

16 Marine Mammals

This section addresses the potential effects of routine Program activities on marine mammal distributions and populations.

16.1 Baseline Conditions

Four marine mammal species were selected as VECs for this assessment:

- the beluga whale and the subsistence hunt for beluga whale
- bowhead whales
- ringed seals
- polar bears

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) lists the bowhead whale as ‘endangered’ and the polar bear in the ‘special concern’ risk category (COSEWIC 2003). Under the *Species at Risk Act (SARA)*, bowhead whale is listed, on Schedule 2, as endangered, while polar bear is listed on Schedule 3 as Special Concern (Section 5.3: Species at Risk Act). Polar bear may be added to Schedule 1 as a Species of Special Concern. Should this occur, the federal government would draft a management plan for polar bear within three years of listing on Schedule 1, at which time mitigative measures for individuals and habitat may be determined.

Bearded seals and Arctic fox, a terrestrial species that ventures out onto the landfast ice in winter and spring, might also be present near Devon’s drilling operations.

16.1.1 Beluga Whale

The Beaufort Sea beluga whale population represents one of the largest stocks of beluga whales in Canada, and many of the whales from this stock concentrate in summering areas in the Mackenzie River estuary. The residents of Aklavik, Tuktoyaktuk and Inuvik undertake an annual subsistence hunt for these whales. The hunt has been monitored since 1977, and conservation measures are outlined in the *Beaufort Sea Beluga Management Plan* (Fisheries Joint Management Committee [FJMC] 2001).

The beluga whale has a northern circumpolar distribution ranging south into the subarctic. The eastern Beaufort Sea stock that summers in the Canadian Beaufort Sea is one of at least five stocks that make up the Bering-Chukchi-Beaufort Sea (BCB) population of beluga whales. The eastern Beaufort Sea stock is not listed as a ‘species of concern’ by COSEWIC (2003), nor is it designated as a strategic stock by the United States National Marine Fisheries Service (NMFS).

Beluga whales of the eastern Beaufort Sea stock migrate annually between the eastern Beaufort Sea and Amundsen Gulf, where they reside in summer, to the Bering Sea where they winter (Finley et al. 1987). The spring migration occurs primarily in April and May through leads offshore from the northern coast of Alaska (Figure 16-1). Beluga whales begin arriving in the Canadian Beaufort Sea in mid-May and in the Mackenzie River estuary typically in late June or early July (FJMC 2001). After arrival, beluga whales concentrate in the generally ice-free Mackenzie River estuary from late June to mid-July, but others move to the Amundsen Gulf and Viscount Melville Sound, and some return to the Mackenzie Delta or offshore waters north of the Mackenzie Delta. By late July and early August, relatively few whales are present in the estuary. Within the Mackenzie River estuary, beluga whales concentrate in three main areas: the Mackenzie Bay and Shallow Bay area, the Kendall Island area (i.e., near Kendall, Garry and Pelly Islands), and Kugmallit Bay area (i.e., near

Hendrickson Island) (Fraker 1977, 1978; Fraker and Fraker 1979, 1981; Harwood et al. 1996) (Figure 16-1). These areas comprise the 1A zones identified in the Beaufort Sea Beluga Management Plan (FJMC 2001).

The relative abundance of beluga whales in the concentration areas varies from year to year. As many as 7000 beluga whales have been estimated to be present in the Mackenzie River estuary at one time. Relatively high numbers of beluga whales were sighted in and near EL 420 during aerial surveys that were flown in conjunction with Devon's marine seismic program (late July 2001) and during the Devon baseline surveys (early July 2002) (Holst et al. 2002; LGL Limited and KAVIK-AXYS Inc. 2004b).

16.1.2 Bowhead Whale

The bowhead whale population that inhabits the BCB (i.e., the Western Arctic stock) is currently listed as 'endangered' under the *United States Endangered Species Act* and by COSEWIC (2003), and is classified as a 'strategic stock' by the NMFS (Angliss et al. 2001). Under the *SARA*, bowhead whale is listed on Schedule 2 as endangered. The most recent population estimate, based on 2001 census data, is 10,020 individuals (George et al. 2002).

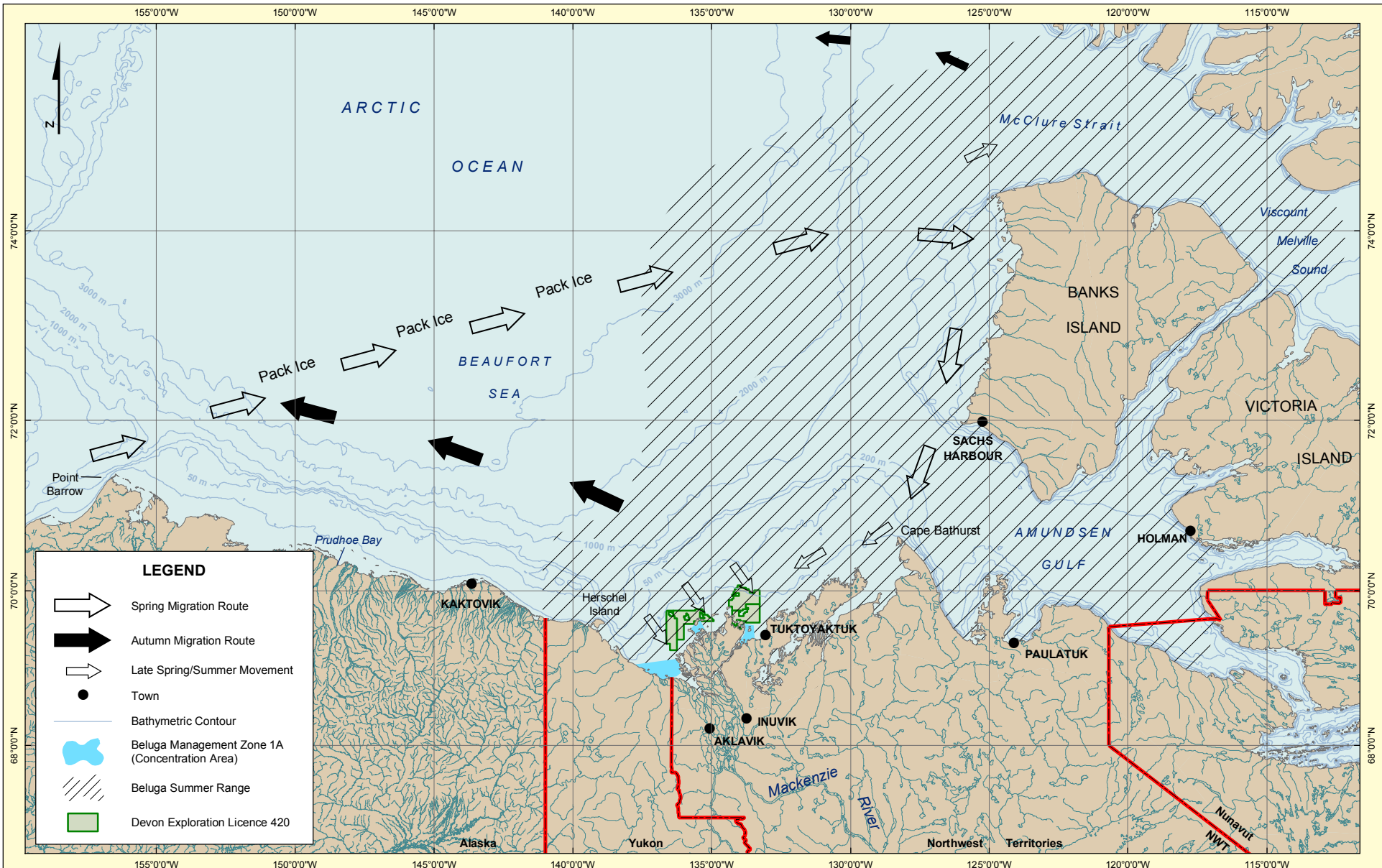
Bowhead whales of the BCB stock winter in the central and western Bering Sea, and most of the stock summers in the Canadian Beaufort Sea and Amundsen Gulf (Figure 16-2) (Moore and Reeves 1993). The spring migration across the western Beaufort Sea occurs through offshore ice leads, generally from mid-April to mid-June (Braham et al. 1984; Moore and Reeves 1993). The distribution of bowhead whales in the Canadian Beaufort Sea in June and early July is poorly known, although it is believed that whales remain in the area of the offshore pack ice. Bowhead whales begin to move gradually from the offshore pack ice toward coastal and nearshore areas during late July to mid-August (Davis et al. 1982). Not all segments of the population follow these patterns every year. The fall migration of bowhead whales out of the Canadian Beaufort Sea begins in early September with the last animals leaving by late October (Figure 16-2).

No bowhead whales were sighted during the two marine mammal surveys conducted by Devon in the first half of July 2002 or during the aerial surveys for birds that were conducted by Devon along coasts and in nearshore waters in the study area later in summer 2002 (LGL Limited and KAVIK-AXYS Inc. 2004b). Bowhead whales were frequently seen during the marine seismic surveys conducted in EL 420 during 2001 (Holst et al. 2002).

16.1.3 Ringed Seal

Ringed seals and polar bears are the only two marine mammal species that commonly overwinter in landfast ice regions of the Beaufort Sea. Ringed seals are an important element of the arctic marine ecosystem, being a major consumer of marine fish and invertebrates and the main prey of polar bears. They are an important species in the subsistence hunts and economy of Tuktoyaktuk and several other ISR communities, although harvests and harvesting activity are considerably lower than they were in the past (Tuktoyaktuk Community Conservation Plan 2000).

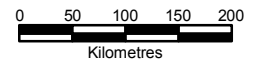
Ringed seals have a continuous northern circumpolar distribution. In the Canadian Arctic, they are not considered to be at risk (COSEWIC 2003). Ringed seals are year-round residents of the Beaufort Sea, and are the most abundant species of marine mammal in the region. Stirling and Øritsland (1995) estimated that there are approximately 650,000 ringed seals in the Beaufort Sea and Amundsen Gulf.



