.72	7.24
Water	0.04	0.00	6.37	0.00	0.00	0.00	6.42	0.00	3,597.20	1.96	183,237.79	31.22
Wetland-Herb	0.31	0.00	27.88	0.14	0.25	0.00	28.44	0.14	736.64	3.65	20,174.71	3.44
Wetland-Shrub	0.45	0.00	2.96	0.02	0.00	0.00	3.42	0.02	595.69	3.97	15,005.99	2.56
Wetland-Treed	0.06	0.00	1.84	0.04	0.00	0.00	1.90	0.05	151.27	3.65	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00
Total	**42.91**	**0.01**	**450.35**	**0.08**	**29.84**	**0.01**	**523.09**	**0.09**	**26,613.02**	**4.53**	**587,002.91**	**100.00**

[1]Parsons Lake Lateral Route was assigned a footprint of 1 m wide; all other routes were assigned a footprint of 5 m wide

[2]Borrow Sources included originated from Imperial Oil and were provided by GNWT

[3]Infrastructure includes estimated footprints for Storm Hills Pigging Facility and Parsons Lake North and South Pads, based on the MGP EIS (2004)

[4]The MGP footprint overlaps with the Alternative 3 and South Parsons Lake Gas Supply Project footprints inside the CEA

[5]The MGP ZOI overlaps with the Alternative 3 and South Parsons Lake Gas Supply Project ZOIs inside the CEA

Table 6: South Parsons Lake Gas Supply Project Pipeline Footprint and Zone of Influence (1 km buffer)

Inside the Cumulative Effects Study Area

	SPL Pipeline[1] (1 m)		**SPL Pipeline ZOI[2] (1 km buffer)**		**Cumulative Effects Study Area**	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.00	0.00	1.02	0.01	7,839.53	1.34
Broadleaf Open	0.00	0.00	5.72	0.22	2,636.80	0.45
Bryoids	1.38	0.00	2,559.06	2.10	121,865.61	20.76
Not Classified	0.00	0.00	5.91	0.13	4,480.70	0.76
Coniferous Dense	0.00	0.00	3.35	0.06	5,524.19	0.94
Coniferous Open	0.01	0.00	32.58	0.39	8,398.39	1.43
Coniferous Sparse	0.16	0.00	257.50	0.93	27,816.67	4.74
Exposed/Barren Land	0.29	0.00	537.04	2.19	24,530.40	4.18
Herbs	0.10	0.00	128.82	1.08	11,948.96	2.04
Mixedwood Dense	0.02	0.00	30.81	0.26	11,683.16	1.99
Mixedwood Open	0.00	0.00	4.25	0.25	1,734.62	0.30
Rock/Rubble	0.07	0.00	107.33	3.35	3,208.02	0.55
Shrub Low	0.44	0.00	784.93	0.87	90,253.20	15.38
Shrub Tall	0.10	0.00	264.29	0.62	42,520.72	7.24
Water	0.02	0.00	646.11	0.35	183,237.79	31.22
Wetland-Herb	0.05	0.00	148.73	0.74	20,174.71	3.44
Wetland-Shrub	0.08	0.00	150.47	1.00	15,005.99	2.56
Wetland-Treed	0.00	0.00	15.13	0.37	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.94	0.00
Total	**2.70**	**0.00**	**5,683.07**	**0.97**	**587,002.91**	**100.00**

[1]The SPL Gas Supply Project footprint overlaps with the Mackenzie Gas Project footprint inside the CEA

[2]The SPL Gas Supply Project ZOI overlaps with the Mackenzie Gas Project and IKHIL Pipeline ZOIs inside the CEA

Table 7: Tuktoyaktuk Harbour Project Zone of Influence (1 km buffer)

