

## **Subsurface Information**

Borrow site 9.010PA was investigated for quarry potential by Norwest Corporation during the summer 2003 (Norwest 2003). A dolomitic limestone sample was obtained from borrow site 9.010PA that was medium to slightly brownish grey, massive and hard. The sample had a slight to moderate reaction to 10% HCl on fresh surfaces only, and showed rust staining on exposed surfaces.

Pemcan Services completed a two borehole drilling program in the western region of the site during February of 1973. The boreholes encountered about 4 m of peat, gravel and clay overburden overlying limestone bedrock.

## **QUARRY DEVELOPMENT**

Available reserves of bedrock near the proposed quarry are considered unlimited (EBA 1988). For the purpose of preparing this conceptual plan, it has been assumed that an estimated 184,000 m<sup>3</sup> of rock might be removed from this site for project construction. Although the extent and nature of the rock occurrence at borrow site 9.010PA requires further investigation, it is evident that only a small portion of the overall deposit will be engaged by the proposed quarry development.

## **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.010PA. This information includes data collected during the 2004 field programs.

### **Biophysical Environment**

#### **Air Quality Setting**

The air quality setting for this site is expected to be similar to regional setting for the SSA described in [Section 8](#).

#### **Air Quality Potential Effects and Mitigation**

Potential effects on air quality associated with the development of the borrow site, such as dust, vehicle and equipment emissions, are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

#### **Noise and Light Setting**

The noise setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

The site is currently undeveloped and therefore, no manmade sources of light occur.

### **Noise and Light Potential Effects and Mitigation**

Potential effects on noise levels associated with the development of the borrow site are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

Industrial lighting can cause increases in ambient light. Sources of light include vehicle, flares and lighting around the site.

Lighting will be used during non-daylight hours, which, during the winter months, might mean periods when lighting is required on a 24 hour basis. Conversely, during the late spring and through summer months, lighting will not be required at all because of the extended daylight hours.

The potential visual effect of lighting can be partially reduced by proper placement and use of lighting only in areas where it is required.

### **Soils, Landforms and Permafrost Setting**

This borrow site lies at the north end of a large, north-trending bedrock ridge. The eastern side of the ridge has a prominent scarp that exposes bedrock and the western slopes are covered in a blanket of colluvium and till. The access road to the borrow site from the pipeline right-of-way will cross the moderately sloping bedrock covered by a veneer of colluvium. The borrow site is within a zone of intermediate discontinuous permafrost.

Colluvial deposits in the borrow site area have likely developed soils of the Cryosolic and Regosolic Orders. The bedrock ridge is likely rapidly to moderately well-drained which might inhibit the formation of permafrost. Areas of permafrost within colluvial deposits are expected to cover between 20 and 30% of the area and commonly contain ice contents between 30 and 50% by weight. The probability of encountering permafrost increases on the north facing slopes at the end of the bedrock ridge.

### **Soils, Landforms and Permafrost Potential Effects and Mitigation**

Landform-related environmental effects are not predicted for the borrow site area. Along the access road, colluvial deposits over bedrock could be susceptible to water erosion in moderately sloping areas. Stripping of soil before further development could result in a reduction of soil quality by mixing.

General mitigation strategies to offset potential effects are outlined in [Section 8](#).

## **Vegetation Setting**

The majority of the borrow site is a trembling aspen/prickly rose vegetation type. There is an area of open water and an area of bare rock near the eastern edge of the borrow site. Vegetated areas on rock outcrops are an uncommon plant community in the area. Land in the northeast and southeast corners was burned and these are now regenerating black spruce/Labrador tea/mountain cranberry and black spruce – tamarack vegetation types. Two rare plant surveys were conducted at this site.

The trembling aspen/prickly rose type is characterized by trembling aspen in the canopy and white spruce in the subcanopy. Prickly rose, soapberry, green alder, low-bush cranberry and long-beaked willow are common shrubs, while bunchberry, mountain cranberry, fireweed and twinflower and common ground cover. Stair-step moss is widespread.

The regenerating black spruce/Labrador tea/mountain cranberry and black spruce – tamarack types are characterized by young black spruce and tamarack in the tree layer, Labrador tea, green alder, willows, prickly rose and shrubby cinquefoil in the shrub layer. Red bearberry and fireweed are common in the ground cover.

The access road will cross the same vegetation types as described above. A portion of the proposed access utilizes an existing linear disturbance.

The vegetation types in this area are common in the area, however, rock outcrops and lakeshores are both uncommon plant communities and rock outcrops in particular might contain species that are not common elsewhere. Two rare plant surveys were conducted near the open water in a rock outcrop and a burned swampy area, but no rare plants were discovered.

## **Vegetation Potential Effects and Mitigation**

Development of this borrow site and its associated access road will affect vegetation through clearing and mechanical damage to trees, shrubs, forbs and non-vascular species, the permanent loss of vegetation and underlying substrates through borrow site expansion and potential changes in site drainage and along the access road.

The majority of effects on vegetation will occur because of project activities arising from site construction and operations. These effects might include the potential influence of dust deposition on the health and growth of nearby vegetation, as well as the potential accidental introduction of non-native plant species. Effects on vegetation due to the borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native

reclamation species might also occur. Vegetation on the borrow site and along the access road might develop into a different vegetation community than what was there before development.

Implementation of primary mitigation measures, as described in [Section 8](#), will help reduce the magnitude of effects on vegetation at this borrow site and its access road.

### Wildlife Setting

Wildlife habitat at this borrow site is composed of regenerating upland white spruce, aspen, and jack pine forest with an open shrub layer of birch. Important wildlife features at the borrow site include a large, deep lake at the base of a steep east facing escarpment and regenerating mixedwood habitat. These features provide foraging and nesting habitat for many bird species, including peregrine falcon, boreal chickadee, lesser yellowlegs, and scaup, as well as cover and foraging habitat for moose and beaver. The habitat types at this site are considered rare in the region.

Key wildlife species reported at the borrow site (by sign or visual observation) included moose, marten, lynx, and peregrine falcon. Key species are species selected because of their importance in the subsistence economy or because they are listed as species of conservation concern or as species of particular ecological relevance. Other species reported during field surveys included horned grebe, American robin, alder flycatcher, warbling vireo, Tennessee warbler, yellow warbler, blackpoll warbler, white-throated sparrow and white-crowned sparrow.

An assessment of key habitat features, such as percent cover of forage species, indicated that the borrow site provides high quality foraging habitat and cover for moose and beaver, and high quality habitat for all key bird species ([Table 5-38](#)).

Habitat quality for wildlife at this borrow site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, is considered high for birds and moderate for mammals. The wetland and steep escarpment at the borrow site are considered rare in the region. The borrow site has been previously disturbed by a right-of-way.

**Table 5-42: Habitat Quality for Key Wildlife Species at Borrow Site 9.010PA**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Mammals	Woodland caribou	Winter foraging	Low
	Moose	Foraging	High
	Grizzly bear	Denning	Moderate
		Fall foraging	Low
		Spring foraging	Moderate

**Table 5-42: Habitat Quality for Key Wildlife Species at Borrow Site 9.010PAA (cont'd)**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Mammals (cont'd)	Marten	Foraging	Moderate
	Lynx	Foraging	Moderate
	Beaver	Cover	High
		Foraging	High
Birds	Scaup	Nesting	High
	Peregrine falcon	Nesting	High
	Lesser yellowlegs	Nesting	High
	Boreal chickadee	Nesting	High

NOTE:  
<sup>a</sup>Habitat quality was determined by comparing the vegetation and terrain characteristics at each site to each species' habitat requirements, such as shrub availability for moose.

Based on habitat availability a variety of species might inhabit the borrow site. These include several species that have special status designation at the national and territorial levels, as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Department of Resources, Wildlife and Economic Development (RWED, now ENR), respectively. These species are summarized in [Table 5-39](#).

**Table 5-43: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.010PA**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Grizzly bear (northwestern population)	Sensitive	Special concern	Schedule 3 – special concern <sup>f</sup>	Lower risk – least concern
Northern flying squirrel	Sensitive	-	-	Lower risk – least concern
River otter	Sensitive	-	-	-
Wolverine	Secure	Special concern	Schedule 3 – special concern <sup>f</sup>	Vulnerable
Woodland caribou	Sensitive	Threatened	Schedule 1 – threatened <sup>f</sup>	Lower risk – least concern
Northern pintail	Sensitive	-	-	-
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-

**Table 5-43: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.010PA (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Golden eagle	Sensitive	Not at risk	-	-
Peregrine falcon (anatum)	May be at risk	Threatened	Schedule 1 – threatened <sup>f</sup>	
Rock ptarmigan	Sensitive	-	-	-
American coot	Sensitive	-	-	-
Lesser yellowlegs	Sensitive	-	-	-
Least sandpiper	Sensitive	-	-	-
Common snipe	Sensitive	-	-	-
Red-necked phalarope	Sensitive	-	-	-
Northern flicker	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Barn swallow	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-
Rusty blackbird	Sensitive	-	-	-
Boreal chorus frog	Sensitive	-	-	-

NOTES:  
<sup>a</sup>A hyphen indicates no status has been assigned for that species.  
<sup>b</sup>RWED – Resources, Wildlife and Economic Development (known as ENR since April 1, 2005)  
<sup>c</sup>COSEWIC – Committee on the Status of Endangered Wildlife in Canada  
<sup>d</sup>SARA – *Species at Risk Act*  
<sup>e</sup>IUCN – The World Conservation Union  
<sup>f</sup>SARA status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation and final Ministerial approval.

### Wildlife Potential Effects and Mitigation

Habitat quality at this borrow site is composed of moderate to high quality habitat for wildlife. Habitat types are considered rare in the region, indicating they might be a limiting resource for wildlife. The borrow site provides high quality foraging habitat and cover for moose and beaver, and high quality habitat for all key bird species.

General potential effects resulting from development and operation of the borrow site include direct and indirect habitat loss, disruption of wildlife movements and wildlife mortality. The timing of project activities, as well as the small footprint of disturbances relative to regional habitat availability, suggests that the magnitude of project effects on birds and most mammals, including those with special status designation, will be low. However, specific issues of concern at the borrow site include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- disturbance of nesting birds during summer and potential abandonment of nest sites
- loss of riparian habitats during extraction activities and road construction
- disturbance of moose along access road during winter
- increased hunting/poaching of wildlife such as moose and beaver resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow site development and operations. Specifically, the following mitigation measures are considered important for this site:

- use waste management plan described in [Section 11](#)
- reduce project activities during the spring, summer and fall (bird nesting season) to the extent practical
- avoid known nesting sites (as determined during pre-construction surveys) to the extent practical
- reduce clearing of riparian habitats
- prohibit the recreational use of access roads and rights-of-way by project staff while on the job site
- establish and enforce regulations to prevent wildlife harassment

### **Hydrology Setting**

The borrow site is located about 4 km upslope of the East bank of Mackenzie River. The borrow area encompasses a small lake and a small watercourse (likely vegetated) that joins with the Mackenzie River. Runoff from the borrow site would be primarily downslope toward the unnamed watercourse. The area

encompassing this borrow site that contributes runoff to the unnamed watercourse is about 30 km<sup>2</sup>.

### **Hydrology Potential Effects and Mitigation**

The small lake and watercourse within the borrow area might be disturbed. Site drainage and sediment control measures might be implemented to mitigate any effects on the unnamed watercourse flowing into the Mackenzie River. An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and an increase in mean sediment concentration on the unnamed watercourse might be local but limited, and are not expected in the Mackenzie River.