KA036 - Beluga Migration Routes
June 23, 2004

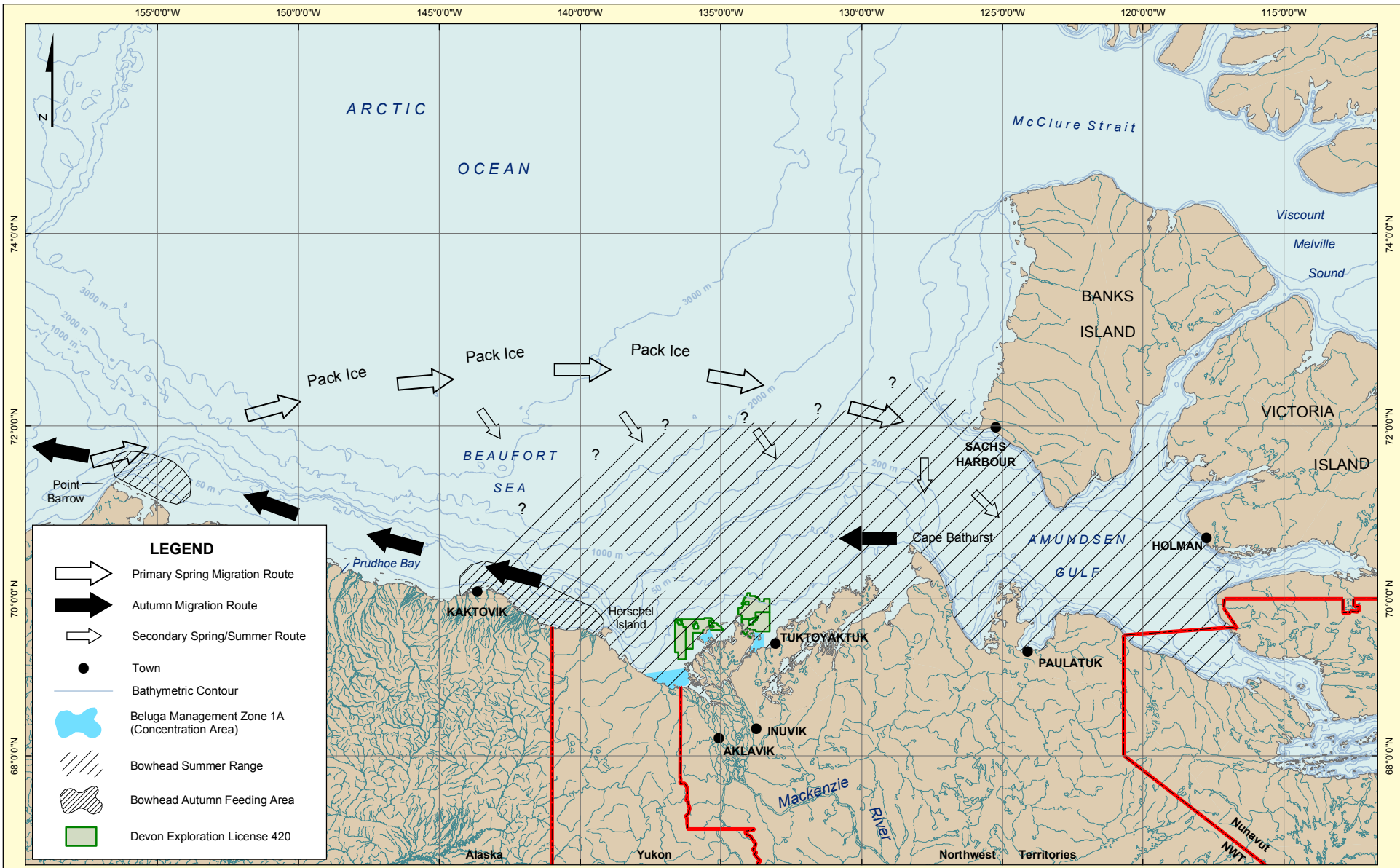


Area of Detail



Data Sources:
LGL Ltd.
Digital Chart of the World
National Energy Board
Projection: World Mercator (WGS84)

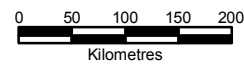
Figure 16-1
General Migration Routes
and Summer Range of
Beluga Whales in the Beaufort Sea



KA036 - Bowhead Migration Routes
June 23, 2004



Area of Detail



Data Sources:
LGL Ltd.
Digital Chart of the World
National Energy Board
Projection: World Mercator (WGS84)

Figure 16-2
General Migration Routes
and Summer Range of
Bowhead Whales in the Beaufort Sea

During winter, ringed seals occupy landfast ice and offshore pack ice. From mid-May through early June, ringed seals in the Beaufort Sea haul out on top of the ice to moult. During summer, ringed seals are dispersed throughout open-water areas, although in some regions, they move into coastal waters.

The marine mammal monitoring program conducted by Devon in and near EL 420, in late July to early October 2001 and August 2002, found ringed seals to be present throughout the study periods, although there was an apparent decline in sighting rates late in the season during 2001 (Moulton et al. 2002; Miller and Moulton 2003). Small numbers of ringed seals were recorded during the July 2002 aerial surveys (LGL Limited and KAVIK-AXYS Inc. 2004b). Field studies in the spring of 2003, which focused on the Paktoa drill site, found a density of active seal structures (i.e., holes and lairs) of 1.4/ km² (Smith and Harwood 2003). During aerial surveys flown in June 2003 offshore of the Mackenzie Delta, including the Paktoa drill site location, hauled out ringed seals were found in a density of 0.13 seals/km² (Smith and Harwood 2003).

16.1.4 Polar Bear

Polar bears are also present in the Program area during winter. They are listed in the ‘special concern’ risk category by COSEWIC (2003). Under SARA, polar bear are listed on Schedule 3 as Special Concern, and they may be added to Schedule 1 as a Species of Special Concern. Residents of Tuktoyaktuk, Aklavik and Inuvik conduct guided hunts for polar bears that contribute substantially to the local economy. Some of these hunts are conducted near EL 420.

Polar bears are distributed throughout the circumpolar Arctic in relatively discrete populations (Lunn et al. 2002). The southern Beaufort Sea population is one of 20 recognized worldwide. This population is subject to a joint management agreement between Alaskan Inupiat and Canadian Inuvialuit and is estimated to contain 1800 animals (Lunn et al. 2002). The population is thought to be stable or increasing slowly (Stirling and Taylor 1999).

Most polar bears of the Southern Beaufort Sea stock are found on the sea ice (Amstrup 2000). Polar bears migrate south and north each year with the advance and retreat of sea ice. In summer, when the pack ice retreats offshore, they are found along the edge of the pack ice (DeMaster and Stirling 1981; Amstrup 1995). During the winter, female polar bears concentrate along the northern coastline for denning and feeding; then, they retreat northward with the ice during the summer (Amstrup and Gardner 1994). During years with little or no pack ice near the coast, polar bears are often found along the coastline and on barrier islands. Polar bears usually exhibit fidelity to spring feeding and denning areas (Ramsay and Stirling 1990; Wiig 1995; Born et al. 1997).

Approximate locations of confirmed and suspected polar bear maternity den sites in the Beaufort Sea region are mapped in Figure 16-3 for the period 1981 to 1999. Confirmed maternity den sites have been located in or near EL 420.

16.1.5 Arctic Fox

Although they are not identified as a VEC, Arctic fox are probably the only other mammal species (aside from polar bear and ringed seal) that might be present near the exploration drilling sites during winter and early spring. Although primarily a terrestrial species, many Arctic foxes venture out onto the sea ice during the winter and spring months where they are known to scavenge on the remains of seals killed by polar bears (Stirling and Smith 1977). Studies in the western Arctic (i.e., Amundsen Gulf, south of Banks Island) have also documented the role of Arctic foxes as significant predators of ringed seal pups during March–June (Smith 1976).

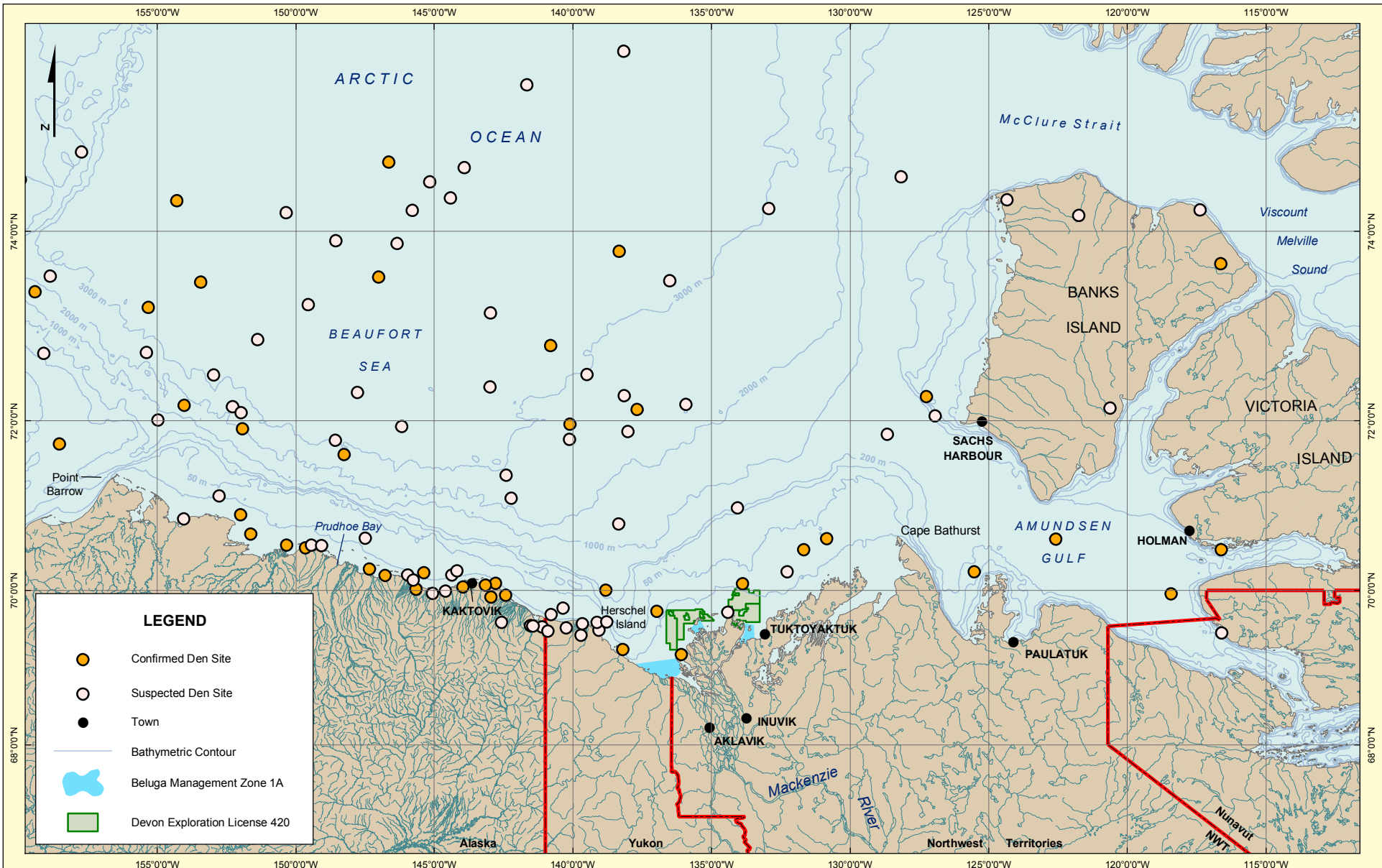


Figure 16-3

Approximate Locations of Confirmed and Suspected Polar Bear Maternal Den Sites in the Beaufort Sea, 1981 to 1999

(Data Provided by the Alaska Science Center, US Geological Survey)

devon
 KA036 - Map
 Marine Mammal Fig 16-4
 June 23, 2004



Data Sources:
 Alaska Science Center (USGS)
 Digital Chart of the World
 Projection: World Mercator (WGS84)

Field studies conducted in the spring of 2003 in a 35.6-km² area centred on the proposed Paktoa drill site found that fox predation in the area appeared to be low (Smith and Harwood 2003).

