

5 Biophysical Effects Summary

5.1 Basis for Summary of Findings

An assessment of the project's effects on biophysical resources is presented in Volume 5, Biophysical Impact Assessment. This section presents a summary of the information presented in that volume. The following tables and discussion provide highlights of the key findings. The results in these tables consolidate assessments for each individual project component, i.e., the three anchor fields, gathering system, pipeline corridor and infrastructure. The effects for these components differ with respect to magnitude, geographic extent and duration (see Section 2, Assessment Method). Information presented in the tables focuses on the highest level of effect reported for all the components.

5.2 Air Quality

Potential effects of the project on air quality are related primarily to emissions during project operations from compressor stations and heater facilities. In addition, dust from vehicle traffic can contribute to air quality effects. Air emissions released during construction and decommissioning are not reported in the assessment because they will be small compared with the emissions during peak operations and will be periodic.

The effect assessment for air quality focused on key indicators (KIs):

- sulphur dioxide (SO₂)
- nitrogen dioxide (NO₂)
- carbon monoxide (CO)
- particulate matter less than 2.5 micrometres (µm) in diameter (PM_{2.5})
- benzene
- benzene, toluene, ethylbenzene and xylene (BTEX)
- potential acid input (PAI)

Ground-level predictions of all compounds are below applicable federal and territorial guideline levels at all locations in the production area and pipeline corridor.

For all KIs at all project locations, effects are predicted to be adverse, local and long term. The magnitude of effects is moderate or low. No significant effects on air quality are predicted (see Table 5-1).

5.3 Noise

Potential effects of the project on the local noise environment are related primarily to facility operations and drilling and well-test flaring at production facilities. See Table 5-2 for a summary of the effects of the project on noise.

Table 5-1: Significance of Effects on Air Quality

Key Indicator	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
1-hour SO ₂	Operations	Adverse	Low ^{all}	Local	Long term	No
24-hour SO ₂	Operations	Adverse	Low ^{all}	Local	Long term	No
Annual SO ₂	Operations	Adverse	Low ^{all}	Local	Long term	No
1-hour NO ₂	Operations	Adverse	Moderate ^{all}	Local	Long term	No
24-hour NO ₂	Operations	Adverse	Moderate ^{all}	Local	Long term	No
Annual NO ₂	Operations	Adverse	Moderate ^{2,5,6,7,8}	Local	Long term	No
1-hour CO	Operations	Adverse	Moderate ^{1,2,8}	Local	Long term	No
8-hour CO	Operations	Adverse	Moderate ^{1,2,3,6,7,8}	Local	Long term	No
24-hour PM _{2.5}	Operations	Adverse	Moderate ^{all}	Local	Long term	No
1-hour benzene	Operations	Averse	Low ^{all}	Local	Long term	No
1-hour BTEX	Operations	Adverse	Low ^{all}	Local	Long term	No
Area PAI	Operations	Adverse	Low ^{all}	Local	Long term	No

NOTES:
all = all stations
1 = Niglintgak
2 = Taglu
3 = Parsons Lake
4 = Inuvik area facility
5 = Little Chicago compressor station
6 = Norman Wells compressor station
7 = Blackwater River compressor station
8 = Trail River compressor station
9 = Trout River heater station
10 = NGTL interconnect facility

Table 5-2: Significance of Effects on Noise

Component	Phase When Impact Occurs	Direction	Magnitude	Geographic Extent	Duration	Significant
Production area	Construction-Drilling	Adverse	Moderate	Local	Short term	No
Production area	Construction-Well-test flaring	Adverse	Low-Moderate ¹	Local	Short term	No
Production area	Operations	Adverse	Low	Local	Long term	No
Gathering system	Operations	Adverse	Low	Local	Long term	No
Pipeline corridor	Operations	Adverse	Low	Local	Long term	No
NGTL interconnect facility	Operations	Adverse	Low	Local	Long term	No

NOTE:
1 Moderate-magnitude effects are related to well-test flaring at Taglu with a predicted sound level of 41 dB at 1.5 km.

Production area facility operational noise will range from 20 dBA to 40 dBA at 1.5 km. These predicted levels will meet the guideline limit of 40 dBA at 1.5 km.