### **Groundwater Setting**

The lake in the borrow site might be receiving groundwater recharge or overland runoff from the bedrock ridge. An icing was noted on the small unnamed watercourse downstream of this ridge during the April 2002 field investigation, indicating possible perennial groundwater flow into the watercourse.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

### **Groundwater Potential Effects and Mitigation**

The removal of borrow materials has the potential to reduce or remove an area of groundwater storage and recharge. This could result in alterations to local groundwater flow patterns, increases in surface water runoff and changes to springs, seeps or groundwater fed wetlands associated with this area of groundwater recharge. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **Water Quality Setting**

The borrow site is located about 4 km upslope of the East bank of Mackenzie River, and is adjacent to a small lake and a small, unnamed watercourse that joins with the Mackenzie River.

Field water quality data, such as dissolved oxygen, pH, conductance, temperature and turbidity, was collected from the unnamed watercourse during summer 2002 and 2003. The water was well-oxygenated, with dissolved oxygen values within aquatic life and drinking water guidelines (see Table 5-40). The pH levels, ranging from 8.0 to 8.5, were also within guidelines. Major ion concentrations, as indicated by conductance levels, were moderate during August 2002, and were very high during two other summer sampling events. Very high conductance levels indicate the input of ground water springs. Turbidity levels were low during summer 2002, and were moderate during summer 2003.

**Table 5-44: Unnamed Stream (RPR-355) – 2002 and 2003 Field Water Quality Parameters**

Waterbody Name <sup>a</sup>	Water Quality Season	Date	Dissolved Oxygen (mg/L)	pH	Conductance (µS/cm)	(°C)	Turbidity (NTU) <sup>b</sup>
Unnamed watercourse <sup>c</sup>	Summer	June 6, 2002	-	8.0	870	13.0	3
	Summer	August 14, 2002	12.0	8.4	461	8.8	7
	Summer	July 24, 2003	11.2	8.5	1,740	9.8	38

NOTES:  
<sup>a</sup>A hyphen indicates data not available.  
<sup>b</sup>NTU – nephelometric turbidity unit  
<sup>c</sup>Field water quality data was measured from both locations (1.5 and 3.5 km downstream of the borrow site). Data is averaged for the sites.

### Water Quality Potential Effects and Mitigation

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed on a site-specific basis. Limited effects are expected on surface water flow and water level in the unnamed lake and watercourse due to

changes in runoff. These effects represent a change of less than 2.0% of the natural range in flows and water levels. Consequently, no effects on water quality are expected.

The effect on mean annual total suspended sediment (TSS) concentrations are predicted to be negligible, that is, less than 10 mg/L, in the unnamed lake and watercourse. Therefore, limited effects are expected on the water quality parameters associated with sediment inputs, that is, nutrients and metals.

Negligible effects were predicted on mean annual flow and mean annual total suspended sediment (TSS) concentrations in the Mackenzie River due to changes in runoff. These effects represent a non-detectable change in the natural range in flows and water levels, and in mean annual TSS levels. Consequently, no effects are expected on water quality.

### **Fish and Fish Habitat Setting**

A small lake and unnamed watercourse fall within the boundaries of this borrow site. The outlet from the lake is an unnamed watercourse that will be crossed by the pipeline right-of-way about 3 km south of the borrow site. The watercourse is classified as an Active II Channel. Active II Channels have defined bed and banks, intermittent flow and are likely to be dry or frozen to the bed of the watercourse in winter. Active II Channels do not provide overwintering habitat for fish but might be used provide habitat on a seasonal basis.

A habitat survey of the watercourse at the crossing location suggest that the bed material was suitable as spawning substrate by Arctic grayling and sucker species. However, the high gradient and shallow depth prevented access by Mackenzie River fish. Similarly, use of the watercourse as adult holding and feed by large bodied species is also considered unlikely. Although evidence of ground water was present, the shallow depths prevented use of the watercourse as overwintering for large bodied fish species. No fish were captured in 2002 and 2003.

### **Fish and Fish Habitat Potential Effects and Mitigation**

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment in runoff.

Maintaining a vegetated buffer zone between the site and local waterbodies, if required, and implementation of site-specific erosion and sediment control plans will prevent sediment from the borrow site reaching surface waters.

## **Human Environment**

This topic contains a description of the protected areas and heritage resource setting and potential effects and mitigation for borrow site 9.080PA. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

Borrow site 9.010PA is located within the proposed Mackenzie River Special Management Area. This area is described in the SPDLUP as a very important regional and territorial travel and transportation corridor, heritage place and traditional use location.

### **Protected Areas Potential Effects and Mitigation**

The development of this site in the proposed Mackenzie River Special Management Area will result in a decrease in the land base available for other land uses within this area. The presence of development within this area will be a permanent change to the landscape.

### **Heritage Resources**

This borrow site was inspected as part of the borrow resource component of the field programs. This location was considered to have high potential for the discovery of heritage resources. Heritage resource sites have been previously recorded within a 5.0 km range of the development area, indicating prior use of this region. No heritage sites were recorded as a result of the surface reconnaissance at this site.

The nature of the heritage resource potential and results of the investigations at this location were provided to the Prince of Wales Northern Heritage Centre in a report under permit 2003-933. A reconnaissance was also conducted in 2004 to examine a proposed expansion to the borrow site, the results of which were provided to the Prince of Wales Northern Heritage Centre in a report under permit 2004-956.

### **Heritage Resources Potential Effects and Mitigation**

Before the development of this site, a Heritage Resource Impact Assessment will be conducted and provided to the Prince of Wales Northern Heritage Centre. If it is determined that the development will affect any heritage resources, mitigation plans will be prepared.

## **PUBLIC INVOLVEMENT**

No concerns regarding this borrow site have been expressed by the local SSA communities in meetings or discussions with Imperial. The public involvement activities are documented in [Section 10](#) of this application.

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TITLE	<b>SSA Crown Lands Application for a Type A Land Use Permit</b>
SECTION	5: Borrow Sites
SUBJECT	17: Borrow Site 9.034PB

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## OVERVIEW

Borrow source 9.034 is a longitudinal remnant of a glaciofluvial plain consisting of stratified, well graded, coarse grained sand and medium to coarse grained gravel. It is located midway between Tulita and Wrigley, about 11 km north of the Blackwater River. It should provide excellent quality material, Class 1, suitable for high quality surfacing materials or asphalt and concrete aggregate with minimal processing. The material might be used for pipeline right-of-way requirements.

## SITE DESCRIPTION

Borrow source 9.034 is located about 3.0 km east of the Mackenzie River and is passed on its eastern edge by the winter road and the proposed pipeline right-of-way. The source is about 7.5 km long (north to south) and between 250 and 750 m wide and encompasses an area of about 375 ha. Borrow site 9.034PB is about 540 m wide and 1,105 m long and encompasses an area of about 60 ha. See [Figure 5-63](#) for an overview map of the borrow site. See [Figure 5-65](#) for a site-specific map of the borrow site.

### Access

Borrow site 9.034PB is located along the winter road midway between Tulita and Wrigley. Access to the borrow site will be from the pipeline right-of-way, which passes through the centre of the site. Adjacent terrain has potential to be thermally sensitive so the site is most readily accessed in the winter.

### Surface Conditions

Borrow site 9.034PB is located on a long, longitudinal remnant of a glaciofluvial outwash plain that is oriented parallel to the eastern shoreline of the Mackenzie River. A meltwater channel marks the eastern boundary of the site, while the western side is bounded by a glaciolacustrine plain with thermokarst features. The site area is relatively flat but slightly elevated above the adjacent terrain. The surrounding terrain consists of poorly drained infilled meltwater channels that exhibit thermally sensitive terrain conditions. Overburden on the site is generally less than 0.3 m and supports moderately dense growths of spruce, poplar and birch. The poorly drained surrounding terrain supports partially stunted growths of spruce, tamarack and willow.

Figure 5.63 as been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.

## Subsurface Information

Pemcan Services completed eleven boreholes on the source in 1973 (Pemcan 1972). In 1975, another test pit was completed on the source by Northern Engineering Services Company Limited (NESCL 1976-1977). Of these, boreholes DH-1, B231-A, C374-B and C376-B (Pemcan) lie within borrow site 9.034PB. The following borehole and test pit information has been extracted from these previous studies.

Available information suggests that the granular material in this site is excellent quality granular material, consisting of stratified, well graded sand and gravel of varying gradation. The granular material is considered suitable for use in most construction requirements.

Borehole DH-1 penetrated about 0.3 m of poorly graded gravel with some sand and a little silt, underlain by about 2.4 m of well to poorly graded sand with a trace of gravel, and about 1.8 m of well graded gravel and sand with a trace of silt. The material encountered in the borehole was friable with low ice contents.

Borehole B231-A penetrated about a negligible layer of moss, underlain by about 3.0 m of variable gravel and sand. The gravel and sand layer progressed from poorly graded gravel in the upper section to well graded gravel in the lower section with an inclusion of poorly graded sand in the central portion about 0.9 m thick. The material encountered in the borehole was unfrozen.

Borehole C374-B penetrated about 1.5 m of poorly graded gravel with sand. The material encountered in the borehole was unfrozen.

Borehole C376-B penetrated about 0.3 m of muskeg, underlain by about 2.1 m of sandy gravel. The water table was encountered in borehole C376-B at a depth of about 0.9 m and the material encountered was unfrozen.

## PIT DEVELOPMENT

For borrow source 9.034 as a whole, proven reserves of 2,000,000 m<sup>3</sup>, and probable reserves of 3,800,000 m<sup>3</sup> of stratified, well graded, coarse grained sands and medium to coarse grained gravels have been estimated (EBA 1986). With the expectation that the distribution and characteristics of the granular materials encountered in the boreholes are representative, an average exploitable granular material thickness of 4.5 m has been assumed. Based on this 4.5 m thickness and a borrow site area of 60 ha, it is estimated that borrow site 9.034PB contains about 2,700,000 m<sup>3</sup> of exploitable granular material. An estimated 13,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests that borrow site 9.034PB is unfrozen or is frozen with low ice contents. Therefore, ripping and some drilling or blasting will be required during the extraction process.

## ENVIRONMENT

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.034PB. This information includes data collected during the 2004 field programs.

### Biophysical Environment

#### Air Quality Setting

The air quality setting for this site is expected to be similar to regional setting for the SSA described in [Section 8](#).

#### Air Quality Potential Effects and Mitigation

Potential effects on air quality associated with the development of the borrow site, such as dust, vehicle and equipment emissions, are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

#### Noise and Light Setting

The noise setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

The site is currently undeveloped and therefore, no manmade sources of light occur.

#### Noise and Light Potential Effects and Mitigation

Potential effects on noise levels associated with the development of the borrow site are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

Industrial lighting can cause increases in ambient light. Sources of light include vehicle, flares and lighting around the site.

Lighting will be used during non-daylight hours, which, during the winter months, might mean periods when lighting is required on a 24 hour basis. Conversely, during the late spring and through summer months, lighting will not be required at all because of the extended daylight hours.

The potential visual effect of lighting can be partially reduced by proper placement and use of lighting only in areas where it is required.

## Soils, Landforms and Permafrost Setting

This borrow site lies in a large glaciofluvial plain that is bordered on either side by lowland areas containing organic fens. The borrow site lies on the pipeline right-of-way and short access roads are entirely within the glaciofluvial plain. The site lies within the zone of extensive discontinuous permafrost.