16.2 Impact Assessment

The LSA encompasses all of EL 420 and the area between the Eastern and Western Blocks, as well as the areas between EL 420 and the outer edge of the Mackenzie Delta. This is the area where most of the open-water activities that could affect marine mammals will occur. The RSA includes all of the marine habitat and coastline in the area bounded by Phillips Bay in the west, McKinley Bay in the east and out to the 30 m bathymetric contour. This study area includes EL 420, and the Kendall Island, Kugmallit Bay, and Mackenzie Bay/Shallow Bay 1A Beluga Management Zones. It also includes the area in which the marine mammal aerial survey transects were flown in 2002 (LGL Limited and KAVIK-AXYS Inc. 2004b). The RSA encompasses areas of marine mammal migration and areas of potential impacts (e.g., from vessel movements) on marine mammals in the broader area surrounding EL 420.

Based on quantitative studies and predictive modeling of noise levels and other potential disturbances, potential impacts were identified and assessed using a combination of quantitative and qualitative criteria. Impacts of the Program are characterized in terms of the following potential effects on marine mammal habitats and populations:

- change in the abundance or distribution of VECs
- change in the distribution or abundance of the prey species, habitats or both used by VECs
- change in Inuvialuit hunting activities

The direction, magnitude, geographic extent and duration of effects are characterized using the criteria in Table 16-1.

An effect is significant if the rating for magnitude is high, the extent is regional or subregional and the duration is medium or long term. A moderate effect would also be significant if it is regional or subregional, and if it is long term.

Devon's drilling Program will occur mainly during the ice-covered season. As a result, ringed seals and polar bears would normally be the only marine mammal VECs present within EL 420 (Figure 16-4). Arctic foxes, a terrestrial species that ventures out onto the fast ice in winter and spring, might also be present near drilling operations. Thus, many impacts and interactions (e.g., noise, vibration, routine discharges) associated with normal drilling operations within the landfast ice zone would be restricted to those species.

Bowhead whales and beluga whales are not present within the landfast ice during the planned winter drilling season. However, longer-term impacts and interactions (e.g., the physical presence of the drilling structure during cold or warm storage, discharge of drilling muds and cuttings, and accidental spills or blowouts [Section 22.3.1 and 22.3.2]) might potentially affect these species, as well as ringed seals and polar bears. Some operations associated with the establishment of the drilling site (e.g., towing of the drilling platform during the open-water season, supply barge movements and staging) could also potentially affect most of the above-noted species (Figure 16-4).

Table 16-1 Effect Attributes for Marine Mammals

Direction	
Positive	Change in the VEC is perceived as beneficial
Neutral	Change in the VEC is not detectable
Negative	Change in the VEC is perceived as detrimental
Magnitude	
Negligible	Impacts would result in very minimal or no effects on species population levels, habitat carrying capacity or both
Low	Impacts would be restricted to a less than 1% change in species' population levels and/or habitat carrying capacity, or only slightly affect the subsistence resource involved
Moderate	Impacts would result in a 1% to 10% change in species' population levels and/or habitat carrying capacity, or noticeably affect the subsistence resource involved; impacts would be socially tolerated
High	Impacts would result in a greater than 10% change in species' population levels and/or habitat carrying capacity, or affect the subsistence resource to an extent that is not socially tolerated
Geographic Extent	
Local	Impacts are limited to the project footprint or immediate area of the project operations (within 1 km)
Subregional	Impacts may extend beyond the limits of the project operations but are limited to the project vicinity, from 1 km to 50 km of the project operations
Regional	Impacts may extend beyond 50 km from the project operations to the RSA
Duration	
Immediate	Impact duration is limited to two days or less
Short term	Impact duration is longer than two days but less than one year
Medium term	Impact duration is one year or longer but less than ten years
Long term	Impact duration extends ten years or longer

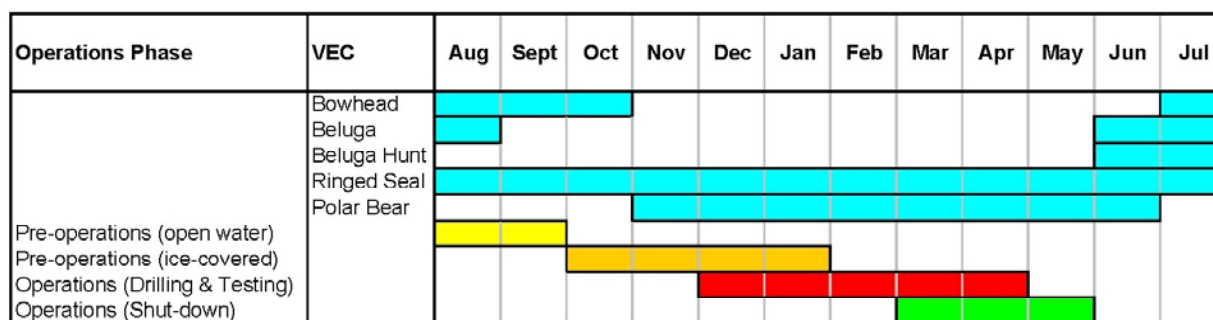


Figure 16-4 Marine Mammal Occupation of Devon Study Area During Phases of the Program

The following Program activities could affect marine mammal VECs:

- marine vessel movements
- establishment of barge staging area
- helicopter overflights
- construction of ice pads, airstrips and ice road
- drilling activities
- waste disposal

Marine vessel traffic may affect marine mammals. Most species will avoid marine vessels (beluga and bowhead whales) or will not be affected. Impacts will be reduced if the vessels steer a straight course and maintain a constant slow speed whenever possible, which will generally be the case for this Program. In an effort to avoid potential conflicts with the Inuvialuit traditional beluga hunt, the towing of the SDC is scheduled to begin from Herschel Island in early to mid-August, when relatively few beluga occupy the nearshore waters of the Mackenzie Delta and most whale hunting activity is over. Therefore, the effects on marine mammals of vessel traffic associated with the pre-operations phase are expected to be low, short term and subregional and are expected to be not significant.

During the open water period, air traffic is expected to be limited to a small number of helicopter flights to and from the drilling platform. Although a higher proportion of beluga than bowhead exhibited some overt reaction to passing aircraft, these reactions were typically brief and resulted in minor behavioural changes, and probably are of no lasting consequences to the animals (Richardson et al. 1995). Behavioural effects of single, low-level overflights are probably also not biologically significant to bowhead whales (Richardson et al. 1995). Impacts of aircraft disturbance will be mitigated by flying, when weather conditions permit, at minimum altitudes of 600 m (2000 ft), which are unlikely to disturb bowhead whales. The majority of helicopter flights will be conducted after the end of July, to avoid the peak period of beluga use of the Mackenzie River estuary and beluga concentration areas. Aircraft will be prohibited from flying low for wildlife viewing or photography. Such measures will reduce effects on beluga whale and bowhead whale behaviour to low, short term and local. These effects are expected to be not significant.

Construction of the areas for the ice pad and airstrip (1500 m x 60 m) are expected to affect a relatively small area. Ringed seals and polar bears will be the only marine mammals present during the period when ice pads are being constructed. These species are expected to avoid the construction site, and only a small number of ringed seals are expected to be displaced. Assuming that seals within one kilometre of the landing strip would be disturbed, then a seal habitat area of 7.2 km² would be affected. However, the temporary displacement of seals from this habitat will probably not have any lasting effects on the displaced individuals or the ringed seal population as a whole. Therefore, the effect of construction activities on these marine species is expected to be low, short term, local and not significant.

Program-related effects on ringed seals, polar bears, and Arctic foxes during the operations phase will be limited mainly to noise and disturbance effects associated with well drilling, testing and aircraft support. However, there also would be the continuing loss of a small amount of marine mammal habitat due to the presence of the ice pads, ice landing strips and the physical presence of the SDC or LTD. In water, noise levels from the drilling operations are mostly low frequency and are below the best hearing frequencies of ringed seals. In addition, the levels are not particularly loud. Therefore, the effects on ringed seals of underwater noise from the drilling operations will be minimal. Underwater noise will have no effects on the other winter residents, polar bears and Arctic foxes, which remain on the surface of the landfast ice.

Aircraft disturbance is expected to have some effect on ringed seals. Reactions to overflights are expected to be limited to a brief alert or startle response and sometimes a hasty dive as the aircraft flies over. Those reactions would have little consequence for individual ringed seals or their populations.

The discharge of drilling muds and cuttings, and the discharge of other fluids and solids could potentially affect marine mammals. Drilling muds, drill cuttings, sewage, grey water and brine will be injected under the ice surface in winter. The waste stream will meet or exceed federal and territorial guidelines for treatment and toxicity prior to release and will be further dispersed and diluted by the discharge pipe under the ice (Section 11.2: Impact Assessment). Effects of the

disposal of drilling muds, cuttings and other fluids on ringed seals and polar bears are expected to be not significant.

Polar bears can be attracted to oil and gas operations because of novel sights, sounds, and smells; the presence of food and garbage; and shelter from the elements (Shideler 1993). Guidelines will be developed to minimize human-bear interactions at the drill site (Table 16-3). Adherence to these guidelines will reduce the risk of increased mortality of polar bears because of polar bear-human interactions and killing of bears in defence of life or property. In the unlikely event that a polar bear is killed during Program operations, Devon will compensate the affected HTC for the value of the lost animal. Effects on polar bears, therefore, are expected to be low, short term, local and not significant.

The effects of Program activities on marine mammals are summarized in Table 16-2.

16.3 Mitigation Measures

Mitigation measures for effects of the Program on marine mammals are summarized in Table 16-3.