Inside the Cumulative Effects Study Area

	Tuk Harbour ZOI[1] (1 km buffer)		Cumulative Effects Study Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.00	0.00	7,839.53	1.34
Broadleaf Open	0.00	0.00	2,636.80	0.45
Bryoids	13.20	0.01	121,865.61	20.76
Not Classified	0.06	0.00	4,480.70	0.76
Coniferous Dense	0.00	0.00	5,524.19	0.94
Coniferous Open	0.00	0.00	8,398.39	1.43
Coniferous Sparse	2.39	0.01	27,816.67	4.74
Exposed/Barren Land	82.95	0.34	24,530.40	4.18
Herbs	0.11	0.00	11,948.96	2.04
Mixedwood Dense	0.00	0.00	11,683.16	1.99
Mixedwood Open	0.00	0.00	1,734.62	0.30
Rock/Rubble	0.88	0.03	3,208.02	0.55
Shrub Low	12.94	0.01	90,253.20	15.38
Shrub Tall	12.24	0.03	42,520.72	7.24
Water	175.81	0.10	183,237.79	31.22
Wetland-Herb	10.16	0.05	20,174.71	3.44
Wetland-Shrub	2.32	0.02	15,005.99	2.56
Wetland-Treed	0.11	0.00	4,142.51	0.71
Snow/Ice	0.94	100.00	0.94	0.00
Total	**314.12**	**0.05**	**587,002.91**	**100.00**

[1]The Tuktoyaktuk Harbour Project ZOI overlaps with the Tuktoyaktuk to 177 Access Road ZOI inside the CEA

Table 8a: Navy Road Footprint and Zone of Influence (1 km buffer)

Inside the Cumulative Effects Study Area

	Navy Road[1] (28 m)		Navy Road ZOI[2] (1 km buffer)		Cumulative Effects Study Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.07	0.00	14.78	0.19	7,839.53	1.34
Broadleaf Open	0.00	0.00	2.33	0.09	2,636.80	0.45
Bryoids	0.00	0.00	1.43	0.00	121,865.61	20.76
Not Classified	0.95	0.02	53.51	1.19	4,480.70	0.76
Coniferous Dense	0.00	0.00	0.13	0.00	5,524.19	0.94
Coniferous Open	0.00	0.00	0.58	0.01	8,398.39	1.43
Coniferous Sparse	0.08	0.00	0.68	0.00	27,816.67	4.74
Exposed/Barren Land	0.00	0.00	1.64	0.01	24,530.40	4.18
Herbs	0.00	0.00	0.00	0.00	11,948.96	2.04
Mixedwood Dense	0.00	0.00	2.54	0.02	11,683.16	1.99
Mixedwood Open	0.00	0.00	0.00	0.00	1,734.62	0.30
Rock/Rubble	0.00	0.00	0.00	0.00	3,208.02	0.55
Shrub Low	0.00	0.00	0.24	0.00	90,253.20	15.38
Shrub Tall	0.00	0.00	0.00	0.00	42,520.72	7.24
Water	0.00	0.00	0.06	0.00	183,237.79	31.22
Wetland-Herb	0.00	0.00	0.06	0.00	20,174.71	3.44
Wetland-Shrub	0.00	0.00	0.00	0.00	15,005.99	2.56
Wetland-Treed	0.00	0.00	0.00	0.00	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.94	0.00
Total	**1.10**	**0.00**	**77.98**	**0.01**	**587,002.91**	**100.00**

[1]The Navy Road footprint overlaps with the IKHIL Pipeline footprint inside the CEA

[2]The Navy Road ZOI overlaps with the IKHIL Pipeline ZOI inside the CEA

Table 8b: Navy Road Footprint and Zone of Influence (1 km buffer)

Outside the Cumulative Effects Study Area

	Navy Road (28 m)	Navy Road ZOI[1] (1 km buffer)
	Area (ha)	Area (ha)
Broadleaf Dense	0.25	68.80
Broadleaf Open	0.17	16.81
Bryoids	0.41	11.63
Not Classified	6.75	558.81
Coniferous Dense	0.05	49.97
Coniferous Open	0.55	16.70
Coniferous Sparse	1.58	46.14
Exposed/Barren Land	0.46	58.32
Herbs	0.00	1.06
Mixedwood Dense	1.07	52.57
Mixedwood Open	0.00	5.57
Rock/Rubble	0.00	5.19
Shrub Low	0.63	51.16
Shrub Tall	0.45	8.48
Water	0.00	73.12
Wetland-Herb	0.04	13.18
Wetland-Shrub	0.00	19.04
Wetland-Treed	0.00	2.17
Snow/Ice	0.00	0.00
Total	**12.43**	**1,058.70**