Glaciofluvial sediments are well drained and have likely developed Orthic Eutric Brunisols. Previous geotechnical work suggests the surficial materials are mostly frozen. The ice contents in frozen areas are expected to be between 5 and 20%, by weight. [Figure 5-64](#) is a photograph of the soil and landforms setting at this borrow site.



**Figure 5-64: Soils and Landforms Setting in Borrow Site 9.034PB**

## Soils, Landforms and Permafrost Potential Effects and Mitigation

Terrain-related environmental sensitivities are not predicted for the borrow site area or access road. Stripping of soil before further development could result in a reduction of soil quality by mixing.

General mitigation strategies to offset potential effects are outlined in [Section 8](#).

## Vegetation Setting

The majority of the borrow site is an upland mosaic of regenerating jack pine forest and regenerating white spruce – trembling aspen – jack pine mixedwood. There is a small area of shrub fen and graminoid fen in the northwestern corner of the borrow site. The site straddles the existing and proposed pipeline rights-of-way. As well, portions of two other existing linear disturbances cross the site. One vegetation survey and one rare plant survey were conducted at this site.

The regenerating upland jack pine forest is dominated by young jack pine, green alder, soapberry, prickly rose and low-bush cranberry in the shrub layer. Ground cover consists of mountain cranberry, common bearberry, fireweed and bunchberry.

The regenerating white spruce – trembling aspen – jack pine type is a young mixedwood with shrubs consisting of green alder, prickly rose, soapberry and low-bush cranberry. Ground cover includes mountain cranberry, bunchberry, northern comandra, twinflower and stair-step moss.

In the shrub fen type, ground birch, sweet gale and willows are dominant in the shrub layer. Water sedge is the most prominent ground cover, and *Drepanocladus* moss is abundant.

The graminoid fen type is dominated by water sedge. Marsh cinquefoil and other sedges are also common. Golden moss is the dominant bryophyte. A small area of spruce/cloudberry-lichen bog was identified in the centre of the fen during rare plant surveys.

There is a short access road in the middle of the borrow site which will cross the same habitat as that which dominates the site.

The vegetation types at the borrow site are common in the area. Two vegetation types of concern occur here: the graminoid fen and the black spruce/cloudberry – lichen bog. The graminoid fen vegetation type is of concern in the area due to high species richness and the potential to support rare plant species, including one nationally rare species. The black spruce/cloudberry – lichen bog type is a vegetation type of concern due to the limited ability to recover from surface disturbance, and the potential of subsidence due to thaw settlement.

### **Vegetation Potential Effects and Mitigation**

Development of this borrow site and its associated access road will affect vegetation through clearing and mechanical damage to trees, shrubs, forbs and non-vascular species, the permanent loss of vegetation and underlying substrates through borrow site expansion and potential changes in site drainage and along the access road.

The majority of effects on vegetation will occur because of project activities arising from site construction and operations. These effects might include the potential influence of dust deposition on the health and growth of nearby vegetation, as well as the potential accidental introduction of non-native plant species. Effects on vegetation due to the borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow site and along the

access road might develop into a different vegetation community than what was there before development.

A small area of graminoid fen on the south west corner of the borrow site will be avoided as much as practical. Silt fencing along the perimeter will protect the wetland from silt deposition during the summer. Any vehicle traffic on these areas will operate on a buffer of ice or snow. A site-specific mitigation and monitoring plan will be developed for this vegetation type of concern.

The black spruce/cloudberry-lichen bog vegetation type occurs in the centre of the borrow pit and therefore cannot be avoided. No mitigation is suggested.

Implementation of primary mitigation measures, as described in [Section 8](#), will help reduce the magnitude of effects on vegetation at this borrow site and its access road.

### **Wildlife Setting**

Wildlife habitat at this borrow site is composed of regenerating upland jack pine forest, regenerating mixedwood forest and graminoid and shrub fen. The closed shrub layer is composed of alder. These habitat types are considered uncommon in the region. Important wildlife features at the borrow site include a high cover of lichen that provides foraging habitat for woodland caribou, berries and herbs provide spring forage for grizzly bear, and a high density of coarse woody debris, snags, and shrub cover provide foraging habitat for marten and lynx. Shrub and graminoid fens and a nearby lake provides important habitat for many bird species including lesser yellowlegs and scaup.

Key wildlife species reported at the borrow site (by sign or visual observation) included moose, woodland caribou, and lesser yellowlegs. Key species are species selected because of their importance in the subsistence economy or because they are listed as species of conservation concern or as species of particular ecological relevance. Other species reported during field surveys included black bear and snowshoe hare.

An assessment of key habitat features, such as percent cover of forage species, indicated that the borrow site provides high quality foraging habitat for woodland caribou, grizzly bear (spring), and marten, and moderate quality nesting habitat for lesser yellowlegs, scaup, and boreal chickadee ([Table 5-41](#)).

Habitat quality for wildlife at this borrow site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, is considered moderate for wildlife. Habitat types are considered uncommon in the region. The borrow site has been previously disturbed by a Wrigley to Fort Good Hope winter road and a right-of-way.

**Table 5-45: Habitat Quality for Key Wildlife Species at Borrow Site 9.034PB**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Mammals	Woodland caribou	Winter foraging	High
	Moose	Foraging	Low
	Grizzly bear	Denning	Low
		Fall foraging	Moderate
		Spring foraging	High
	Marten	Foraging	High
	Lynx	Foraging	Moderate
	Beaver	Cover	Low
Foraging		Low	
Birds	Scaup	Nesting	Moderate
	Peregrine falcon	Nesting	Low
	Lesser yellowlegs	Nesting	Moderate
	Boreal chickadee	Nesting	Moderate

NOTE:  
<sup>a</sup>Habitat quality was determined by comparing the vegetation and terrain characteristics at each site to each species' habitat requirements, such as shrub availability for moose.

Based on habitat availability a variety of species might inhabit the borrow site. These include several species that have special status designation at the national and territorial levels, as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Department of Resources, Wildlife and Economic Development (RWED, now ENR), respectively. These species are summarized in [Table 5-42](#).

**Table 5-46: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.034PB**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Grizzly bear (northwestern population)	Sensitive	Special concern	Schedule 3 – special concern <sup>f</sup>	Lower risk – least concern
Northern flying squirrel	Sensitive	-	-	Lower risk – least concern
Wolverine	Secure	Special concern	Schedule 3 – special concern <sup>f</sup>	Vulnerable

**Table 5-46: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.034PB (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Woodland caribou	Sensitive	Threatened	Schedule 1 – threatened	Lower risk – least concern
Northern pintail	Sensitive	-	-	-
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Rock ptarmigan	Sensitive	-	-	-
American coot	Sensitive	-	-	-
Lesser yellowlegs	Sensitive	-	-	-
Least sandpiper	Sensitive	-	-	-
Common snipe	Sensitive	-	-	-
Red-necked phalarope	Sensitive	-	-	-
Black tern	Sensitive	Not at risk	-	-
Short-eared owl	Sensitive	Special concern	Schedule 3 – special concern	-
Northern flicker	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-
Rusty blackbird	Sensitive	-	-	-

NOTES:  
<sup>a</sup>A hyphen indicates no status has been assigned for that species.  
<sup>b</sup>RWED – Resources, Wildlife and Economic Development (known as ENR since April 1, 2005)  
<sup>c</sup>COSEWIC – Committee on the Status of Endangered Wildlife in Canada  
<sup>d</sup>SARA – *Species at Risk Act*  
<sup>e</sup>IUCN – The World Conservation Union  
<sup>f</sup>SARA status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation and final Ministerial approval.

### Wildlife Potential Effects and Mitigation

This borrow site is composed of moderate quality habitat for wildlife. Habitat types are considered uncommon in the region, indicating they might be a limiting

resource for wildlife. The borrow site provides high quality foraging habitat for woodland caribou, grizzly bears (spring), and marten, and moderate quality nesting habitat for lesser yellowlegs, scaup, and boreal chickadee.

General potential effects resulting from development and operation of the borrow site on wildlife include direct and indirect habitat loss, disruption of wildlife movements and wildlife mortality. The timing of project activities, as well as the small footprint of disturbances relative to regional habitat availability, suggests that the magnitude of project effects on birds and most mammals, including those with special status designation, will be low. However, specific issues of concern at the borrow site include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- displacement of grizzly bears from high quality foraging habitat during the spring (if site is active)
- disturbance of nesting birds near the borrow site during summer and potential abandonment of nest sites
- displacement of caribou from high quality foraging habitat during winter
- disturbance of caribou and disruption of movements
- increased hunting/poaching of wildlife such as marten resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow site development and operations. Specifically, the following mitigation measures are considered important for this site:

- use waste management plan described in [Section 11](#)
- avoid active nesting sites (as determined during pre-construction surveys) to the extent practical
- reduce activities during the spring, summer and fall (bird nesting season) to the extent practical
- monitor occurrence of caribou near the borrow site during winter and schedule peak construction activities during mid to late winter when fewer caribou might occur in the area
- prohibit the recreational use of associated access roads by project staff while on the job site

- establish and enforce regulations to prevent harassment of wildlife

### **Hydrology Setting**

The borrow site is about 0.6 km upslope of an unnamed lake (WS 164A) with a surface area of about 1.5 km<sup>2</sup>. The area encompassing this borrow site that contributes runoff at the location where the watercourse from the lake outlet joins a larger watercourse is about 21 km<sup>2</sup>.

### **Hydrology Potential Effects and Mitigation**

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and an increase in mean sediment concentration on the unnamed lake would be limited because of the large area contributing runoff.

### **Groundwater Setting**

Low rates of shallow groundwater flow are expected in this area due to the low relief.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

### **Groundwater Potential Effects and Mitigation**

The removal of borrow materials has the potential to reduce or remove an area of groundwater storage and recharge. This could result in alterations to local groundwater flow patterns, increases in surface water runoff and changes to springs, seeps or groundwater fed wetlands associated with this area of groundwater recharge. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **Water Quality Setting**

Water quality data for this site is expected to be similar to regional data described in [Section 8](#).

### **Water Quality Potential Effects and Mitigation**

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed on a site-specific basis. Limited effects are expected on surface water flow and water level in the unnamed lake due to changes in runoff. These effects represent a change of less than 2.0% of the natural range in flows and water levels. Consequently, no effects on water quality are expected.

The effect on mean annual total suspended sediment (TSS) concentrations are predicted to be low, that is, less than 10 mg/L, in the unnamed lake. Therefore, limited effects are expected on the water quality parameters associated with sediment inputs, that is, nutrients and metals.

### **Fish and Fish Habitat Setting**

There are no aquatic features within the boundaries of this borrow site. Several small ponds are located along the western boundary of the borrow site. Typically, small ponds such as these are shallow and freeze to the bottom in winter. Therefore, they are unlikely to support large bodied fish. An unnamed lake and an unnamed watercourse are located about 250 m to the north and east of the borrow site boundaries respectively. Lakes of similar size are not likely to freeze to the bottom and are typically able to support both large bodied and small-bodied fish species such as northern pike and minnows.

### **Fish and Fish Habitat Potential Effects and Mitigation**

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment in runoff.

Maintaining a vegetated buffer zone between the site and local waterbodies, if required, and implementation of site-specific erosion and sediment control plans will prevent sediment from the borrow site reaching surface waters.