16.4 Residual Program Effects and Significance

None of the residual effects is rated as higher than low, short term and subregional. The likelihood of sustained interactions with Program activities is low and mitigation measures will be developed to the satisfaction of local regulatory and co-management bodies. Thus, residual Program effects on marine mammals are expected to be not significant.

16.5 Cumulative Effects and Significance

Marine activities within the vicinity of the proposed Program include seismic activity that occurred from 1965 through to 1992 and more recently in 2001 and 2002. Vessel traffic involved in community resupply, scientific research voyages and the annual hunting of marine mammals is present during most years.

The effects of the Program on marine mammals are anticipated to be low in magnitude, short term in duration, and local to subregional in extent. Some of these Program effects (e.g., vessel and aircraft disturbance) will overlap with other ongoing effects (e.g., other vessel traffic, aircraft overflights, annual hunting). As a result, there is the potential for cumulative effects in the RSA. However, given the low levels of activity and the expected low levels of interactions with marine mammals, these potential cumulative effects are not expected to result in measurable effects on marine mammals.

There are no other known drilling or seismic programs planned at this time. Therefore, there is no overlap of the Program with other planned projects. However, even if other programs were planned for a similar period within the RSA, it is unlikely that another one or two exploration programs of a comparable scale would lead to significant cumulative effects for marine mammals, based on experience in the Alaskan Beaufort Sea.

Table 16-2 Program Effects on Marine Mammals

Potential Effect	Interaction with VEC	Level of Effect ¹				Effect Significance ²	
		Direction	Magnitude	Extent	Duration	Program-related Effect	Cumulative Effect
Pre-operations							
Noise and disturbance from marine vessel movements	<ul style="list-style-type: none"> Small numbers of beluga and bowhead whales may be in the RSA during platform mobilization in late summer. Operations will be planned to avoid the peak beluga hunting period 	Negative	Low	Subregional	Short term	Not significant	Not significant
	<ul style="list-style-type: none"> Minimal disturbance of ringed seals 	Negative	Negligible	Sub regional	Immediate	Not significant	Not significant
Disturbance due to establishment of barge staging area	<ul style="list-style-type: none"> Scheduling and barge travel will minimize potential for impact on whales. Areas will be located outside of Beluga 1A zones 	Negative	Low	Local	Short term	Not significant	Not significant
Disturbance of marine mammals by aircraft overflights	<ul style="list-style-type: none"> Small numbers of beluga and bowhead whales may be in the RSA during aircraft movements in late summer. Flights will be planned to avoid the peak beluga hunting period. Flight paths and elevations will minimize potential effects 	Negative	Low	Local	Short term	Not significant	Not significant
	<ul style="list-style-type: none"> Ringed seals will be present during ice-cover conditions 	Negative	Low	Local	Short term	Not significant	Not significant
Construction of ice pads and airstrips	<ul style="list-style-type: none"> Small numbers of seals (i.e., 2-7 animals) may be displaced by ice pad and ice island construction Seals may be displaced from another 7.2 km² of habitat due to airstrip construction and operations disturbance Disturbance of polar bear habitat; attraction to drill site 	Negative	Low	Local	Short term	Not significant	Not significant
Construction of ice road for ice island platform	<ul style="list-style-type: none"> Additional displacement of seals along ice road corridor Additional disturbance of polar bear habitat 	Negative	Low	Sub regional	Short term	Not significant	Not significant
Operations							
Disturbance from drilling activities and shutdown	<ul style="list-style-type: none"> Effects on seals similar to ice pad construction If polar bears are displaced from drill site due to noise disturbance or displacement of seals, this would represent a very small area of their total range Arctic fox may be displaced (due to displacement of seals) or attracted to site. Very small numbers of animals affected 	Negative	Low	Local	Short term	Not significant	Not significant

Table 16-2 Program Effects on Marine Mammals (cont'd)

Potential Effect	Interaction with VEC	Level of Effect ¹				Effect Significance ²	
		Direction	Magnitude	Extent	Duration	Program-related Effect	Cumulative Effect
Operations (cont'd)							
Wastes attracting wildlife, especially polar bear, potential for bear kill	<ul style="list-style-type: none"> Mitigation measures to minimize attraction and protocols for managing polar bears in the vicinity of camps (reduce risk of need for a polar bear kill in defence of life and property [DLP]) will reduce potential impact HTCs will be compensated for any loss of tags due to DLP kills 	Negative	Negligible	Local	Short term	Not significant	Not significant
Under ice waste disposal and air emissions	<ul style="list-style-type: none"> Liquid wastes non-toxic in receiving water (Section 11: Chemical Oceanography). No significant effects on water quality, plankton, benthos or fish (Sections 12 to 14); therefore no direct or indirect effects on marine mammals Effects of air emissions are localized and short term with little or no interactions with marine mammals 	Negative	Negligible	Local	Immediate	Not significant	Not significant
Presence of platform structures (SDC, LTD) during shutdown	<ul style="list-style-type: none"> Platforms occupy very small footprint within available habitat – little or no disturbing activities on board 	Negative	Negligible	Local	Short term	Not significant	Not significant
Closure							
Potential storage of SDC or LTD platforms	<ul style="list-style-type: none"> Platforms occupy very small footprint within available habitat; site selection will avoid sensitive habitat; little or no disturbing activities on board 	Negative	Negligible	Local	Short term	Not significant	Not significant

- Notes:**
- 1 Based on criteria in Table 16-1
 - 2 Based on criteria in Section 16.2

Table 16-3 Mitigation Measures for Effects on Marine Mammals

Potential Effect	Mitigation Measures
<ul style="list-style-type: none"> Disturbance from marine vessel movements for platform supply and movement of SDC and LTD to drill site during pre-operations 	<ul style="list-style-type: none"> Restrict timing of vessel movements to after late July period, when few beluga are present and the beluga hunt has typically been completed Meet with the local HTC and the appropriate Inuvialuit co-management organizations to discuss Program schedules and determine appropriate mitigation prior to mobilization Marine vessels to maintain straight course and a slow, steady speed as much as possible
<ul style="list-style-type: none"> Disturbance from helicopter flights to and from SDC and LTD during pre-operations 	<ul style="list-style-type: none"> Use of recommended flight routes and minimum altitudes (600 m when possible) to minimize wildlife disturbance.
<ul style="list-style-type: none"> Disturbance from establishment of barge staging area for ice island platform 	<ul style="list-style-type: none"> Restrict barge movements to late August when beluga have left and the whale hunt is over Meet with the local HTC and the appropriate Inuvialuit co-management organizations to discuss sites and avoid sensitive area (Beluga 1A zones)
<ul style="list-style-type: none"> Disturbance from construction of ice pad and landing strip for all platforms, ice road for ice island during pre-operations 	<ul style="list-style-type: none"> Timing of construction operations will limit the number of species impacted
<ul style="list-style-type: none"> Disturbance from aircraft flights (Hercules Transport, heavy-lift helicopters, small fixed wing, helicopter) to platforms during pre-operations and operations 	<ul style="list-style-type: none"> Use of recommended flight routes and minimum altitudes (600 m when possible) to minimize wildlife disturbance
<ul style="list-style-type: none"> Disturbance from drilling operations 	<ul style="list-style-type: none"> Timing of drilling operations will restrict the number of species impacted by drilling operations and associated activities
<ul style="list-style-type: none"> Wildlife attraction to camp, especially polar bears with increased risk of DLP kills 	<ul style="list-style-type: none"> Use of an Inuvialuit wildlife monitor and an environmental monitor to ensure mitigation measures are fully implemented Odour and refuse control Education of workers about bear safety Strict regulation of garbage disposal and incineration Prohibition of the feeding of bears Detection systems, if required (e.g., infra-red detection units, dogs, and trip-wire fence systems) Deterrent systems (e.g., rubber bullets, flare cartridges and air horns) Compensation of HTCs for any loss of tags due to DLP kill at drill site

Although oil and gas exploration and development activities have been conducted in the Alaskan Beaufort Sea continuously over the last 25 years, no significant impacts, change in populations, or change in resource harvesting have occurred (Miller et al. 2002). There have been some localized effects (e.g., local avoidance), but they do not appear to persist beyond the duration of the activity.

The recommended mitigation measures described for Program effects are applicable and effective in addressing cumulative effects. After mitigation, cumulative effects of all activities on the marine mammal VECs are expected to be negligible to low in magnitude, short term in duration, local to subregional in extent and, therefore, not significant.

16.6 Monitoring

The on-going ringed seal monitoring study (Smith and Harwood 2003) will provide useful monitoring data concerning the effect of the Devon Program on ringed seals (Table 16-4).

During the Program, Devon will retain Inuvialuit wildlife monitors to maintain daily records of wildlife sightings and advise on response measures, consistent with impact mitigation commitments. These individuals will be onboard during the mobilization of the SDC from Herschel Island to the drill site in Year 1 or on the LTD when it is towed to the drill site in Year 1. They also will present throughout the operations phase. No other Program-specific monitoring is recommended related to marine mammal issues.

Table 16-4 Monitoring Programs for Marine Mammals

Potential Effects	Program Objectives	General Methods	Reporting	Implementation
Potential disturbance to marine mammals due to vessel movements, aircraft, and barge staging during pre-operations and operations	<ul style="list-style-type: none"> Verify impact predictions Confirm the effectiveness of mitigation measures 	On-site Inuvialuit wildlife monitor to ensure mitigation measures are implemented and observe mitigation effectiveness	<ul style="list-style-type: none"> Annual Distribute report to Inuvialuit co-management agencies 	Devon
Potential effects on ringed and bearded seals (ongoing study by Smith and Harwood [2003])	<ul style="list-style-type: none"> Obtain baseline seal data 	Ongoing monitoring study by Smith and Harwood (2003) to assess seal distribution, densities, baseline behaviour, body and reproductive condition	<ul style="list-style-type: none"> Annual 	Joint program – industry/ government/ co-management agencies
Potential effects during operations	<ul style="list-style-type: none"> Obtain seal data during operations 	Similar to methods used by Smith and Harwood (2003)	<ul style="list-style-type: none"> Annual 	Devon

17 Socio-economic Conditions

This section focuses on the potential socio-economic effects associated with routine operations for the Program. Additional information on effects on traditional use is provided in Section 18: Traditional Knowledge and Land Use. Potential effects of the Program on non-traditional land use are addressed in Section 20: Land and Resource Use. Effects of potential accidents or malfunctions are discussed in Section 22: Accidents and Malfunctions.

The scope of this assessment includes aspects required under the *CEAA* (socio-economic effects that may occur as a result of a change in the environment), as well as aspects required under the *IFA* (broader consideration of socio-economic effects).