The guideline limit for assessing operational noise is 40 dBA at 1.5 km, whereas there is no guideline that applies to the assessment of noise from flaring or drilling. In the production area, well drilling noise will range from 30 dBA to 42 dBA at 1.5 km from facilities. Well-test flaring noise will range from 38 dBA to 41 dBA at 1.5 km.

Well drilling and well-test flaring, both temporary noise sources, were assessed and predicted to be low to moderate magnitude, local and of short duration.

Pipeline corridor operational noise will range from 27 dBA at the NGTL interconnect facility to 40 dBA at the Inuvik area facility. Sound levels at compressor facilities will range from 37 dBA to 38 dBA. Predicted operational noise levels at the Trout River heater station will be in the 23 to 25 dBA range at 1.5 km.

No significant effects on environmental noise are predicted.

5.4 Groundwater

Potential effects of the project on groundwater can be related to factors such as:

- changes to groundwater recharge and discharge patterns, which can occur from the removal of material at borrow sites
- flow obstruction, which can occur from the development of frost bulbs around pipelines
- changes in permafrost patterns, which can occur from activities such as vegetation removal
- subsidence, which might occur as result of gas extraction at Niglingtak and Taglu

All effects on groundwater from project-related activities are expected to be of local extent. Most effects will be initiated by construction activities and will result in changes that will persist through, or occur during, the remainder of the project. Some effects will persist into the far future, specifically those related to sedimentation, flow obstruction (e.g., in areas where the pipeline is abandoned in place), changes in permafrost at Niglingtak and Taglu, and changes in recharge and discharge related to the removal of materials from the borrow sites. All residual effects are expected to cause a small adverse change in groundwater, i.e., a change that is within the normal range of variation. No significant effects on groundwater are predicted (see Table 5-3).

Table 5-3: Significance of Effects on Groundwater

Valued Component	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Magnitude	Geographic Extent	Duration	
Groundwater quantity and flow patterns	Construction	Adverse	Low ¹	Local	Far future ²	No
	Operations	Adverse	Low ¹ (possible moderate to high ³)	Local	Far future	No
	Decommissioning	Neutral	No effect	N/A	N/A	No
Groundwater quality	Construction	Adverse	Low	Local	Long term	No
	Operations	Adverse	Low	Local	Far future	No
	Decommissioning	Adverse	Low	Local	Long term	No

NOTE:

1 Low-magnitude effect for infrastructure assumes that site development plans at borrow sites will be developed to limit effects to low magnitude

2 All far-future effects are low magnitude

3 Moderate- to high-magnitude effects are related to flow obstruction along pipelines

5.5 Hydrology

Potential effects of the project on hydrology can be related to factors such as:

- land disturbance during construction
- water withdrawal for winter road construction and camp use
- land settlement along the pipelines
- flow obstruction, which could result from frost bulb formation around pipelines
- land subsidence because of gas extraction

The effects of the project components on runoff amount, drainage pattern, and water level and velocity, are expected to be low magnitude and confined to the LSA (see Table 5-4) from construction through decommissioning, except for potential high-magnitude effects in localized places where redirection of groundwater will lead to large icings and blockage of stream flow. This effect would be local.

Effects on sediment concentrations usually range from low to moderate magnitude and are local in extent. High-magnitude effects could occur at pipeline watercourse crossing locations during construction, and because of potential dredging activities during construction and decommissioning of the barge-based gas conditioning facility at Niglintgak. These effects would be localized and short term.

Table 5-4: Significance of Effects on Hydrology

Key Indicator	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Runoff amounts	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Neutral	No effect	N/A	N/A	No
Drainage patterns	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Neutral	No effect	N/A	N/A	No
Water levels and velocities	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low to possibly high ¹	Local	Long term	No
	Decommissioning	Neutral	No effect	N/A	N/A	No
Water levels and velocities – from subsidence	Construction	Neutral	No effect	N/A	N/A	No
	Operations	Adverse	Moderate	Local	Long term	No
	Decommissioning	Neutral	No effect	N/A	N/A	No
Sediment concentrations	Construction	Adverse	Moderate ² High ³	Local	Medium term	No
	Operations	Adverse	Moderate ⁴	Local	Long term	No
	Decommissioning	Adverse	High ⁵	Local	Short term	No
Channel morphology	Construction	Adverse	Low	Local	Long term ⁶	No
	Operations	Adverse	Moderate ⁷	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Medium term	No

NOTES:

N/A = not applicable because no effect is predicted

- 1 Possibly moderate to high in a few localized places where the redirection of groundwater leads to large icings and blockage of stream flow
- 2 Moderate-magnitude effects relate to potential dredging at Niglintgak, pipeline and gathering system construction, and land disturbance at infrastructure sites
- 3 High-magnitude effects because of land disturbance, watercourse crossing construction and potential dredging in connection with the barge-based gas conditioning facility at Niglintgak
- 4 Moderate-magnitude effects during operations because of potential dredging in connection with the barge-based gas conditioning facility option at Niglintgak and bank disturbance from potential dredging
- 5 High-magnitude effects related to decommissioning of gas conditioning facility at Niglintgak
- 6 Long-term effects related to changes from gathering system and pipeline corridor
- 7 Moderate-magnitude effects relate to channel morphology at Taglu

In general, effects on channel morphology will be low magnitude, and low to moderate magnitude at Taglu. These effects are expected to be low magnitude after decommissioning and abandonment. If so, these effects would be considered not significant.

5.6 Water Quality

Potential effects of the project on water quality can be related to factors such as:

- acid deposition caused by air emissions
- wastewater releases
- leaks and spills
- suspended sediments

Predicted effects on water quality range from low to moderate magnitude and will be local in extent (see Table 5-5). Predicted effects related to hydrostatic test water discharges, land disturbance and release of wastewater will be low magnitude, whereas effects from potential dredging if the barge option is chosen, will be low to moderate magnitude. Watercourse crossings along the gathering pipelines and the pipeline corridor could have effects ranging from no effects to moderate-magnitude effects. No effects are predicted from acid deposition.

Table 5-5: Significance of Effects on Water Quality

Valued Component	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Water and sediment quality	Construction	Adverse	Moderate ¹	Local	Medium term	No
	Operations	Adverse	Moderate ¹	Local	Long term	No
	Decommissioning	Adverse	Moderate ¹	Local	Long term	No
NOTE: 1 Moderate-magnitude effects relate to watercourse crossings and disturbance of bottom sediments during potential dredging at Niglintgak						

Infrastructure associated with the production area and the pipeline corridor could have an effect of low to moderate magnitude on water quality from disturbance of bottom sediments during dredging. The effect of barge traffic is predicted to be low magnitude and the effect of domestic wastewater releases will be limited to low magnitude by implementing a waste management plan. No significant effects on water quality are predicted.

5.7 Fish and Fish Habitat

Potential effects of the project on fish can be related to factors such as:

- direct effects on fish habitat from activities, such as pipeline watercourse crossing construction, dredging, or constructing footprints of project infrastructure facilities such as barge landings
- changes in water levels and water flow related to activities, such as water withdrawal or the formation of frost bulbs around pipelines
- sediment suspended in water during work such as pipeline construction and dredging, which could affect fish health or fish habitat downstream

Effects will range from no effect to low magnitude, local to regional in extent, with most effects not extending beyond long term (see Table 5-6).

Table 5-6: Significance of Effects on Fish

Key Indicator	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Fish habitat	Construction	Adverse	Low	Regional ²	Long term	No
	Operations	Adverse	Low	Regional ²	Long term	No
	Decommissioning	Adverse	Low	Local	Far future ¹	No
Fish health	Construction	Adverse	Low	Local	Short term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Fish distribution and abundance	Construction	Adverse	Low	Regional ³	Long term	No
	Operations	Adverse	Low	Regional ³	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No

NOTES:
 1 Far-future effects are related to subsidence at Niglintgak and Taglu
 2 Regional effects are related to pipeline corridor and gathering pipelines
 3 Regional effects are related to pipeline corridor, pipeline corridor infrastructure and production area infrastructure

Effects related to land subsidence in the production area are the only effects predicted to last into the far future. However, the effects are considered to be low magnitude, as the effects will be local and occur gradually. Fish potentially affected will have time to adjust to any changes in habitat that might occur.

No significant effects on fish key indicators, i.e., fish habitat, fish health or fish abundance and distribution, are predicted.