## **Human Environment**

This topic contains a description of the protected areas and heritage resource setting and potential effects and mitigation for borrow site 9.034PB. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

This borrow site is located within the proposed Mackenzie River Special Management Area. This area is described in the SPDLUP as a very important regional and territorial travel and transportation corridor, heritage place and traditional use location.

### **Protected Areas Potential Effects and Mitigation**

The development of this site in the proposed Mackenzie River Special Management Area will result in a decrease in the land base available for other land uses within this area. The presence of development within this area will be a permanent change to the landscape.

### **Heritage Resources Setting**

This borrow site was inspected as part of the borrow resource component of the field programs. Investigations at the borrow site included limited ground reconnaissance in 2002 and aerial overflights in 2003. This location was considered to have low potential for the discovery of heritage resources. No heritage sites were recorded as a result of the surface reconnaissance and no heritage resource sites have been previously recorded in the immediate area.

The nature of the heritage resource potential and results of the investigations at this location were provided to the Prince of Wales Northern Heritage Centre in a report under permit 2003-933. Information is also included in the report that was submitted to the Prince of Wales Northern Heritage Centre under permit 2004-956.

### **Heritage Resources Potential Effects and Mitigation**

Before the development of this site, a Heritage Resource Impact Assessment will be conducted and provided to the Prince of Wales Northern Heritage Centre. If it is determined that the development will affect any heritage resources, mitigation plans will be prepared.

## **PUBLIC INVOLVEMENT**

No concerns regarding this borrow site have been expressed by the local SSA communities in meetings or discussions with Imperial. The public involvement activities are documented in [Section 10](#) of this application.

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TITLE	<b>SSA Crown Lands Application for a Type A Land Use Permit</b>
SECTION	5: Borrow Sites
SUBJECT	18: Borrow Site 9.034PA

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## OVERVIEW

Borrow source 9.034 is a longitudinal remnant of a glaciofluvial plain consisting of stratified, well graded, coarse grained sand and medium to coarse grained gravel. It is located midway between Tulita and Wrigley, about 11 km north of the Blackwater River. It should provide excellent quality material, Class 1, suitable for high quality surfacing materials or asphalt and concrete aggregate with minimal processing. The material might be used for pipeline right-of-way requirements.

## SITE DESCRIPTION

Borrow source 9.034 is located about 3.0 km east of the Mackenzie River and is passed on its eastern edge by the winter road and the proposed pipeline right-of-way. The source is about 7.5 km long (north to south) and between 250 and 750 m wide and encompasses an area of about 375 ha. Borrow site 9.034PA is about 480 m wide and 505 m long and encompasses an area of about 24.1 ha. See [Figure 5-66](#) for an overview map of the borrow site. See [Figure 5-69](#) for a site-specific map of the borrow site.

### Access

Borrow site 9.034PA is located along the Wrigley to Fort Good Hope winter road midway between Tulita and Wrigley. Access to the borrow site will be from the pipeline right-of-way, which passes by the northeast corner of the site. A winter access road, TD-B1-W-9.034PA, about 300 m long will be required to travel southwest from the pipeline right-of-way to the borrow site. Adjacent terrain has potential to be thermally sensitive so the site is most readily accessed in the winter.

Figure 5.66 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.

## Surface Conditions

Borrow site 9.034PA is located on a long, longitudinal remnant of a glaciofluvial outwash plain that is oriented parallel to the eastern shoreline of the Mackenzie River. A meltwater channel marks the eastern boundary of the site, while the western side is bounded by a glaciolacustrine plain with thermokarst features. The site area is relatively flat but slightly elevated above the adjacent terrain. The surrounding terrain consists of poorly drained infilled meltwater channels that exhibit thermally sensitive terrain conditions. Overburden on the site is generally less than 0.3 m and supports moderately dense growths of spruce, poplar and birch. The poorly drained surrounding terrain supports partially stunted growths of spruce, tamarack and willow.

## Subsurface Information

Pemcan Services completed eleven boreholes on the source in 1973 (Pemcan 1972). In 1975, another test pit was completed on the source by Northern Engineering Services Company Limited. Of these, borehole DH-3 and B224-A (Pemcan), and test pit B5-1 (NESCL 1976-1977) lie within borrow site 9.034PA. The following borehole and test pit information has been extracted from these previous studies.

Available information suggests that the granular material in this site is excellent quality granular material, consisting of stratified, well graded sand and gravel of varying gradation. The granular material is considered suitable for use in most construction requirements.

Borehole DH-3 penetrated about 0.6 m of well to poorly graded gravel with some sand, underlain by about 3.9 m of poorly to well graded sand with some gravel and a trace of silt. The soils encountered in DH-3 were friable with medium ice contents and a small section of unfrozen sand at a depth of about 2.4 m.

Borehole B224-A penetrated about 1.2 m of poorly graded, coarse gravel with sand, underlain by about 3.3 m of well graded, coarse grained sand with isolated random pebbles. The soils encountered in B224-A were unfrozen.

Test pit B5-1 penetrated a negligible layer of silt and peat, underlain by about 2.0 m of sand with interlayered gravel. There are two gravel layers about 0.3 m thick located at depths of about 0.15 m and 0.67 m. The soils encountered in B5-1 were unfrozen. Sieve analysis on material from the test pit contained about 32% gravel, about 66% sand, and about 2% silt.

## PIT DEVELOPMENT

For borrow source 9.034 as a whole, proven reserves of 2,000,000 m<sup>3</sup>, and probable reserves of 3,800,000 m<sup>3</sup> of stratified, well graded, coarse grained sands and medium to coarse grained gravels have been estimated (EBA 1986). With the

expectation that the distribution and characteristics of the granular materials encountered in the boreholes are representative, an average exploitable granular material thickness of 4.5 m has been assumed. Based on this 4.5 m thickness and a borrow site area of 24.1 ha, it is estimated that borrow site 9.034PA contains about 1,084,500 m<sup>3</sup> of exploitable granular material. An estimated 13,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests that borrow site 9.034PA is unfrozen or is frozen with low ice contents. Therefore, ripping and some drilling or blasting will be required during the extraction process.

## **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.034PA. This information includes data collected during the 2004 field programs.

### **Biophysical Environment**

#### **Air Quality Setting**

The air quality setting for this site is expected to be similar to regional setting for the SSA described in [Section 8](#).

#### **Air Quality Potential Effects and Mitigation**

Potential effects on air quality associated with the development of the borrow site, such as dust, vehicle and equipment emissions, are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

#### **Noise and Light Setting**

The noise setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

The site is currently undeveloped and therefore, no manmade sources of light occur.

#### **Noise and Light Potential Effects and Mitigation**

Potential effects on noise levels associated with the development of the borrow site are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

Industrial lighting can cause increases in ambient light. Sources of light include vehicle, flares and lighting around the site.

Lighting will be used during non-daylight hours, which, during the winter months, might mean periods when lighting is required on a 24 hour basis. Conversely, during the late spring and through summer months, lighting will not be required at all because of the extended daylight hours.

The potential visual effect of lighting can be partially reduced by proper placement and use of lighting only in areas where it is required.

### **Soils, Landforms and Permafrost Setting**

This borrow site lies in a large glaciofluvial plain that is bordered on either side by lowland areas containing organic fens. Access to the borrow site from the pipeline right-of-way is entirely over the glaciofluvial plain. The region lies within the zone of extensive discontinuous permafrost.

Glaciofluvial sediments are well drained and have likely developed Orthic Eutric Brunisols. The land surface is flat to locally gently sloping. Previous geotechnical work suggests the surficial materials are unfrozen or frozen over between 5 and 10% of the landform. The ice contents in frozen areas are expected to be between 5 and 20%, by weight. [Figure 5-67](#) is a photograph of the soil and landforms setting at this borrow site.



**Figure 5-67: Soils and Landforms Setting in Borrow Site 9.034PA**

### **Soils, Landforms and Permafrost Potential Effects and Mitigation**

Terrain-related environmental sensitivities are not predicted for the borrow site area or access road. Stripping of soil before further development could result in a reduction of soil quality by mixing.

General mitigation strategies to offset potential effects are outlined in [Section 8](#).

## Vegetation Setting

The majority of the borrow site is an upland mosaic of regenerating jack pine forest and regenerating white spruce – trembling aspen – jack pine mixedwood. There is a small area of black spruce – Labrador tea/mountain cranberry and shrub fen vegetation type along the western edge of the borrow site. Four existing linear disturbances cross the borrow site. Two visual vegetation surveys and one rare plant survey were conducted at this site. No rare plant species or uncommon communities were observed during the site surveys.

The regenerating upland jack pine forest is dominated by young jack pine, green alder, soapberry, prickly rose and low-bush cranberry in the shrub layer. Ground cover consists of mountain cranberry, common bearberry, fireweed and bunchberry.

The regenerating white spruce – trembling aspen – jack pine type is a young mixedwood with shrubs consisting of green alder, prickly rose, soapberry and low-bush cranberry. Ground cover includes mountain cranberry, bunchberry, northern comandra, twinflower and stair-step moss.

In the black spruce – Labrador tea/mountain cranberry vegetation type, scattered black spruce and tamarack occur in the tree and shrub layers. Labrador tea, willow, ground birch, bog bilberry and shrubby cinquefoil are also common. Ground covers include myrtle-leaved willow, mountain cranberry, red bearberry and dwarf scouring rush. Bryophytes and lichens are abundant.

In the shrub fen type, ground birch, sweet gale and willows are dominant in the shrub layer. Water sedge is the most prominent ground cover, and *Drepanocladus* moss is abundant.

Access to the borrow site is short and will cross the same habitat as that which dominates the site.

All of the vegetation types at the borrow site are common in the project area. [Figure 5-68](#) is a photograph of the vegetation at this borrow site.



**Figure 5-68: Example of Vegetation at Borrow Site 9.034PA**

### **Vegetation Potential Effects and Mitigation**

Development of this borrow site and its associated access road will affect vegetation through clearing and mechanical damage to trees, shrubs, forbs and non-vascular species, the permanent loss of vegetation and underlying substrates through borrow site expansion and potential changes in site drainage and along the access road.

The majority of effects on vegetation will occur because of project activities arising from site construction and operations. These effects might include the potential influence of dust deposition on the health and growth of nearby vegetation, as well as the potential accidental introduction of non-native plant species. Effects on vegetation due to the borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow site and along the access road might develop into a different vegetation community than what was there before development.

Implementation of primary mitigation measures, as described in [Section 8](#), will help reduce the magnitude of effects on vegetation at this borrow site and its access road.

### **Wildlife Setting**

Wildlife habitat at this borrow site is composed of regenerating and young upland jack pine forest, regenerating mixedwood forest, black spruce bog, and shrub fen.

The closed shrub layer is composed of poplar, aspen, alder, and willow. Important wildlife features at the borrow site include shrubs that provide forage for moose and a high density of coarse woody debris and snags that provide foraging and denning habitat for marten and lynx. Shrub fen and a nearby lake provide important habitat for many bird species including waterbirds.

Key wildlife species reported at the borrow site (by sign or visual observation) included moose, woodland caribou, and marten. Key species are species selected because of their importance in the subsistence economy or because they are listed as species of conservation concern or as species of particular ecological relevance. Other species reported during field surveys included black bear, Tennessee warbler, yellow-rumped warbler, palm warbler, alder flycatcher, chipping sparrow, and white-throated sparrow.