17.1 Baseline Conditions

The total population of the communities in the Program area in 2001 was approximately 6210, 47 percent of whom lived in the Town of Inuvik. The smaller Inuvialuit and Gwich'in communities (Aklavik, Tuktoyaktuk, Sachs Harbour, Holman, Paulatuk, Tsiigehtchic, Fort McPherson) had fewer than 1000 residents each. Fifty-nine percent of Inuvik's population was Aboriginal and, in the seven smaller communities, more than 80 percent were Aboriginal. Recent labour force data indicated a participation rate of 80 percent and an employment rate of 74 percent in Inuvik. Rates in the smaller communities were lower. In 1999, there was a potential labour supply of 336 individuals in Inuvik and 775 individuals in the seven smaller communities.

The RSA communities all sustain significant traditional economies and have monetary economic activity dominated by employment in government services and tourism; local residents look forward to some hydrocarbon industry prospects.

Traditional livelihoods are from non-commercial fishing, hunting and trapping. Trapping, which involves approximately one-tenth of the adult population, has recently suffered from depressed fur prices and increased equipment and fuel costs. Throughout the RSA, traditional culture provides communities with strengths that buffer the economic booms and slumps in the region

Both the Inuvialuit and the Gwich'in have made significant progress in governance, particularly in settling land claims. The Inuvialuit and the Government of Canada signed the Inuvialuit Final Agreement (IFA) in 1984, the first comprehensive land claim agreement north of the sixtieth parallel. The Gwich'in signed the Gwich'in Comprehensive Land Claim Agreement with the Government of Canada in 1992. The agreement established the Gwich'in Settlement Area (GSA) and several boards responsible for specific functions.

In the Northwest Territories, the federal and territorial governments and the Aboriginal people and their organizations are in negotiations to achieve devolution of authority and to confer self-government responsibilities for Aboriginal peoples. A key focus of these talks has been revenue sharing arrangements between the senior levels of government (i.e., the GNWT and the Government of Canada) and the regional and municipal governments. Within the RSA communities, it is widely hoped that new arrangements

will lead to the allocation of needed financial resources to provide and upgrade physical infrastructure and key social services.

Inuvik residents have an average annual income of approximately \$36,000, and at least six of the smaller communities have average personal incomes that are less than two-thirds of this amount. Income support programs provide some assistance, though the percentage of adults receiving payments has been steadily declining. Cost of living indicators show that the cost of living in Inuvik, Aklavik, Fort McPherson and Tsiigehtchic is 55 to 70 percent higher than in Edmonton. In the four coastal communities, the cost of living is about 80 percent higher.

The Inuvik Regional Health and Social Services Authority provide health care programs through the Inuvik Regional Hospital, five health care centres and two health stations. Health and social conditions at the household level have improved because of increased accessibility of health care services and better housing. However, movement into settled communities has brought some negative trends, such as the increased dependence on store-bought food and related health threats (diabetes and heart attacks), high rates of smoking and increased respiratory diseases, and high death rates due to accidents, injuries and suicides.

Inuvik and five of the seven smaller communities have RCMP detachments. All the RSA communities have volunteer fire departments and current emergency plans. Community concerns in the Program area include teenage motherhood, single parent families, family violence, sexual abuse, elder abuse and alcohol and substance abuse. The Inuvik Regional Health and Social Services Authority provides a wide range of social services through social service or community wellness centres in Inuvik, Aklavik, Tuktoyaktuk and Fort McPherson. One program of special note is the Addictions/Alcohol and Drug Program.

Each of the communities in the Program area has a school and most offer a full complement of grades. Recent enrolment data indicate that some schools have substantial unused capacity, while others, especially in the larger communities, appear to be overcrowded. Diploma and certificate programs and courses are offered by the Aurora College campus in Inuvik and by satellite Community Learning Centres in all the communities in the Program area. Most communities have a diversity of recreation facilities, such as community halls, arenas, gymnasiums, summer pools and curling rinks.

Inuvik and the seven smaller communities have running water, sewage treatment, solid waste disposal, electricity and heating fuel. Inuvik is the only community with natural gas. Only three communities have an all-weather road, but this is seasonally restricted. The others have winter road access or no road access at all. All communities have marine resupply capability and airport runways.

17.2 Impact Assessment

Socio-economic effects of the Program were a consistent theme during public meetings. In addition to interest in employment and contracting opportunities and arrangements for ensuring local participation, stakeholders indicated concerns regarding the effects of employment on community wellness and related demands on social services, effects of Program-related in-migration on community infrastructure, and effects of the Program on wildlife with secondary effects on tourism-related businesses and subsistence economies.

Community wellness refers to physical, emotional, social and economic well being of all aspects of a community (i.e., individuals, families and the community as a functioning whole). Community wellness was chosen as the central focus of the socio-economic impact assessment because:

- community wellness is generally the most highly valued aspect of community life
- community wellness might be substantially enhanced by Program benefits and vulnerable to adverse Program effects

The VSCs and their relevance to community wellness are as follows:

- regional employment and training – growth of a competent and skilled workforce in the region
- population stability – avoidance of stresses caused by rapid growth or decline in population
- regional procurement – growth of businesses owned by residents of the region
- personal and corporate income – increased income as a result of regional employment and procurement and subsequent cycles of spending and respending
- government revenue – availability of revenues to governments for spending on infrastructure and community services
- provision of physical infrastructure – avoidance of overloading existing physical infrastructure and facilities
- individual and family wellness – essential building blocks for establishing and maintaining community wellness
- provision of community and social services – avoidance of overloading existing community and social services
- traditional culture and economies – of paramount importance among the Inuvialuit and other Aboriginal groups in their interpretation of quality of life and the value they place on preserving it (this section deals with the economic aspect of traditional culture and activities; Section 18 deals with the broader aspects of Program effects on traditional culture and activities)
- tourism – sustainability of an important income-earning activity for some local residents

Effects of the Program on use of traditional foods by local people and potential effects on human health were also addressed through a screening level risk assessment (Health Canada 2003). The conclusion of the screening level risk assessment is that the risk of human exposure to Program-related contaminants by the consumption of traditional foods, with attendant health effects, is extremely low (KAVIK-AXYS Inc. 2004b). Nonetheless, as discussed in the Monitoring discussions for Chemical Oceanography (Section 11.6), Benthos (Section 13.6) and Fish (Section 14.6), Devon will assess contaminant levels in benthic sediments, invertebrates and fish tissue each summer at the location of drilling Program the previous winter. In addition, Devon is conducting a more detailed screening level risk assessment, with specific reference to the potential for exposure of humans by the consumption of country foods. The results of this assessment

will be used to identify the requirements for any additional monitoring of specific country foods or further risk assessment.

There are no permanent human settlements in the LSA (i.e., EL 420 and environs). Although the LSA includes areas used for some harvesting activities, almost all Program-related socio-economic effects are expected to occur in the human communities within a broader region. Hence, this assessment focuses entirely on Program-related socio-economic effects in the RSA, including all areas in which the direct or indirect effects of the Program may affect permanent residents, specifically:

- all communities in the Inuvialuit Settlement Region (ISR), namely the regional administrative and commercial centre of Inuvik, the Mackenzie Delta community of Aklavik, the port of Tuktoyaktuk on the mainland coast, and the high arctic coastal communities of Sachs Harbour, Holman and Paulatuk
- all communities in the GSA, including the regional administrative and commercial centre of Inuvik and Fort McPherson and Tsiigehtchic on the southern border of the Mackenzie Delta (Figure 17-1)

It is expected that all these communities will experience some effects from the Program. The Program might affect other communities in the Northwest Territories and Yukon Territory to some degree. For example, Hay River, a major trans-shipment point between road and rail networks and the Mackenzie River barging system, may be used to move some supplies for the Program. Northern workers also might be sourced from other communities such as Kugluktuk in Nunavut and Old Crow in Yukon Territory. However, this section focuses on the communities of the ISR and GSA, unless otherwise indicated.

The prediction and assessment of Program-related effects and cumulative effects is based on socio-economic baseline data, published literature, consultation with knowledgeable people, a Program issues identification workshop (September 2003), an impact assessment workshop (February 2004) with local community members and agency representatives and the professional judgement of the assessors.

Socio-economic effects are predicted and assessed qualitatively. Detailed modeling of effects was deemed impractical given the relatively small scale of the Program and the very small population and economy of the region. However, insights into the effects of the Program on the economies of the Northwest Territories and other parts of Canada were gained through a customized run of the Statistics Canada Inter-provincial Input-Output Model.

Effects on VSCs are evaluated using four descriptors: direction, magnitude, geographic extent and duration. These are defined in Table 17-1.

In the absence of threshold values that may be specified in standards, legislation or regulations, effects significance is assessed as follows. A significant change in the VSC is one that compares adversely with the national average in a substantial way, or it compares adversely with the expectations of communities and governments with regard to preferred lifestyles and wellness. A significant effect indicates that the well being or actions of future generations would be impaired by the proposed activity.

Significance of effects during pre-operations and operations is defined in relation to existing or baseline conditions. Potential cumulative effects of the Program in combination with other projects affecting the VSCs in the RSA are also discussed. At closure, new effects of the Program on socio-economic conditions will cease.