[1]The Navy Road ZOI overlaps with the Alternative 3 ZOI outside the CEA

Table 9: Alternative 3 Overlaps with IKHIL Gas Pipeline

Inside the Cumulative Effects Study Area

	Footprint Overlaps with the IKHIL Gas Pipeline		ZOI (1 km buffer) Overlaps with the IKHIL Gas Pipeline		Cumulative Effects Study Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.01	0.00	633.95	8.09	7,839.53	1.34
Broadleaf Open	0.00	0.00	189.59	7.19	2,636.80	0.45
Bryoids	0.00	0.00	6.81	0.01	121,865.61	20.76
Not Classified	0.00	0.00	122.86	2.74	4,480.70	0.76
Coniferous Dense	0.00	0.00	38.00	0.69	5,524.19	0.94
Coniferous Open	0.00	0.00	24.67	0.29	8,398.39	1.43
Coniferous Sparse	0.02	0.00	197.93	0.71	27,816.67	4.74
Exposed/Barren Land	0.00	0.00	2.53	0.01	24,530.40	4.18
Herbs	0.00	0.00	0.86	0.01	11,948.96	2.04
Mixedwood Dense	0.01	0.00	369.16	3.16	11,683.16	1.99
Mixedwood Open	0.00	0.00	1.76	0.10	1,734.62	0.30
Rock/Rubble	0.00	0.00	0.00	0.00	3,208.02	0.55
Shrub Low	0.00	0.00	9.02	0.01	90,253.20	15.38
Shrub Tall	0.00	0.00	1.95	0.00	42,520.72	7.24
Water	0.00	0.00	86.38	0.05	183,237.79	31.22
Wetland-Herb	0.00	0.00	6.40	0.03	20,174.71	3.44
Wetland-Shrub	0.00	0.00	23.00	0.15	15,005.99	2.56
Wetland-Treed	0.00	0.00	4.47	0.11	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.94	0.00
Total	**0.05**	**0.00**	**1,719.34**	**0.29**	**587,002.91**	**100.00**

Table 10: Alternative 3 Overlaps with Mackenzie Gas Project

Inside the Cumulative Effects Study Area

	Footprint Overlaps with the Mackenzie Gas Project		ZOI (1 km buffer) Overlaps with the Mackenzie Gas Project		Cumulative Effects Study Area	
	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area	Area (ha)	% of Cumulative Effects Area
Broadleaf Dense	0.00	0.00	0.75	0.01	7,839.53	1.34
Broadleaf Open	0.00	0.00	3.86	0.15	2,636.80	0.45
Bryoids	32.70	0.03	247.02	0.20	121,865.61	20.76
Not Classified	0.00	0.00	0.00	0.00	4,480.70	0.76
Coniferous Dense	0.00	0.00	1.31	0.02	5,524.19	0.94
Coniferous Open	1.38	0.02	37.27	0.44	8,398.39	1.43
Coniferous Sparse	0.19	0.00	57.07	0.21	27,816.67	4.74
Exposed/Barren Land	4.43	0.02	152.85	0.62	24,530.40	4.18
Herbs	7.93	0.07	79.29	0.66	11,948.96	2.04
Mixedwood Dense	0.00	0.00	14.04	0.12	11,683.16	1.99
Mixedwood Open	0.14	0.01	3.41	0.20	1,734.62	0.30
Rock/Rubble	0.37	0.01	1.91	0.06	3,208.02	0.55
Shrub Low	21.08	0.02	381.68	0.42	90,253.20	15.38
Shrub Tall	17.17	0.04	240.54	0.57	42,520.72	7.24
Water	3.12	0.00	335.21	0.18	183,237.79	31.22
Wetland-Herb	6.76	0.03	91.04	0.45	20,174.71	3.44
Wetland-Shrub	0.65	0.00	52.61	0.35	15,005.99	2.56
Wetland-Treed	1.14	0.03	18.14	0.44	4,142.51	0.71
Snow/Ice	0.00	0.00	0.00	0.00	0.94	0.00
Total	**97.06**	**0.02**	**1,717.99**	**0.29**	**587,002.91**	**100.00**