An assessment of key habitat features, such as percent cover of forage species, indicated that the borrow site provides high quality foraging habitat for moose and foraging and denning habitat for marten and lynx (Table 5-47).

Habitat quality for wildlife at this borrow site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, is considered moderate for birds and high for mammals. Habitat types are considered rare in the region. The borrow site has been previously disturbed by a winter road and a right-of-way and there is evidence that moose, caribou, and bears are using these disturbances as travel corridors.

**Table 5-47: Habitat Quality for Key Wildlife Species at Borrow Site 9.034PA**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Mammals	Woodland caribou	Winter foraging	Low
	Moose	Foraging	High
	Grizzly bear	Denning	Low
		Fall foraging	Low
		Spring foraging	Moderate
	Marten	Foraging	High
	Lynx	Foraging	High
	Beaver	Cover	Low
		Foraging	Low

**Table 5-47: Habitat Quality for Key Wildlife Species at Borrow Site 9.034PA (cont'd)**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Birds	Scaup	Nesting	Low
	Peregrine falcon	Nesting	Low
	Lesser yellowlegs	Nesting	Low
	Boreal chickadee	Nesting	Low

**NOTE:**

<sup>a</sup>Habitat quality was determined by comparing the vegetation and terrain characteristics at each site to each species' habitat requirements, such as shrub availability for moose.

Based on habitat availability a variety of species might inhabit the borrow site. These include several species that have special status designation at the national and territorial levels, as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Department of Resources, Wildlife and Economic Development (RWED, now ENR), respectively. These species are summarized in [Table 5-48](#).

**Table 5-48: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.034PA**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Wolverine	Secure	Special concern	Schedule 3 – special concern <sup>f</sup>	Vulnerable
Woodland caribou	Sensitive	Threatened	Schedule 1 – threatened	Lower risk – least concern
Northern pintail	Sensitive	-	-	-
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Rock ptarmigan	Sensitive	-	-	-
American coot	Sensitive	-	-	-
Lesser yellowlegs	Sensitive	-	-	-

**Table 5-48: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.034PA (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Least sandpiper	Sensitive	-	-	-
Common snipe	Sensitive	-	-	-
Red-necked phalarope	Sensitive	-	-	-
Black tern	Sensitive	Not at risk	-	-
Short-eared owl	Sensitive	Special concern	Schedule 3 – special concern	-
Northern flicker	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-
Rusty blackbird	Sensitive	-	-	-

NOTES:  
<sup>a</sup>A hyphen indicates no status has been assigned for that species.  
<sup>b</sup>RWED – Resources, Wildlife and Economic Development (known as ENR since April 1, 2005)  
<sup>c</sup>COSEWIC – Committee on the Status of Endangered Wildlife in Canada  
<sup>d</sup>SARA – *Species at Risk Act*  
<sup>e</sup>IUCN – The World Conservation Union  
<sup>f</sup>SARA status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation and final Ministerial approval.

### Wildlife Potential Effects and Mitigation

This borrow site is composed of moderate to high quality habitat for wildlife. The borrow site provides high quality foraging habitat for moose and foraging habitat for marten and lynx.

General potential effects resulting from development and operation of the borrow site and access road on wildlife include direct and indirect habitat loss, disruption of wildlife movements and wildlife mortality. The timing of project activities, as well as the small footprint of disturbances relative to regional habitat availability, suggests that the magnitude of project effects on birds and most mammals, including those with special status designation, will be low. However, specific issues of concern at the borrow site and along the access road include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears

- disturbance of nesting birds near the borrow site during summer and potential abandonment of nest sites
- disturbance of moose along the access road during the winter
- increased hunting/poaching of wildlife such as marten and lynx resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow site and access road development and operations. Specifically, the following mitigation measures are considered important for this site:

- use the waste management plan described in [Section 11](#)
- avoid active nesting sites (as determined during pre-construction surveys) to the extent practical
- reduce activities during the spring, summer and fall (bird nesting season) to the extent practical
- prohibit the recreational use of associated access roads by project staff while on the job site
- establish and enforce regulations to prevent harassment of wildlife

### **Hydrology Setting**

The borrow site is located about 0.3 km northwest of a small unnamed lake (ST 24). The drainage from the lake to a nearby unnamed watercourse appears to be undefined. The area encompassing this borrow site that contributes runoff to the lake is about 1.5 km<sup>2</sup>.

### **Hydrology Potential Effects and Mitigation**

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and an increase in mean sediment concentration on the unnamed lake would be limited with the implementation of sediment control measures.

### **Groundwater Setting**

Low rates of shallow groundwater flow are expected in this area due to the low relief.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

### **Groundwater Potential Effects and Mitigation**

The removal of borrow materials has the potential to reduce or remove an area of groundwater storage and recharge. This could result in alterations to local groundwater flow patterns, increases in surface water runoff and changes to springs, seeps or groundwater fed wetlands associated with this area of groundwater recharge. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

### **Water Quality Setting**

Water quality data for this site is expected to be similar to regional data described in [Section 8](#).

### **Water Quality Potential Effects and Mitigation**

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed on a site-specific basis. Limited effects are expected on surface water flow and water level in the unnamed lake due to changes in runoff. These effects represent a change of less than 2.0% of the natural range in flows and water levels. Consequently, no effects on water quality are expected.

The effect on mean annual total suspended sediment (TSS) concentrations are predicted to be low, that is, less than 10 mg/L, in the unnamed lake. Therefore,

limited effects are expected on the water quality parameters associated with sediment inputs, that is, nutrients and metals.

### **Fish and Fish Habitat Setting**

There are no aquatic features within the boundaries of this borrow site. The closest waterbody is a small lake located to about 250 m downslope and southeast of the borrow site boundary. Typically small lakes such as this are shallow and freeze to the bottom in winter. Therefore they are unable to support large bodied fish year round.

### **Fish and Fish Habitat Potential Effects and Mitigation**

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment in runoff.

Maintaining a vegetated buffer zone between the site and local waterbodies, if required, and implementation of site-specific erosion and sediment control plans will prevent sediment from the borrow site reaching surface waters.

## **Human Environment**

This topic contains a description of the protected areas and heritage resource setting and potential effects and mitigation for borrow site 9.034PA. Other human environment information is described in [Section 8](#).

### **Protected Areas Setting**

According to the SPDLUP, this site is located within area designated for multiple use. Multiple use areas have no restrictions to development as long as their effects on resource users and values are reduced.

### **Protected Areas Potential Effects and Mitigation**

Because this site is located within a proposed multiple use area, no effects on protected areas are expected.

### **Heritage Resources**

This borrow site was inspected as part of the borrow resource component of the field programs. This location was considered to have low potential for the discovery of heritage resources. No heritage sites were recorded as a result of the surface reconnaissance and no heritage resource sites have been previously recorded in the immediate area.

The nature of the heritage resource potential and results of the investigations at this location were provided to the Prince of Wales Northern Heritage Centre in a report under permit 2003-933. Information is also included in the report that was submitted to the Prince of Wales Northern Heritage Centre under permit 2004-956.

### **Heritage Resources Potential Effects and Mitigation**

Before the development of this site, a Heritage Resource Impact Assessment will be conducted and provided to the Prince of Wales Northern Heritage Centre. If it is determined that the development will affect any heritage resources, mitigation plans will be prepared.

### **PUBLIC INVOLVEMENT**

No concerns regarding this borrow site have been expressed by the local SSA communities in meetings or discussions with Imperial. The public involvement activities are documented in [Section 10](#) of this application.

Figure 5.69 as been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.



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TITLE	<b>SSA Crown Lands Application for a Type A Land Use Permit</b>
SECTION	5: Borrow Sites
SUBJECT	19: Borrow Site 9.037PA

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## OVERVIEW

Borrow source 9.037 is a glaciofluvial plain consisting of stratified medium to coarse grained, well-graded sand and gravel. It is located about 15 km north of the Blackwater River, adjacent to the Enbridge pipeline right-of-way. It should provide good quality material, Class 2, suitable for base and surface course aggregates, embankments, or structural fill. The material might be used for pipeline right-of-way requirements.

## SITE DESCRIPTION

There are two borrow sites located on borrow source 9.037. Borrow site 9.037PA is located on the northern part of the low, broad linear remnant of the glaciofluvial plain, and borrow site 9.037PB in the central part. The northern part of borrow source 9.037 is about 3,000 m long (north to south) and about 400 m wide and encompasses an area of about 120 ha. Borrow site 9.037PA is about 505 m wide and 820 m long and encompasses an area of about 41.3 ha. See [Figure 5-70](#) for an overview map of the borrow site. See [Figure 5-73](#) for a site-specific map of the borrow site.

### Access

The borrow site is located about 120 km south of Tulita. Access to borrow site 9.037PA will be from the pipeline right-of-way, which is located about 1.5 km to the northeast. The winter road is adjacent to the pipeline right-of-way at this location. A winter access road, TD-B1-W-9.037PA, about 2.0 km in length will be required in order to travel southwest from the pipeline right-of-way to borrow site 9.037PA. Adjacent terrain has potential to be thermally sensitive so the site is most readily accessed in the winter.

### Surface Conditions

Borrow site 9.037PA is located on the northern portion of a north-south trending glaciofluvial plain that is a broad, low feature rising about 5.0 to 6.0 m above the adjacent landscape, as shown in [Figure 5-71](#). The site is well drained and overburden consists of organic topsoil up to 0.3 m thick. Moderate to dense growths of spruce, poplar, and birch cover the site.

Figure 5.70 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.



**Figure 5-71: Northern Part of Borrow Source 9.037**

### **Subsurface Information**

Pemcan Services completed seven boreholes on the source in 1973 (Pemcan 1972). Of these, two of the boreholes, BH-1 and BH-7, lie within borrow site 9.037PA. The following borehole information has been extracted from this previous study.

Available information suggests that the granular material in this deposit is of excellent quality and consists of stratified, well graded sand and gravel. The sand and gravel is considered suitable for various construction uses.

Of the two boreholes, borehole BH-1 penetrated about 0.15 m of organic peat, underlain by about 2.0 m of medium grained, poorly graded gravel with little sand. The material in the borehole was frozen with no visible ice and low ice contents.

Borehole BH-7 penetrated about 0.15 m of organic topsoil, underlain by about 2.0 m of medium grained, well graded gravel with little sand, and about 1.8 m of poorly graded gravel and sand with pebbles up to 5.0 cm in size. The upper 1.2 m of material encountered in the borehole was friable with low ice contents. The water table was encountered at a depth of about 1.2 m, resulting in unfrozen material below this depth.

### **PIT DEVELOPMENT**

For borrow source 9.037 as a whole, proven reserves of 3,100,000 m<sup>3</sup>, and probable reserves of 4,600,000 m<sup>3</sup> of stratified medium to coarse grained, well-graded sand and gravel have been estimated (EBA 1986). With the expectation that the distribution and characteristics of the granular materials encountered in the boreholes are representative, an average exploitable granular material

thickness of 4.5 m has been assumed. Based on this 4.5 m thickness and a borrow site area of 41.3 ha, it is estimated that borrow site 9.037PA contains about 1,858,500 m<sup>3</sup> of exploitable granular material. An estimated 8,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests that borrow site 9.037PA is frozen with low ice contents. Therefore, ripping and some drilling or blasting will be required during the extraction process.

## **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.037PA. This information includes data collected during the 2004 field programs.