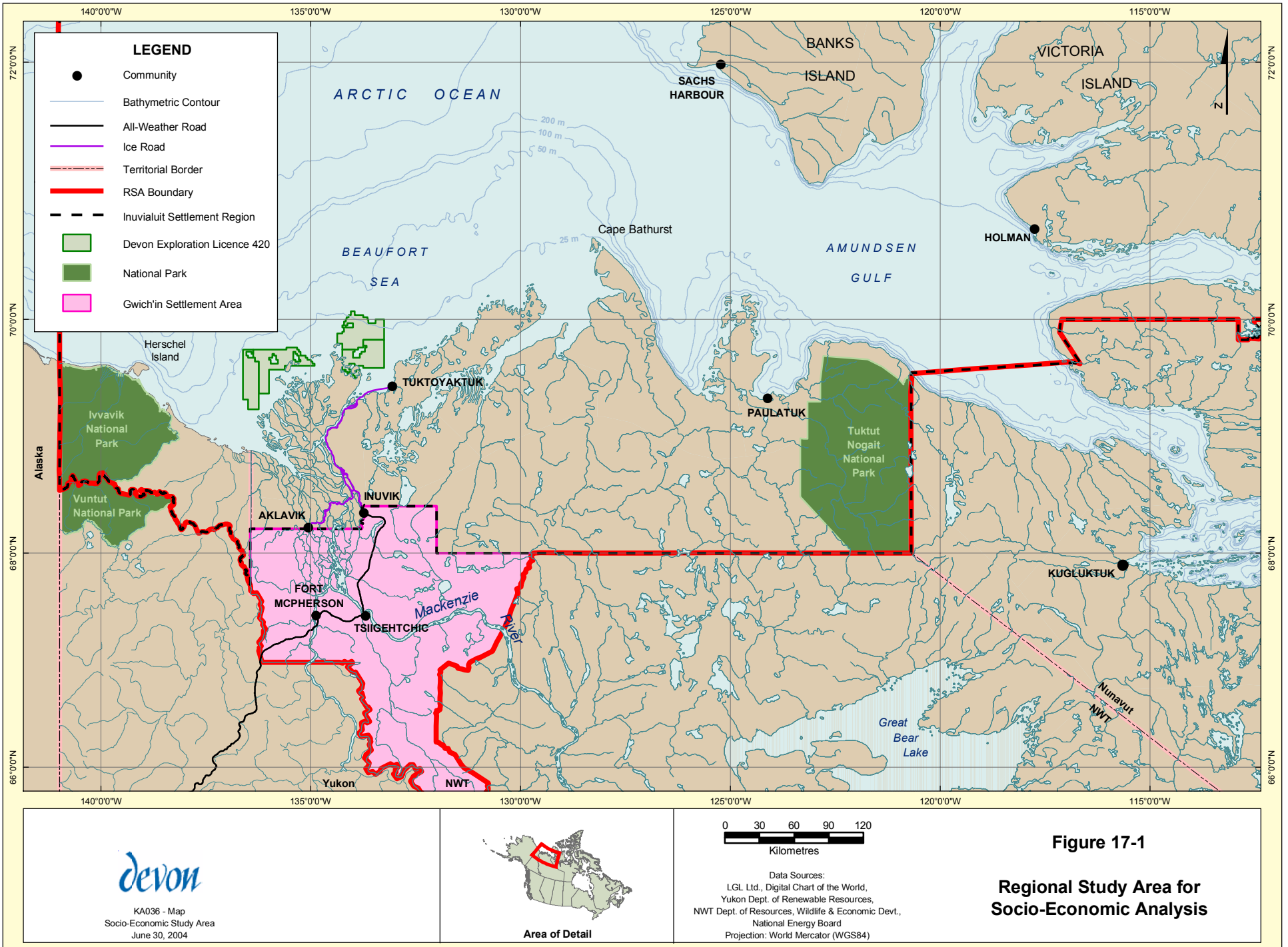


Table 17-1 Effect Attributes for Socio-economic Conditions

Attribute	Definition
Direction	
Positive	VSC is improving or is acceptable
Neutral	VSC is not expected to change
Negative	VSC is worsening or is unacceptable
Positive or negative	VSC is changing in both directions
Magnitude	
No effect	No change to the VSC
Low	Effect is unlikely to be detectable
Moderate	Effect is detectable within the normal range of variation
High	Effect is detectable and outside the normal range of variation
Geographic Extent	
Local	Inuvik and Tuktoyaktuk
Regional	Regional study area
Territorial	Northwest Territories
National	Canada other than Northwest Territories
Duration	
Short term	Less than one year
Medium term	Between one and five years
Long term	More than five years, beyond the end of the Program

17.2.1 Regional Employment and Training

Since the 1999/2000 winter season, Devon has implemented a northern hire program for each of its onshore exploration programs in the Mackenzie Delta and the company, as well as the local communities, have recognized the benefits of this program. In 2002 and 2003, Devon’s onshore drilling programs provided 4090 person-days of employment for northern workers. Devon has and will continue to implement the northern hire program for the proposed offshore Program. For example, the majority of individuals contracted to conduct the traditional knowledge studies in the RSA were Inuvialuit, and each field team for the biophysical surveys included one or more Inuvialuit assistants. The total number of person-days for these individuals during the studies, to date, is 200.

Devon anticipates 90 positions will have to be filled throughout operations, (i.e., drilling, in each year of the Program) (Table 17-2). With the focus of activity being a 120 to 150-day winter drilling season, these positions in total will amount to approximately 23,835 person-days of employment per year (includes RSA community residents and others).

Several of these positions will require skill and experience that may or may not be found among northern residents. With Devon’s current understanding of available labour supply, positions that northerners would fill include rig floor hands, camp operations and management, wildlife and environmental monitoring, barging operations and ice road construction. RSA residents with traditional environmental knowledge would bring skills to some positions that would not be found among workers from elsewhere. Devon and its contractors will hire as many qualified men and women from among RSA community residents as possible, as specified in Articles 3 and 4 of the Comprehensive Cooperation and Benefits Agreement (CCBA) signed in August 2000 between Devon (formerly Anderson Resources Ltd.) and the Inuvialuit Regional Corporation. To meet federal requirements under the *Canada Oil and Gas Operations Act (COGOA)*, Devon will be required to submit a Benefits Plan to Indian and Northern Affairs Canada for approval by

the Minister before starting the exploration drilling Program (NEB 1985). The *COGOA* also requires the submission of an annual Benefits Plan monitoring report.

Table 17-2 Drilling Program Employment in Year 1¹

Program Phase	Number of Person-Days	Number of Positions
Mobilization	6853	71
Drilling	11,037	93
Testing	4501	90
Demobilization	1444	41
Total	23,835	–

Note: 1 Assumes steel drilling caisson platform system at Paktoa

Source: Devon

17.2.2 Population Stability

A potential concern is the effect on population stability of migrants who either come with pre-arranged employment or arrive in the hope of finding employment. With the high price and shortage of temporary accommodation, which usually occurs in ‘boom’ conditions, speculative in-migration is often associated with an increased need for shelter and policing and support from relatives, municipal authorities and charitable agencies.

Due to the shortness of the drilling season, in-migration of noticeable numbers of workers without pre-arranged employment from elsewhere in the Northwest Territories and southern Canada is not expected. In addition, Devon will:

- publicize employment opportunities and hiring procedures through the IRC and in the ISR communities
- discuss employment opportunities, including length of employment, at public consultation meetings so residents can make informed decisions when considering leaving a full-time position for a better paying short-term job
- continue to participate in the Petroleum Sub-Committee of the government-industry Regional Training Partnership in Inuvik

Together, these measures should be sufficient to ensure that RSA residents have realistic expectations of employment with the Program and minimize potential negative effects on population stability.

17.2.3 Regional Procurement

While opportunities for local sourcing of goods and services will be limited by availability and suitability, Devon and its contractors will identify specific items for which there is a regional supply capability and maximize regional procurement through commitments in its federal Benefits Plan and CCBA with the Inuvialuit. As specified in Article 5 of the CCBA, bids will first be solicited from Inuvialuit businesses listed in Schedule ‘A’. If goods or services can be provided on a competitive and timely basis and meet Devon’s safety, technical and quality standards, the contract will be awarded to that Inuvialuit business. If appropriate suppliers are not found through Schedule ‘A’, Devon will consider businesses on the Inuvialuit Business List maintained by the Inuvialuit Regional Corporation (IRC).

Examples of goods and services that might best be sourced from northern residents or companies are some perishable supplies, camp operations and management, ice road construction and wildlife and environmental monitoring. Transportation of equipment and supplies to the drilling location and the staging areas will provide important short-term business opportunities for barging companies, airlines and a range of other northern-owned freight handlers.

17.2.4 Personal and Corporate Income

Devon’s budgeted annual expenditures on the Program will depend on the drilling platform system selected and they could be approximately C\$80 million per year. Table 17-3 presents Devon’s estimates of total expenditures for Year 1 of the Program, and estimates of the expenditures that may be made in the Northwest Territories.

Estimates of the economic effects of the Program for Year 1 were obtained from a custom simulation prepared by Statistics Canada using its Inter-provincial Input-Output model. This is an open model that provides estimates of direct and indirect economic impacts, based on input-output tables prepared by Statistics Canada for the year 2000 (the most recent year available).

Based on the output of the Statistics Canada model (Table 17-4), an expenditure by Devon of C\$80 million in the first year of the Program would result in the following total (i.e., direct and indirect) effects in the Northwest Territories:

- approximately C\$45 million in GDP (or value-added)
- C\$23 million in labour income
- 531 person-years of employment
- approximately C\$90 million in total output (which points to a potential output multiplier of 1.13; a multiplier is calculated by taking the total impact observed for a change in an economic variable and dividing it by the direct change)

Table 17-3 Approximate Drilling Program Expenditures in Year 1¹

Expenditure Category	Total Expenditures (C\$ million)	Expenditures within the Northwest Territories (C\$ million [rough estimates])
Labour	12.1	2.5
Major Equipment	41.7	5.0
Consumables/Supplies	10.9	2.0
Transportation and Other Services	14.1	4.0
Other including Program Management, Fees and Permits	1.2	0.2
Total	80.0	13.7

Notes: Dollar amounts are given in 2004 Canadian dollars
1 Assuming steel drilling caisson platform system at Paktoa

Source: Devon

Table 17-4 Estimated Economic Impacts of the Devon Exploration Program in Year 1¹

	Direct plus Indirect Effects on Economy of Northwest Territories	Direct plus Indirect Effects on Economy of Canada
GDP (C\$ million)	45.1	58.2
Labour income (C\$ million)	22.6	30.8
Employment (number of person-years)	531	720
Total output (C\$ million)	90.5	117.7

Notes: Dollar amounts are given in 2004 Canadian dollars
1 Assuming steel drilling caisson platform system at Paktoa

Source: Based on a custom simulation provided by Statistics Canada using the 2000 Inter-provincial Open Input-Output Model (Rioux 2004, pers. comm.)

Corresponding figures for the Canadian economy would be higher due to program-related spending outside the territory, especially in Ontario, Alberta, Quebec and British Columbia. For Canada as a whole, the total output resulting from first-year Program expenditures would be C\$118 million, indicating an output multiplier of 1.47.

17.2.5 Government Revenues

Devon's Program will contribute revenues to federal and territorial levels of government through the payment of taxes, duties and fees over the life of the Program. Using the custom simulation prepared by Statistics Canada, estimates can be derived of 'indirect taxes' payable to the Northwest Territories government and to the Government of Canada during the first year of the Program. These taxes (property taxes, licences and permits, sales taxes, excise taxes, municipal taxes) could amount to approximately C\$300,000 to the Northwest Territories government and C\$1 million to the Government of Canada. Direct taxes (essentially taxes on income) would flow to the territorial and federal governments, but the amounts cannot be distinguished by the custom simulation of the Statistics Canada model.