5.8 Soils and Landforms

Potential effects of the project on soils and landforms can be related to factors such as:

- surface disturbance during construction that can damage soils, cause erosion, and remove uncommon landforms
- a changed subsurface thermal regime that can cause settlement or frost heave along the pipeline right-of-way

All project effects on soils and landforms are limited to the LSA. Some moderate-magnitude effects are predicted for ground stability, particularly with respect to settlement along the pipeline right-of-way, and erosion and frost heave in sensitive aeolian deposits along the pipeline right-of-way. Moderate-magnitude, long-term effects related to patterned ground are predicted

for glaciofluvial and aeolian deposits. Low-magnitude, far-future effects are predicted for patterned ground and moderate-magnitude, long-term effects are predicted for soil quality. These effects will not be significant (see Table 5-7).

Table 5-7: Significance of Effects on Soils, Landforms and Permafrost

Key Indicator	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Ground stability	Construction	Adverse	Moderate ¹	Local	Long term	No
	Operations	Adverse	Moderate ¹	Local	Long term	No
	Decommissioning	Adverse	Moderate ²	Local	Long term	No
Uncommon landforms	Construction	Adverse	Low ³ Moderate ³	Local	Far future ³ Long term ³	No
	Operations	Adverse	Low	Local	Far future	No
	Decommissioning	Neutral	No effect	N/A	N/A	No
Soil quality	Construction	Adverse	Moderate ⁴ Low ⁵	Local	Long term ⁴ Far future ⁵	No
	Operations	Adverse	Low	Local	Far future	No
	Decommissioning	Adverse	Low	Local	Short term	No

NOTES:

N/A = not applicable

1 Moderate-magnitude effects on ground stability relate to settlement along the pipeline right-of-way and erosion and frost heave of aeolian deposits along the pipeline right-of-way

2 Moderate-magnitude, local, long-term effects are related to frost bulb thaw after decommissioning along the pipeline corridor

3 The magnitude of effects from the project on uncommon landforms varies with indicator:

- low-magnitude, far-future, local effects on patterned ground at Niglintgak, Taglu, Parsons Lake
 - moderate-magnitude, long-term, local effects for glaciofluvial and aeolian landforms along pipeline rights-of-way
 - low-magnitude, far-future, local effects on glaciofluvial and aeolian landforms at infrastructure and borrow sites
- Therefore, project effects on uncommon landforms are considered not significant.

4 Moderate-magnitude, long-term effects on soil quality are related to soil loss and soil drainage changes from gathering system and pipeline construction

5 Low-magnitude, far-future effects are related to production areas, infrastructure and pipelines

5.9 Vegetation

Potential effects of the project on vegetation can be related to factors such as:

- clearing and grading for project construction
- dust and air emissions
- changes in landforms and soils from project activities

5.9.1 Abundance and Distribution

Vegetation types of concern, vegetation communities of concern, rare plants and traditional plant use and collecting sites were identified as VCs for vegetation.

Because of the length of time required for vegetation communities to recover or

re-establish sustainable native plant communities, the duration of effects on all vegetation VCs will range up to far future (see Table 5-8).

Table 5-8: Significance of Effects on Vegetation Abundance and Distribution

Valued Component	Phase When Impact Occurs	Effect Attribute				
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	Significant
Vegetation types	Construction	Adverse	Low ¹	Local	Far future	No
	Operations	Adverse	Low ¹	Local	Far future	No
	Decommissioning	Adverse	Low ¹	Local	Far future	No
Vegetation communities of concern	Construction	Adverse	Low ¹	Regional ²	Far future	No
	Operations	Adverse	Low ¹	Regional ²	Far future	No
	Decommissioning	Adverse	Low ¹	Regional ²	Far future	No
Rare plants	Construction	Adverse	Low ³	Beyond regional	Far future	No
	Operations	Adverse	Low ³	Beyond regional	Far future	No
	Decommissioning	Adverse	Low ³	Beyond regional	Far future	No

NOTES:

1 Borrow sites and associated vegetation communities of concern might sustain losses disproportionate to their availability on the landscape; these effects have not been quantified yet

2 Tall forests are regionally uncommon

3 Effects of the project footprint on rare plant sites will be assessed after site-specific mitigation planning
 Vegetation surveys will be completed on project infrastructure components

Effects on traditionally used plants and collecting sites will be assessed after traditional knowledge studies are completed

Project construction will adversely affect vegetation types through loss and alteration of vegetation, changes in abiotic site conditions, presence of reclamation species and possible introduction of non-native or invasive plant species. The magnitude of effects on vegetation types will be low, although effects on vegetation communities associated with borrow sites might be disproportionate because of their limited distribution on the landscape. There are rare plants present on the current pipeline corridor route. The magnitude of effects on rare plants is predicted to be low. Any additional assessment of project components and required site-specific mitigation and reporting will be presented in the permitting documents.