### **Biophysical Environment**

#### **Air Quality Setting**

The air quality setting for this site is expected to be similar to regional setting for the SSA described in [Section 8](#).

#### **Air Quality Potential Effects and Mitigation**

Potential effects on air quality associated with the development of the borrow site, such as dust, vehicle and equipment emissions, are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

#### **Noise and Light Setting**

The noise setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

The site is currently undeveloped and therefore, no manmade sources of light occur.

#### **Noise and Light Potential Effects and Mitigation**

Potential effects on noise levels associated with the development of the borrow site are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

Industrial lighting can cause increases in ambient light. Sources of light include vehicle, flares and lighting around the site.

Lighting will be used during non-daylight hours, which, during the winter months, might mean periods when lighting is required on a 24 hour basis. Conversely, during the late spring and through summer months, lighting will not be required at all because of the extended daylight hours.

The potential visual effect of lighting can be partially reduced by proper placement and use of lighting only in areas where it is required.

### **Soils, Landforms and Permafrost Setting**

This borrow site lies with glaciofluvial outwash plain that is bordered on either side by lowland areas containing lakes and organic fens. Access roads to the borrow site will cross the glaciofluvial plain. The region lies within the zone of extensive discontinuous permafrost.

Glaciofluvial sediments are well drained and have likely developed Orthic Eutric Brunisols. Previous geotechnical work suggests the surficial materials are frozen. The ice contents in frozen areas are expected to be between 5 and 20%, by weight. Organic fens form flat-laying plains that are very poorly-drained. Fen areas have likely developed soils of the Cryosolic or Organic Orders. Fen areas might not have permafrost.

### **Soils, Landforms and Permafrost Potential Effects and Mitigation**

Terrain-related environmental sensitivities are not predicted for the borrow site area or access road. Stripping of soil prior to pit development could result in a reduction of soil quality by mixing.

General mitigation strategies to offset potential effects are outlined in [Section 8](#).

### **Vegetation Setting**

The vegetation at this site has been burned, and is composed of a mosaic of regenerating upland white spruce – trembling aspen – jack pine and upland jack pine forest types. The eastern edge of the borrow site also includes a lowland area composed of shrubby and sedge dominated fen vegetation. A rare plant and a vegetation survey were completed for this site in 2004.

Areas of forested vegetation are characterized by standing fire-killed snags, and dense tree regeneration of 2.0 m tall jack pine and 4.0 m tall trembling aspen. Shrub cover on the relatively dry, nutrient poor upland areas of the borrow site is moderate and consists mainly of prickly rose, willows, green alder and buffalo berry. The groundcover layer of this site is dominated by fireweed and twinflower but bunchberry, northern bedstraw, death camas and one-sided wintergreen were also present.

The wetland vegetation present along the eastern edge of the borrow site is characterized by shrubbier vegetation on drier ridges including ground birch, willows, and sweet gale, and by sedges, marsh cinquefoil and bog rosemary in wetter areas. This graminoid fen has high species richness and the potential to support rare plants, including one nationally rare species.

A rare plant, narrow-leaved willowherb (*Epilobium leptophyllum*) was tentatively identified at the western edge of the borrow site during the 2004 rare plant survey. Narrow-leaved willowherb has been observed in fourteen other locations in the area during 2004 rare plant surveys. Thirteen of these locations are within areas of proposed development. About eight individual plants of this species were found.

Access to the borrow site will cross the same burned and regenerating forest types described for the borrow site, and vegetation composition of these areas is expected to be similar to that described above. Most vegetation types associated with the proposed development are common both locally and regionally, however the sedge dominated fen vegetation is a vegetation type of concern in this region. [Figure 5-72](#) is a photograph of the vegetation at this borrow site.



**Figure 5-72: Example of Vegetation at Borrow Site 9.037PA**

### **Vegetation Potential Effects and Mitigation**

Development of this borrow site and its associated access road will affect vegetation through clearing and mechanical damage to trees, shrubs, forbs and non-vascular species, the permanent loss of vegetation and underlying substrates through borrow site expansion and potential changes in site drainage and along the access road.

The majority of effects on vegetation will occur because of project activities arising from site construction and operations. These effects might include the

potential influence of dust deposition on the health and growth of nearby vegetation, as well as the potential accidental introduction of non-native plant species. Effects on vegetation due to the borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow site and along the access road might develop into a different vegetation community than what was there before development.

The rare plant on the west boundary, and a vegetation type of concern along the eastern boundary will be avoided, if possible, by changing the shape of the borrow site. The rare plant site will be clearly marked in the field and avoided by site development activities as much as possible. Silt fencing will be installed at the edge of the borrow site to prevent debris from sliding into the wetland.

The graminoid fen running along the east side of the borrow site will be avoided where possible. Any vehicle traffic on this area will operate on a buffer of ice or snow.

Implementation of primary mitigation measures, as described in [Section 8](#), will help reduce the magnitude of effects on vegetation at this borrow site and its access road.

### **Wildlife Setting**

Wildlife habitat at this borrow site and its associated access road are composed of mature upland white spruce, aspen and jack pine forest, regenerating pine, and shrub/graminoid fen. The closed shrub layer is composed of aspen. These habitat types are considered uncommon in the region. An important wildlife feature at the borrow site and along the road is a mature mixedwood habitat. The complex forest structure, coarse woody debris, shrub cover, and berries/lichen/moss, provide important foraging and denning habitat for marten and lynx, foraging habitat for grizzly bear, and nesting habitat for boreal chickadees. Shrub and graminoid fens provide important habitat for many bird species scarp.

Key wildlife species reported along the access road (by sign or visual observation) included moose and marten. Key species are species selected because of their importance in the subsistence economy or because they are listed as species of conservation concern or as species of particular ecological relevance. Other species reported during field surveys included black bear, northern harrier, rusty blackbird, Tennessee warbler, yellow-rumped warbler, chipping sparrow, and western tanager.

An assessment of key habitat features, such as percent cover of forage species, indicated that the access road provides high quality foraging habitat for grizzly

bear, marten and lynx, denning habitat for marten and lynx, and nesting habitat for boreal chickadee and scaup (Table 5-49).

Habitat quality for wildlife at this borrow site and its associated access road, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, was considered moderate to high for birds and high for mammals. The habitat types are considered uncommon in the region. The proposed access road will cross an existing winter road and a small portion of habitat has been disturbed by fire.

**Table 5-49: Habitat Quality for Key Wildlife Species at Borrow Site 9.037PA and Associated Access Road**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Mammals	Woodland caribou	Winter foraging	Moderate
	Moose	Foraging	Moderate
	Grizzly bear	Denning	Low
		Fall foraging	High
		Spring foraging	High
	Marten	Foraging	High
	Lynx	Foraging	High
	Beaver	Cover	Low
Foraging		Low	
Birds	Scaup	Nesting	Moderate
	Peregrine falcon	Nesting	Low
	Lesser yellowlegs	Nesting	Low
	Boreal chickadee	Nesting	High
NOTE: <sup>a</sup> Habitat quality was determined by comparing the vegetation and terrain characteristics at each site to each species' habitat requirements, such as shrub availability for moose.			

Based on habitat availability a variety of species might inhabit the borrow site. These include several species that have special status designation at the national and territorial levels, as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Department of Resources, Wildlife and Economic Development (RWED, now ENR), respectively. These species are summarized in Table 5-50.

**Table 5-50: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.037PA and Associated Access Road**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Grizzly bear (northwestern population)	Sensitive	Special concern	Schedule 3 – special concern <sup>f</sup>	Lower risk – least concern
Northern flying squirrel	Sensitive	-	-	Lower risk – least concern
Wolverine	Secure	Special concern	Schedule 3 – special concern <sup>f</sup>	Vulnerable
Northern pintail	Sensitive	-	-	-
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Rock ptarmigan	Sensitive	-	-	-
American coot	Sensitive	-	-	-
Least sandpiper	Sensitive	-	-	-
Common snipe	Sensitive	-	-	-
Red-necked phalarope	Sensitive	-	-	-
Black tern	Sensitive	Not at Risk	-	-
Short-eared owl	Sensitive	Special concern	Schedule 3 – special concern	-
Northern flicker	Sensitive	-	-	-
Olive-sided flycatcher	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-
Rusty blackbird	Sensitive	-	-	-
<p>NOTES:</p> <p><sup>a</sup>A hyphen indicates no status has been assigned for that species.</p> <p><sup>b</sup>RWED – Resources, Wildlife and Economic Development (known as ENR since April 1, 2005)</p> <p><sup>c</sup>COSEWIC – Committee on the Status of Endangered Wildlife in Canada</p> <p><sup>d</sup>SARA – <i>Species at Risk Act</i></p> <p><sup>e</sup>IUCN – The World Conservation Union</p> <p><sup>f</sup>SARA status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation and final Ministerial approval.</p>				

### **Wildlife Potential Effects and Mitigation**

This borrow site and its associated access road are composed of moderate to high quality habitat for wildlife. Habitat types are considered uncommon in the region, indicating they might be a limiting resource for wildlife. The access road provides high quality foraging habitat for grizzly bear, marten and lynx, denning habitat for marten and lynx, and moderate to high quality nesting habitat for boreal chickadee and scaup.

General potential effects resulting from development and operation of the borrow site and access road on wildlife include direct and indirect habitat loss, disruption of wildlife movements and wildlife mortality. The timing of project activities, as well as the small footprint of disturbances relative to regional habitat availability, suggests that the magnitude of project effects on birds and most mammals, including those with special status designation, will be low. However, specific issues of concern at the borrow site and along the access road include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- displacement of grizzly bears from high quality foraging habitat during spring, summer, and fall (if site is active)
- disturbance of nesting birds during summer
- loss of riparian habitats during extraction activities and road construction
- disturbance of moose along access road during winter
- increased hunting/poaching of wildlife such as marten and lynx resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow site and access road development and operations. Specifically, the following mitigation measures are considered important for this site:

- use waste management plan described in [Section 11](#)
- minimize project activities during the spring, summer and fall (bird nesting season and grizzly bear active period)
- avoid known nesting sites (as determined during pre-construction surveys)
- reduce clearing of riparian habitats

- prohibit the recreational use of project roads and rights-of-way by project staff while on the job site
- establish and enforce regulations to prevent wildlife harassment

### **Hydrology Setting**

The borrow site is located adjacent to an unnamed watercourse. The area encompassing this borrow site that contributes runoff to a location on the watercourse about 1 km downslope of the borrow site is about 58 km<sup>2</sup>.

### **Hydrology Potential Effects and Mitigation**

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and in mean sediment concentration on the unnamed watercourse are expected to be limited because of the large area contributing runoff.

### **Groundwater Setting**

Shallow groundwater flow is expected off the low ridge to the east and west of the site.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

### **Groundwater Potential Effects and Mitigation**

The removal of borrow materials has the potential to reduce or remove an area of groundwater storage and recharge. This could result in alterations to local groundwater flow patterns, increases in surface water runoff and changes to springs, seeps or groundwater fed wetlands associated with this area of groundwater recharge. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles.

### **Water Quality Setting**

Water quality data for this site is expected to be similar to regional data described in [Section 8](#).

### **Water Quality Potential Effects and Mitigation**

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed on a site-specific basis. Limited effects are expected on surface water flow and water level in the unnamed watercourse due to changes in runoff. These effects represent a change of less than 2.0% of the natural range in flows and water levels. Consequently, no effects on water quality are expected.