17.2.6 Physical Infrastructure

The Program does not require a base for onshore logistical support. However, there will be a need for transportation infrastructure and logistical services to meet onshore staging and support requirements. It is anticipated that logistics support for drilling in the Western Block, including Year 1 of operations, will be based primarily in Inuvik. In subsequent years, Inuvik or Tuktoyaktuk may be a suitable location for some staging activities, depending on the location of the drill site and the platform system to be used. Devon will use existing infrastructure, facilities and local services such as airports, wharves, storage, communications and freight handling, dispatch, security services and garbage disposal. In spite of increased use of existing infrastructure and facilities, it is not expected that new infrastructure and facilities will have to be constructed because of Devon's operations.

17.2.7 Individual and Family Wellness

Social conditions in the RSA communities have been affected by the consequences of past hydrocarbon-sector employment, through the combination of the short-lived nature of the work and the much higher wages. There have been positive effects in households where the higher income has been used for home improvements, buying a vehicle and more efficient harvesting equipment, and various quality of life expenditures such as education and travel. Compared to earlier periods of intense exploration activity, northern workers and their families are more adjusted to wage employment and the temporary absence of adults working on the exploration programs. However, there is still a widespread belief in the region that short-term exploration employment may impede efforts to combat substance abuse, crime, family violence, child neglect, gambling, and physical and mental illness (AMEC and KAVIK-AXYS Inc. 2004b).

Devon participates in a number of initiatives that support family and individual wellness:

- financial and planning support various educational funds and initiatives (Aurora College Rig Training School, Inuvialuit Education Fund, CareerQuest, Petroleum Sub-Committee of the government-industry Regional Training Partnership in Inuvik) and recreational facilities (Kids Play Area in the Inuvik Family Centre)
- participation in the Safety, Health and Respect for the Environment (SHARE) initiative, an ongoing industry program in the Beaufort Mackenzie Delta Region focused on drug and alcohol education (the initiative also assists local companies in preparing safety plans and drug and alcohol policies)
- providing more rotation options for northern workers, to facilitate northern workers undertaking family responsibilities and sustaining traditional activities, such as subsistence harvesting and sport-guiding, if they wish

Program effects are expected to range from positive to negative, based on the response of individuals to the opportunities and challenges presented by the Program.

17.2.8 Social and Community Services

Workers at the drilling location will have access to medical care (i.e., paramedic on-site and dedicated air ambulance), recreation facilities such as a fitness room, TVs, a games room and possibly educational upgrading in off-work hours. Under normal operating conditions, there would be little need for workers to access medical, recreation and educational services in Inuvik, Tuktoyaktuk or the other RSA communities.

The principal effect on community services would be short-term accommodation requirements whenever crew changes coincide with flight delays (e.g., during inclement weather). At such times, Devon will use a variety of commercial accommodations in Inuvik. Additional short-term accommodation is available at the MGK Open Camp and Capital Suites built by the Nihtat (Inuvik) Gwich'in Council.

17.2.9 Traditional Culture and Economies

Potential effects of the Program on traditional resource use and culture are discussed in Section 18: Traditional Knowledge and Land Use. As noted in Section 7.2.7: Individual and Family Wellness, the availability of income from exploration-related employment may have a positive effect on traditional culture by providing income to support purchase of equipment such as snowmobiles and boats that can make it easier for households to

engage in traditional harvesting activities. On the other hand, attraction to wage employment could result in erosion of time and skills for traditional economic pursuits. In addition to mitigation measures identified by the traditional knowledge study—and integrated throughout this CS Report —Devon will undertake the following mitigation to minimize potential effects on traditional culture and related economic benefits:

- encourage respect for specific concerns of Aboriginal people, consistent with the company's Aboriginal Relations Policy
- provide rotation options for northern workers that facilitate scheduling of traditional harvesting activities and family responsibilities during time off
- provide a comprehensive orientation and cross-cultural awareness session to northern and southern workers in advance of their employment

17.2.10 Tourism

Probably the highest dollar-value activity in the tourism sector is guided sport hunting, including polar bear hunting. Trophy hunters pay between US\$20,000 and \$25,000 for a 'tag' or permit to participate in guided polar bear hunts using a dog team. Communities close to Devon's potential drill sites harvest from the southern Beaufort Sea population of polar bears.

Experience with offshore drilling in the 1970s and 1980s revealed that polar bears can be attracted to drill sites, giving rise to circumstances where a bear could be shot in defence of life and property (DLP). There is a perception among some RSA residents that guided polar bear hunts will suffer since any bears killed at or close to a drill site would be included in the quota. The potential for DLP polar bear kills as a result of the Program appears to be slight; however, any polar bear killed in this manner during Devon's Program could constitute an economic loss to the region's communities.

To address this concern, Devon will:

- prohibit firearms and hunting by workers at the drill site
- meet with RWED, the HTC's and co-management agencies to discuss work schedules and locations and ways to reduce potential conflicts with tourism activities including guided polar bear hunting activities
- develop, with RWED, the HTC's and co-management agencies, procedures for minimizing attraction of polar bears to the drill sites and protocols for managing potential problem bear interactions (Section 16: Marine Mammals)
- maintain an on-site wildlife monitor responsible for ensuring that specified mitigation measures and protocols are properly implemented, thereby reducing the potential for DLP kills
- develop a compensation agreement, addressing potential DLP kills with each of the hunters and trappers committees (HTCs) in communities near the potential drill sites; this agreement will specify which community will be responsible for providing the tag and will be compensated for DLP polar bear kills at each of Devon's prospective drill sites

17.2.11 Program Effects

Socio-economic effects of the Program are summarized in Table 17-5 and mitigation measures are summarized in Table 17-6. Effects will manifest in varying degrees throughout all phases of Program activities, but will tend to be greatest during the winter drilling season. Effects will be similar between platform types or drilling locations.

17.3 Mitigation Measures

Mitigation measures addressing potential effects on each VSC are summarized in Table 17-6.

17.4 Residual Program Effects and Significance

Effects on regional employment and training and regional procurement are expected to be positive, with application of mitigation and enhancement measures. Program effects on provision of community and social services and tourism, especially guided polar bear hunts, are characterized as potentially negative. With effective application of the identified mitigation measures, negative residual effects are expected to be not significant. The remaining effects could be positive or negative, based on the degree to which opportunities are realized by individuals and local businesses. Again, with effective application of the identified mitigation measures, negative residual effects are expected to be not significant. At closure, both positive and negative effects are expected to diminish. The result of those changes at closure will depend on economic activities in the area at the time and related opportunities for transferring skills and capacity for contract services.

Because of the relatively small scale of the Program, positive and negative effects are rated low (unlikely to be detectable) to moderate (detectable within the normal range of variation) in magnitude. Effects will not give rise to conditions that compare adversely with expectation of communities and governments with regard to preferred lifestyles and wellness. Accordingly, residual effects are expected to be not significant.

With one exception, the program effects are not expected to differ substantially for Inuvialuit, Gwich'in and non-Aboriginal people. The potential for negative residual effects on tourism, specifically on guided polar bear hunts, is restricted to the Inuvialuit in Aklavik, Inuvik and Tuktoyaktuk.

Although contractual obligations exist between Devon and the IRC (representing the Inuvialuit) with respect to regional employment and training and regional procurement, it is not anticipated that Gwich'in will be disadvantaged, given the degree of cooperation that has been evident in recent years between the IRC and GTC on hydrocarbon sector projects.

Table 17-5 Program Effects on Socio-economic Conditions

Potential Effect	Interaction with VSC	Level of Effect ¹				Effect Significance ²	
		Direction	Magnitude	Extent	Duration	Program-related Effect	Cumulative Effect
Pre-operations and Operations							
Regional employment and training	<ul style="list-style-type: none"> A total of 90 positions will be available throughout operations. Through its CCBA and federal Benefits Plan, Devon and its contractors will hire as many qualified people from RSA communities as possible 	Positive	Moderate	Regional	Medium term	Not significant	Not significant
Population stability	<ul style="list-style-type: none"> Due to the small scale of the Program and duration of the Program, substantial in-migration is not anticipated 	Neutral	Low	Local	Short term	Not significant	Not significant
Regional procurement	<ul style="list-style-type: none"> Devon and its contractors will identify specific items for which there is a regional supply capability and maximize regional procurement, according to the CCBA 	Positive	Moderate	Regional	Medium term	Not significant	Not significant
Personal and corporate income	<ul style="list-style-type: none"> Average personal income and corporate income will increase. Effects will be short-lived (during the winter drilling season). Possible inflationary effects could negatively affect those not employed by the Program 	Positive and negative	Moderate	Regional	Medium term	Not significant	Not significant
Government revenues	<ul style="list-style-type: none"> Program taxes to governments would be relatively small (C\$300,000 to the Northwest Territories government and C\$1 million to the Government of Canada); however, cycles of spending and re-spending will benefit the regional and territorial economies. Distribution of government revenues may depend on results of ongoing devolution discussions 	Neutral	Low	Territorial and national	Medium term	Not significant	Not significant
Effects on physical infrastructure	<ul style="list-style-type: none"> No new onshore support facilities will be required. The Program will use existing transportation services and infrastructure 	Positive and possibly negative	Low	Local	Medium term	Not significant	Not significant

Table 17-5 Program Effects on Socio-economic Conditions (cont'd)

Potential Effect	Interaction with VSC	Level of Effect ¹				Effect Significance ²	
		Direction	Magnitude	Extent	Duration	Program-related Effect	Cumulative Effect
Pre-operations and Operations (cont'd)							
Individual and family wellness	<ul style="list-style-type: none"> Potential effects of short term, high wage employment (e.g., related to financial management, stress and substance abuse) 	Positive and negative	Low	Mainly local	Medium term	Not significant	Not significant
Effects on community and social services	<ul style="list-style-type: none"> Crews will have very little time in communities. Services will be available on-site 	Negative	Low	Mainly local	Medium term	Not significant	Not significant
Traditional culture and economies	<ul style="list-style-type: none"> Possible effects of wage employment in eroding traditional skills and associated economic benefits 	Positive and negative	Low	Regional	Medium term	Not significant	Not significant
Tourism	<ul style="list-style-type: none"> Possible effects on tourism revenues, especially guided polar bear hunts 	Potentially negative	Low	Local	Medium term	Not significant	Not significant
Closure							
No socio-economic effects expected during closure	NA	NA	NA	NA	NA	NA	NA

Notes:

- 1 Based on criteria in Table 17-1
- 2 Based on criteria in Section 17.1

Table 17-6 Mitigation Measures for Effects on Socio-economic Conditions

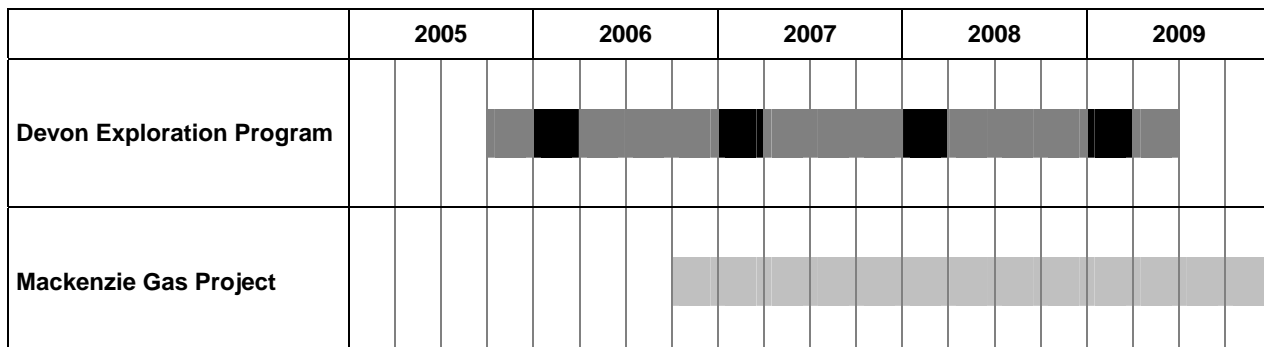
Potential Effect	Mitigation Measures
Regional employment and training	<ul style="list-style-type: none"> • Publicize employment opportunities and skill requirements in the ISR communities in advance of the Program (CCBA and federal Benefits Plan) • Develop a long-range training plan for Inuvialuit wanting to work in Devon’s operation (CCBA and federal Benefits Plan) • Reinforce the importance of finishing high school to qualify for employment opportunities and post-secondary education • Cooperate with the GNWT and post-secondary institutions (e.g., Aurora College Campus, Petroleum Institute Training Service) in the design of short-duration, skill-based courses for Inuvialuit and Gwich’in beneficiaries and other northern residents to improve job readiness, expand the pool of persons with specific skills needed for the Program and enhance the capabilities of potential entrepreneurs • Continue to be involved in the Petroleum Sub-Committee of the government-industry Regional Training Partnership in Inuvik
Population stability, speculative in-migration	<ul style="list-style-type: none"> • Publicize employment opportunities and hiring procedures through the IRC and in the ISR communities • Discuss employment opportunities, including length of employment, at public consultation meetings
Regional procurement	<ul style="list-style-type: none"> • Adhere to the framework governing business opportunities and commitments, as specified in the CCBA and federal Benefits Plan • Publicize Devon’s procurement policy, including safety, technical and quality standards, to clarify the criteria that will guide the awarding of contracts to Inuvialuit businesses
Personal and corporate income	<ul style="list-style-type: none"> • Communicate type and nature of the work (i.e., short term each year, for the duration of the Program) so local workers and contractors can plan accordingly • Provide regional workers, if they wish, with letters verifying their status with the Program to facilitate personal financial management • Seek to pay market rates for goods and services in an effort to lessen inflationary pressures on the regional economy • Pay invoices received from regional suppliers and contractors promptly
Government revenues	<ul style="list-style-type: none"> • Devon will meet with municipalities in the RSA to discuss the potential impacts of the Program on those municipalities, if requested
Individual and family wellness	<ul style="list-style-type: none"> • Support to community well-being through a few specific initiatives and carefully targeted donations (e.g., education and career initiatives, recreational facilities) • Participation in SHARE, an ongoing industry program in the Beaufort Mackenzie Delta Region focused on drug and alcohol education • Providing more rotation options for northern workers
Effects on community and social services	<ul style="list-style-type: none"> • Ongoing consultation in Inuvik, Tuktoyaktuk and Aklavik to help monitor community conditions, linkages to the Program and requirements for additional mitigation measures • Meet with agencies to discuss potential Program impacts and mitigation strategies commensurate with the scope of the Program • Discuss strategies for meeting worker and community concerns with other operators in the region • No one under the age of 18 will be employed in the Program
Traditional culture and economies	<ul style="list-style-type: none"> • Encourage respect for specific concerns of Aboriginal people, consistent with the company’s Aboriginal Relations Policy • Ensure that rotation options are available for northern workers to help accommodate traditional harvesting activities and family responsibilities

Table 17-6 Mitigation Measures for Effects on Socio-economic Conditions (cont'd)

Potential Effect	Mitigation Measures
Tourism revenues, especially guided polar bear hunts	<ul style="list-style-type: none"> • Prohibit firearms and hunting by workers at the drill site • Meet with RWED, the HTC's and co-management agencies to discuss operations schedules and locations and ways to reduce potential conflicts with tourism activities, including guided polar bear hunting activities • Develop, with RWED, the HTC's and co-management agencies, procedures for minimizing attraction of polar bears to the drill sites and protocols for managing potential problem bear interactions • Maintain an on-site wildlife monitor responsible for ensuring that specified mitigation measures and protocols are properly implemented • Develop a compensation agreement, addressing potential DLP kills with the IGC

17.5 Cumulative Effects and Significance

The construction phase of the Mackenzie Gas Project, assuming all necessary approvals from regulatory agencies and a decision to proceed by the proponents, is scheduled to commence in the fall of 2006 and proceed over approximately three years with most of the pipeline construction occurring over two winter seasons. Assuming the Mackenzie Gas Project proceeds, overlap with demands for employees, infrastructure and services would not occur during Year 1 of the Devon Program. However, such effects can be anticipated, to a limited extent, during Year 2 of the Program and more substantially during Years 3 and 4 (Figure 17-2). These effects will be most pronounced during the winter drilling period when demands for employees and services would be highest. During the summer resupply and mobilization period for the Devon Program, there may also be overlapping demands with the Mackenzie Gas Project for barges and aircraft support.



Notes:

- Low demand for employment, services and infrastructure
- Moderate demand for employment, services and infrastructure
- High to very high demand for employment, services and infrastructure

Source: Mackenzie Gas Project (2004, Internet site)

Figure 17-2 Timing of Mackenzie Gas Project Activity

Were the Mackenzie Gas Project to proceed, its project-related effects would eclipse those of the Program. Devon's Program would contribute in only a minor way to what is anticipated to be an overall increase in economic activity and social change in the RSA, especially Inuvik, resulting from the Mackenzie Gas Project.

The resulting cumulative effects would require careful management on a regional scale: Government bodies, the IRC and GTC and industry participants would all have to play a role in coordinating mitigation measures and monitoring them for effectiveness. Devon would ensure that its own Program-related mitigation measures are closely aligned with those of larger-scale projects in the area.

In summary, all Program-related socio-economic effects are expected to be not significant. Although cumulative effects may be significant (resulting from the Mackenzie Gas Project), Devon's contribution to each of the cumulative effects is expected to be not significant.

17.6 Monitoring

In the absence of threshold standards, the only type of compliance monitoring required of the Program will be annual compliance with the terms of the existing CCBA and a future Benefits Plan with Indian and Northern Affairs Canada. Devon recognizes that systematic and periodic monitoring will be needed to establish whether the prediction of socio-economic impacts is accurate and mitigation measures are effective.

If the Mackenzie Gas Project were to proceed, Devon would commit to examine the extent to which the monitoring of its own program-related effects could be aligned with the monitoring procedures of other operators. Devon would be willing to participate in a joint government and industry cooperative program to implement monitoring and, if required, studies on socio-economic effects and management initiatives.

Monitoring related to potential socio-economic effects is summarized in Table 17-7. In addition, Devon is conducting a more detailed screening level risk assessment with specific reference to the potential for exposure of humans to health risks from the Program by the consumption of country foods. The results of this study will indicate the need, if any for monitoring of contaminants in specific country foods.

Table 17-7 Monitoring Programs for Socio-economic Effects

Potential Effects	Program Objectives	General Methods	Reporting	Implementation
Employment of northern residents	Confirm enhancement and mitigation effectiveness	Person-days of Program employment completed by northerners, with breakout by type of position	Annual (reported publicly)	Devon
	Confirm implementation of benefits agreements	Evaluate compliance with CCBA and Benefits Plan and the federal Benefits Plan with INAC.	According to agreements, to IRC and INAC	Devon
Population in-migration	Confirm impact prediction and mitigation effectiveness	Measure of emergency and shelter accommodation provided in Inuvik	Annual (internal)	Devon with Inuvik Interagency Committee
Goods and services contracts to northern companies	Confirm enhancement and mitigation effectiveness	Dollar value of signed contracts for goods and services to northern companies	Annual (reported to public)	Devon
	Confirm implementation of benefits agreements	Evaluate compliance with CCBA and Benefits Plan and the federal Benefits Plan with INAC	According to agreements, to IRC and INAC	Devon
Increased personal and corporate income	Confirm impact prediction	Average personal income for region	Review data as available (internal)	GNWT Bureau of Statistics
	Confirm enhancement/mitigation effectiveness	Total value of wages and salaries paid by the Program to Northern workers	Annual (reported to public)	Devon
Increased revenues for government	Confirm impact prediction	Payments made by the Program to each level of government	Annual (reported to public)	Devon
	Confirm implementation of benefits agreements	Evaluate compliance with CCBA and Benefits Plan and the federal Benefits Plan with INAC.	According to agreements, to IRC and INAC	Devon
Use of physical infrastructure	Confirm impact prediction	Number of Program-related flights per day to and from Inuvik airport	Annual (internal)	Devon with Inuvik airport administration
	Confirm enhancement and mitigation effectiveness	Number and status of complaints and requests received from governments, northern businesses and northern residents	Annual (internal)	Devon with IRC and GTC

Table 17-7 Monitoring Programs for Socio-economic Effects (cont'd)

Potential Effects	Program Objectives	General Methods	Reporting	Implementation
Changes in individual and family wellness	Confirm impact prediction	Commonly used measures of social conditions	Data as available (internal)	Inuvik Interagency Committee
	Confirm enhancement and mitigation implementation	Listing of Program initiatives and donations	Annual (internal)	Devon
Use of existing community and social services	Confirm impact prediction	Commonly used measures of social services load	Data as available (internal)	Inuvik Interagency Committee
	Confirm impact prediction	Number of person-nights of short-term accommodation used by Program workers	Annual (internal)	Devon
	Confirm enhancement and mitigation effectiveness	Number and status of complaints and requests received from governments and northern residents	Annual (internal)	Devon
Preservation of traditional culture	Confirm enhancement and mitigation effectiveness	Number and status of complaints and requests received from northern workers, IRC and GTC	Annual (internal)	Devon
Disruption of tourism	Confirm enhancement and mitigation effectiveness	Number of DLP polar bear kills involving Program staff; number of bear – human incidents reported	Annual (internal)	Devon and IGC