The effect on mean annual total suspended sediment (TSS) concentrations to be low, that is, less than 10 mg/L, in the unnamed watercourse. Therefore, limited effects are expected on the water quality parameters associated with sediment inputs, that is, nutrients and metals.

### **Fish and Fish Habitat Setting**

There are no aquatic features within the boundaries of this borrow site. An unnamed watercourse parallels the eastern boundary of the borrow site and is crossed by the pipeline right-of-way about 1.5 km to the north and upstream of the borrow site boundary. The unnamed watercourse is classified as a Vegetated Channel. Vegetated Channels have no defined channel, ephemeral flows and are dry or frozen to the bed in winter. Therefore, there are unlikely to provide fish habitat except for the brief period when they are flowing.

A series of small lakes and ponds are located about 300 m northwest of the borrow site. Typically small lakes and ponds such as these are shallow and freeze to the lake bed in winter. Therefore, they are unable to support large bodied fish year round.

### **Fish and Fish Habitat Potential Effects and Mitigation**

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site

and extraction and processing of borrow material and indirect effects resulting from increased sediment in runoff.

Maintaining a vegetated buffer zone between the site and local waterbodies, if required, and implementation of site-specific erosion and sediment control plans will prevent sediment from the borrow site reaching surface waters.

## **Human Environment**

This section contains a description of the protected areas and heritage resource setting and potential effects and mitigation for borrow site 9.037PA. Other human environment information is discussed in [Section 8](#).

### **Protected Areas Setting**

This borrow site is located within the proposed Mackenzie River Special Management Area. This area is described in the SPDLUP as a very important regional and territorial travel and transportation corridor, heritage place and traditional use location.

### **Protected Areas Potential Effects and Mitigation**

The development of this site in the proposed Mackenzie River Special Management Area will result in a decrease in the land base available for other land uses within this area. The presence of development within this area will be a permanent change to the landscape.

### **Heritage Resources Setting**

This borrow site was inspected as part of the borrow resource component of the field programs. This location was considered to have low to moderate potential for the discovery of heritage resources. Heritage resource sites were previously recorded within a 5.0 km range of the development area, indicating prior use of this region. No new heritage sites were recorded as a result of the surface reconnaissance at this site.

The nature of the heritage resource potential and results of the investigations at this location were provided to the Prince of Wales Northern Heritage Centre in a report under permit 2003-933. Information is also included in the report that was submitted to the Prince of Wales Northern Heritage Centre under permit 2004-956.

### **Heritage Resources Potential Effects and Mitigation**

Before the development of this site, a Heritage Resource Impact Assessment will be conducted and provided to the Prince of Wales Northern Heritage Centre. If it

is determined that the development will affect any heritage resources, mitigation plans will be prepared.

## **PUBLIC INVOLVEMENT**

No concerns regarding this borrow site have been expressed by the local SSA communities in meetings or discussions with Imperial. The public involvement activities are documented in [Section 10](#) of this application.

Figure 5.73 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.



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TITLE	<b>SSA Crown Lands Application for a Type A Land Use Permit</b>
SECTION	5: Borrow Sites
SUBJECT	20: Borrow Site 9.037PB

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## OVERVIEW

Borrow source 9.037 is a glaciofluvial plain consisting of stratified medium to coarse grained, well-graded sand and gravel. It is located about 15 km north of the Blackwater River, adjacent to the Enbridge pipeline right-of-way. It should provide good quality material, Class 2, suitable for base and surface course aggregates, embankments, or structural fill. The material might be used for pipeline right-of-way requirements.

## SITE DESCRIPTION

There are two borrow sites located on borrow source 9.037. Borrow site 9.037PA is located on the northern part of the low, broad linear remnant of the glaciofluvial plain, and borrow site 9.037PB in the central part. The central part of borrow source 9.037 is about 5,600 m long (north to south) and about 1,000 m wide and encompasses an area of about 560 ha. Borrow site 9.037PB is about 600 m wide and 945 m long encompassing an area of about 56.6 ha. See [Figure 5-74](#) for an overview map of the borrow site. See [Figure 5-77](#) for a site-specific map of the borrow site.

### Access

The borrow site is located about 120 km south of Tulita. Access to borrow site 9.037PB will be from the pipeline right-of-way, which is located about 3.0 km to the northeast. As well, the winter road and the Enbridge pipeline right-of-way are located about 2.0 km east of the site. A winter access road, TD-B1-W-9.037PB, about 4.2 km in length will be required in order to travel southwest from the pipeline right-of-way to borrow site 9.037PB. This access will follow an existing cutline that bisects the borrow site. Adjacent terrain has potential to be thermally sensitive so the site is most readily accessed in the winter.

### Surface Conditions

Borrow site 9.037PB is located in the central part of a north-south trending glaciofluvial plain that is a broad, low feature rising about 5.0 to 6.0 m above the adjacent landscape. The site is well drained and overburden consists of organic topsoil up to 0.3 m thick.

Figure 5.74 as been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.

## Subsurface Information

Pemcan Services completed seven boreholes on the source in 1973 (Pemcan 1973). Of these, five of the boreholes, BH-2, BH-3, BH-4, BH-5, and BH-6, lie within borrow site 9.037PB. The following borehole information has been extracted from this previous study.

Available information suggests that the granular material in this deposit is of excellent quality and consists of stratified, well graded sand and gravel. The sand and gravel is considered suitable for various construction uses.

Of the five boreholes, borehole BH-2 penetrated a negligible layer of organic peat, underlain by about 2.3 m of coarse grained, well graded gravel with a trace of sand. The material encountered in the borehole was friable with low ice contents.

Borehole BH-3 penetrated a negligible layer of organic topsoil, underlain by about 4.5 m of well graded gravel with a trace of sand. The material encountered in the borehole was frozen with low ice content and visible ice crystals.

Borehole BH-4 penetrated a negligible layer of organic topsoil, underlain by about 0.3 m of low plasticity silt with little sand, and about 4.75 m of frozen medium grained, well graded gravel with a trace of sand. The material encountered in the borehole was frozen, primarily with low ice contents and no visible ice. There was a thin layer near the bottom of the gravel layer that revealed visible ice crystals in the borehole sample.

Borehole BH-5 penetrated a negligible layer of organic topsoil, underlain by about 2.6 m of medium grained, well graded gravel with some sand. The material encountered in the borehole was frozen with low ice contents and visible ice crystals.

Borehole BH-6 penetrated a negligible layer of topsoil with some silt and sands, underlain by about 2.4 m of medium grained, well graded gravel with some sand. The material encountered in the borehole was frozen with low ice contents and visible ice crystals.

## PIT DEVELOPMENT

For borrow source 9.037 as a whole, proven reserves of 3,100,000 m<sup>3</sup>, and probable reserves of 4,600,000 m<sup>3</sup> of stratified medium to coarse grained, well-graded sand and gravel have been estimated (EBA 1986). With the expectation that the distribution/characteristics of the granular materials encountered in the boreholes are representative, an average exploitable granular material thickness of 4.5 m has been assumed. Based on this 4.5 m thickness and a borrow site area of 56.6 ha, it is estimated that borrow site 9.037PB contains about 2,547,000 m<sup>3</sup> of

exploitable granular material. An estimated 8,000 m<sup>3</sup> of granular material might be removed from this site for project construction.

Available information suggests that borrow site 9.037PB is frozen with low ice contents. Therefore, ripping and some drilling or blasting will be required during the extraction process.

## **ENVIRONMENT**

The following section provides specific biophysical and human environment setting, effects and mitigation information for borrow site 9.037PB. This information includes data collected during the 2004 field programs.

### **Biophysical Environment**

#### **Air Quality Setting**

The air quality setting for this site is expected to be similar to regional setting for the SSA described in [Section 8](#).

#### **Air Quality Potential Effects and Mitigation**

Potential effects on air quality associated with the development of the borrow site, such as dust, vehicle and equipment emissions, are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

#### **Noise and Light Setting**

The noise setting for this site is expected to be similar to the regional setting for the SSA described in [Section 8](#).

The site is currently undeveloped and therefore, no manmade sources of light occur.

#### **Noise and Light Potential Effects and Mitigation**

Potential effects on noise levels associated with the development of the borrow site are expected to be limited and localized. Site-specific effects and mitigation are expected to be similar to regional effects and mitigation for the SSA described in [Section 8](#).

Industrial lighting can cause increases in ambient light. Sources of light include vehicle, flares and lighting around the site.

Lighting will be used during non-daylight hours, which, during the winter months, might mean periods when lighting is required on a 24 hour basis. Conversely,

during the late spring and through summer months, lighting will not be required at all because of the extended daylight hours.

The potential visual effect of lighting can be partially reduced by proper placement and use of lighting only in areas where it is required.

### **Soils, Landforms and Permafrost Setting**

This borrow site lies with glaciofluvial outwash plain that is bordered on either side by lowland areas containing lakes and organic fens. Access roads to the borrow site cross the glaciofluvial plain. The site lies within the zone of extensive discontinuous permafrost.

Glaciofluvial sediments are well drained and have likely developed Orthic Eutric Brunisols. Previous geotechnical work suggests the surficial materials are frozen. The ice contents in frozen areas are expected to be between 5 and 20%, by weight. Fens form flat-laying plains that are very poorly-drained. Fen areas have likely developed soils of the Cryosolic or Organic Orders. Fen areas might not have areas of permafrost. [Figure 5-75](#) is a photograph of the soil and landforms setting at this borrow site.



**Figure 5-75: Soils and Landforms Setting in Borrow Site 9.037PB**

### **Soils, Landforms and Permafrost Potential Effects and Mitigation**

Terrain-related environmental sensitivities are not predicted for the borrow site area or access road. Stripping of soil before further development could result in a reduction of soil quality by mixing.

General mitigation strategies to offset potential effects are outlined in [Section 8](#).

### **Vegetation Setting**

The vegetation at this site has been burned, and is composed of a mosaic of regenerating upland white spruce – trembling aspen – jack pine forests and upland jack pine forest types. A vegetation survey of this site was completed in 2004. The area is characterized by standing fire-killed snags, and moderate to dense tree regeneration of 2.0 m tall jack pine with a smaller component of trembling aspen. The western two thirds of the borrow site has a lower density of snags than the eastern third. Shrub cover is moderate and consists mainly of prickly rose, willows, green alder and buffalo berry. The groundcover layer of this site is likely to be similar to the adjacent 9.037AP borrow site, which is dominated by fireweed and twinflower with lower abundance of bunchberry, northern bedstraw, death camas and one-sided wintergreen.

Access to the borrow site will traverse the same burned and regenerating forest types described for the borrow site, and vegetation composition of these areas is expected to be similar to that described above. All vegetation types associated with the proposed development are common. [Figure 5-76](#) is a photograph of the vegetation at this borrow site.



**Figure 5-76: Example of Vegetation at Borrow Site 9.037PB**

### **Vegetation Potential Effects and Mitigation**

Development of this borrow site and its associated access road will affect vegetation through clearing and mechanical damage to trees, shrubs, forbs and non-vascular species, the permanent loss of vegetation and underlying substrates through borrow site expansion and potential changes in site drainage and along the access road.

The majority of effects on vegetation will occur because of project activities arising from site construction and operations. These effects might include the potential influence of dust deposition on the health and growth of nearby vegetation, as well as the potential accidental introduction of non-native plant species. Effects on vegetation due to the borrow site and access road will persist into the far future, that is, effect extends beyond 30 years past decommissioning and abandonment, given the slow rate of vegetation growth in the North. When the borrow site and access road are decommissioned, introduction of non-native reclamation species might also occur. Vegetation on the borrow site and along the access road might develop into a different vegetation community than what was there before development.

Implementation of primary mitigation measures, as described in [Section 8](#), will help reduce the magnitude of effects on vegetation at this borrow site and its access road.

### **Wildlife Setting**

Wildlife habitat at this borrow site is composed of regenerating upland jack pine on coarse gravel and surrounded by graminoid and shrub fen. The sparse shrub layer is composed of ground birch. Important wildlife features at the borrow site include good shrub cover for lynx, high grass cover for grizzly bear, and small wetlands and shrub/graminoid fen for many waterbird species including scaup and lesser yellowlegs.

Key wildlife species were not reported at the borrow site (by sign or visual observation) during field surveys. Key species are species selected because of their importance in the subsistence economy or because they are listed as species of conservation concern or as species of particular ecological relevance. Other species reported during field surveys included wood frog, blue-winged teal, mew gull, greater yellowlegs, spotted sandpiper, sharp-shinned hawk, ruffed grouse, sharp-tailed grouse, eastern kingbird, alder flycatcher, common yellowthroat, rusty blackbird, white-throated sparrow, and white-crowned sparrow.

An assessment of key habitat features, such as percent cover of forage species, indicated that the borrow site provides high quality foraging habitat for grizzly bear (spring) and lynx, and nesting habitat for scaup and lesser yellowlegs ([Table 5-51](#)).

Habitat quality for wildlife at this borrow site, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, was considered high for birds and moderate for mammals. The habitat types are considered rare in the region and the borrow site has been disturbed by fire and a right-of-way occurs nearby.

**Table 5-51: Habitat Quality for Key Wildlife Species at Borrow Site 9.037PB**

Group	Species	Habitat Use	Habitat Quality <sup>a</sup>
Mammals	Woodland caribou	Winter foraging	Low
	Moose	Foraging	Low
	Grizzly bear	Denning	Low
		Fall foraging	Low
		Spring foraging	High
	Marten	Foraging	Moderate
	Lynx	Foraging	High
	Beaver	Cover	Low
Foraging		Moderate	
Birds	Scaup	Nesting	Moderate-High
	Peregrine falcon	Nesting	Low
	Lesser yellowlegs	Nesting	High
	Boreal chickadee	Nesting	Low

**NOTE:**

<sup>a</sup>Habitat quality was determined by comparing the vegetation and terrain characteristics at each site to each species' habitat requirements, such as shrub availability for moose.

Based on habitat availability a variety of species might inhabit the borrow site. These include several species that have special status designation at the national and territorial levels, as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Department of Resources, Wildlife and Economic Development (RWED, now ENR), respectively. These species are summarized in [Table 5-52](#).

**Table 5-52: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.037PB**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Grizzly bear (northwestern population)	Sensitive	Special concern	Schedule 3 – special concern <sup>f</sup>	Lower risk – least concern
Wolverine	Secure	Special concern	Schedule 3 – special concern <sup>f</sup>	Vulnerable
Northern pintail	Sensitive	-	-	-
Lesser scaup	Sensitive	-	-	-

**Table 5-52: Special Status Species That Were Observed or That Might Occur at Borrow Site 9.037PB (cont'd)**

Species	Status <sup>a</sup>			
	RWED <sup>b</sup>	COSEWIC <sup>c</sup>	SARA <sup>d</sup>	IUCN <sup>e</sup>
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Rock ptarmigan	Sensitive	-	-	-
American coot	Sensitive	-	-	-
Lesser yellowlegs	Sensitive	-	-	-
Least sandpiper	Sensitive	-	-	-
Common snipe	Sensitive	-	-	-
Red-necked phalarope	Sensitive	-	-	-
Black tern	Sensitive	Not at risk	-	-
Short-eared owl	Sensitive	Special concern	Schedule 3 – special concern	-
Olive-sided flycatcher	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-
Rusty blackbird	Sensitive	-	-	-

NOTES:  
<sup>a</sup>A hyphen indicates no status has been assigned for that species.  
<sup>b</sup>RWED – Resources, Wildlife and Economic Development (known as ENR since April 1, 2005)  
<sup>c</sup>COSEWIC – Committee on the Status of Endangered Wildlife in Canada  
<sup>d</sup>SARA – *Species at Risk Act*  
<sup>e</sup>IUCN – The World Conservation Union  
<sup>f</sup>SARA status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation and final Ministerial approval.

### Wildlife Potential Effects and Mitigation

This borrow site is composed of moderate to high quality habitat for wildlife. The borrow site provides high quality foraging habitat for grizzly bear (spring) and lynx, and nesting habitat for scaup and lesser yellowlegs. Suitable denning habitat for grizzly bear was not observed.

General potential effects resulting from development and operation of the borrow site and access road on wildlife include direct and indirect habitat loss, disruption of wildlife movements and wildlife mortality. The timing of project activities, as well as the small footprint of disturbances relative to regional habitat availability,

suggests that the magnitude of project effects on birds and most mammals, including those with special status designation, will be low. However, specific issues of concern at the borrow site and along the access road include:

- attraction of grizzly bears to the borrow site and potential mortality of problem bears
- displacement of grizzly bears from high quality foraging habitat during spring (if site is active)
- disturbance of nesting birds during summer (if site is active)
- loss of riparian habitats during extraction activities and road construction
- increased hunting/poaching of wildlife such as lynx resulting from increased access

Implementation of general mitigation measures, as outlined in [Section 8](#), will reduce effects on wildlife during borrow site and access road development and operations. Specifically, the following mitigation measures are considered important for this site:

- use waste management plan described in [Section 11](#)
- reduce project activities during the spring, summer and fall (bird nesting season and grizzly bear active period) to the extent practical
- avoid known nesting sites (as determined during pre-construction surveys) to the extent practical
- reduce clearing of riparian habitats
- prohibit the recreational use of project roads and rights-of-way by project staff while on the job site
- establish and enforce regulations to prevent wildlife harassment

### **Hydrology Setting**

This borrow site is located about 200 m from an unnamed watercourse. This watercourse eventually flows into the Mackenzie River about 4 km from the borrow site. The area encompassing this borrow site that contributes runoff to the Mackenzie River at the mouth of the unnamed watercourse is about 72 km<sup>2</sup>.

## **Hydrology Potential Effects and Mitigation**

An increase in mean annual flow because of the higher runoff coefficient of the disturbed area and in mean sediment concentration on the unnamed watercourse are expected to be limited because of the large area contributing runoff.

## **Groundwater Setting**

Shallow groundwater flow is expected eastwards towards a watercourse, about 200 m from the site.

At site locations where continuous permafrost exists, groundwater flow is expected to be limited, seasonal and restricted to the active layer.

## **Groundwater Potential Effects and Mitigation**

The removal of borrow materials has the potential to reduce or remove an area of groundwater storage and recharge. This could result in alterations to local groundwater flow patterns, increases in surface water runoff and changes to springs, seeps or groundwater fed wetlands associated with this area of groundwater recharge. The removal of borrow resources also has potential to result in siltation of shallow aquifers, where present, because of increased sediment load in surface waters recharging the aquifer. These effects will be effectively managed by the implementation of the following mitigation measures:

- maintain sufficient permeable surface area to permit groundwater recharge in these areas, as necessary
- implement drainage, erosion and sediment controls, as appropriate, to limit the mobilization of fine sediment particles

## **Water Quality Setting**

Water quality data for this site is expected to be similar to regional data described in [Section 8](#).

## **Water Quality Potential Effects and Mitigation**

Currently, there are no plans to wash material extracted from this borrow site. Therefore, no water withdrawals from, or disposals into, local waterbodies are anticipated.

Other potential effects on water quantity and quality from the borrow site development include changes in surface water flows or levels because of changes in runoff and changes in suspended sediment inputs because of land disturbance. These effects will be reduced by implementing the following mitigation measures:

- developing and implementing specific erosion and sediment control plans and drainage plans to prevent sediment from the site reaching surface waters
- maintaining a vegetated buffer between the site and local waterbodies, where practical

The effects of land disturbance on surface runoff and suspended sediment concentrations were assessed on a site-specific basis. Limited effects are expected on surface water flow and water level in the unnamed watercourse due to changes in runoff. These effects represent a change of less than 2.0% of the natural range in flows and water levels. Consequently, no effects on water quality are expected.

The effect on mean annual total suspended sediment (TSS) concentrations are predicted to be low, that is, less than 10 mg/L, in the unnamed watercourse. Therefore, limited effects are expected on the water quality parameters associated with sediment inputs, that is, nutrients and metals.

### **Fish and Fish Habitat Setting**

There are no aquatic features within the boundaries of the borrow site. An unnamed watercourse is located about 200 m to the east and downslope of eastern boundary of the borrow site. The unnamed watercourse classified as a Vegetated Channel is crossed by the pipeline right-of-way about 3 km to the north and upstream of the site. Vegetated Channels have no defined channel, ephemeral flows and are dry or frozen to the bed in winter. Therefore they are unlikely to provide fish habitat except for the brief period when they are flowing.

A series of small lakes and ponds are about 300 m northwest of the borrow site. Typically small lakes and ponds such as these are shallow and freeze to the lake bed in winter. Consequently, they are unlikely to support large bodied fish year round.

### **Fish and Fish Habitat Potential Effects and Mitigation**

Effects of borrow site development on fish and fish habitat are primarily related to direct disturbance from activities associated with development of the borrow site and extraction and processing of borrow material and indirect effects resulting from increased sediment in runoff.

Maintaining a vegetated buffer zone between the site and local waterbodies, if required, and implementation of site-specific erosion and sediment control plans will prevent sediment from the borrow site reaching surface waters.

## **Human Environment**

This topic contains a description of the protected areas and heritage resource setting and potential effects and mitigation for borrow site 9.037PB. Other human environment information is described in Section 8.

### **Protected Areas Setting**

This borrow site is located within the proposed Mackenzie River Special Management Area. This area is described in the SPDLUP as a very important regional and territorial travel and transportation corridor, heritage place and traditional use location.

### **Protected Areas Potential Effects and Mitigation**

The development of this site in the proposed Mackenzie River Special Management Area will result in a decrease in the land base available for other land uses within this area. The presence of development within this area will be a permanent change to the landscape.

### **Heritage Resources Setting**

This borrow site was inspected as part of the borrow resource component of the field programs. Investigations at the borrow site included limited ground reconnaissance in 2002 and aerial overflights in 2003. This location was considered to have low to moderate potential for the discovery of heritage resources. No heritage sites were recorded as a result of the surface reconnaissance and no heritage resource sites have been previously recorded in the immediate area.

The nature of the heritage resource potential and results of the investigations at this location were provided to the Prince of Wales Northern Heritage Centre in a report under permit 2003-933. Information is also included in the report that was submitted to the Prince of Wales Northern Heritage Centre under permit 2004-956.

### **Heritage Resources Potential Effects and Mitigation**

Before the development of this site, a Heritage Resource Impact Assessment will be conducted and provided to the Prince of Wales Northern Heritage Centre. If it is determined that the development will affect any heritage resources, mitigation plans will be prepared.

## **PUBLIC INVOLVEMENT**

No concerns regarding this borrow site have been expressed by the local SSA communities in meetings or discussions with Imperial. The public involvement activities are documented in [Section 10](#) of this application.

Figure 5.77 as been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.