The magnitude of effects remains low for all project components during operations and decommissioning, when no substantive additional effects on the abundance and distribution of vegetation are expected other than low-magnitude subsidence effects at the Niglintgak and Taglu anchor fields.

Reclaimed areas are predicted to develop into functioning, self-sustaining native plant communities within the long term. Resulting plant communities might be different from the predisturbance vegetation, and will appear different on the landscape. They will remain in an early successional state for many years. Trace amounts of reclamation species and, potentially, weed species are expected to persist into the far future.

Most effects on vegetation and vegetation VCs are local in extent. Losses of tall forest communities have regional effects. Any losses of rare plant populations will have a beyond regional effect. Effects for these VCs will be far future in duration.

Combined project effects on the abundance and distribution of vegetation species and associations are predicted to be not significant.

Effects on traditionally used plants and collecting sites will be assessed after traditional knowledge studies are completed. In addition, vegetation surveys will be completed at infrastructure sites.

5.9.2 Vegetation Health

The combined project effects of dust and air emissions on vegetation health are not significant (see Table 5-9). The effects of dust will be restricted to small areas adjacent to all-weather roads, gravel pads and borrow sites and will occur when dust deposition is thick, i.e. downwind of borrow sites. Effects will be long term near all-weather roads that will be used during construction, operations and decommissioning. The effects on vegetation VCs are predicted to be low magnitude. Site-specific surveys will be completed before construction.

Table 5-9: Significance of Effects on Vegetation Health

Valued Components	Phase When Impact Occurs	Effect Attribute				
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	Significant
Vegetation types ¹	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Medium term	No
Vegetation communities of concern ¹	Construction	Adverse	Low	Local	Long term	No
	Operations	Adverse	No effect	N/A	N/A	No
	Decommissioning	Adverse	Low	Local	Long term	No
Rare plants ¹	Construction	Adverse	Low	Beyond regional	Far future	No
	Operations	Adverse	Low	Beyond regional	Far future	No
	Decommissioning	Adverse	Low	Beyond regional	Far future	No

NOTES:
 N/A = no applicable effect pathway
 1 No effect on known occurrences, but potential for effects on unidentified occurrences
 Vegetation surveys have not been completed on infrastructure sites
 Effects on traditionally used plants and collecting areas will be assessed after traditional knowledge studies are completed.

The effects of air emissions are restricted to areas of nitrogen deposition near facilities. Nitrogen deposition could result in a long-term shift in community composition, however, the magnitude is low and the effects are not significant.

5.10 Wildlife

Potential effects of the project on wildlife can be related to factors such as:

- reduced habitat because of direct habitat loss from construction, or sensory disturbance that causes wildlife to avoid areas
- barriers that the project might present to wildlife movement, such as trenches or pipelines that animals cannot cross
- increased mortality because human–wildlife conflicts can result in the destruction of wildlife, and because hunters and predators can access wildlife more readily along roads or pipeline rights-of-way

These three KIs, habitat availability, wildlife movement and wildlife mortality, were used to understand the project's effects on wildlife. The most severe effects on wildlife are predicted to be of moderate magnitude. This means that a part of the population might be affected in a way that would change the distribution or abundance of a VC and affect opportunities for hunting, trapping or viewing wildlife. Although these effects could alter local distribution of the animals, it will not affect population productivity or viability. No significant effects on wildlife are predicted.

5.10.1 Habitat Availability

Habitat availability for wildlife is influenced by several factors, including vegetation loss, sensory disturbance, and increased access by humans and predators. The magnitude of most effects on habitat availability will be low, with sensory disturbance being an important contributing factor when magnitude is moderate (see Table 5-10). Some effects extend into the far future because of the length of time it takes for vegetation, particularly lichen to recover and restore habitat values. No significant effects on habitat availability are predicted.

5.10.2 Wildlife Movement

The effect assessment for wildlife movement examined physical barriers, vegetation clearing, increased predator and human access, sensory disturbance and attraction to facilities. The project is predicted to have low-magnitude effects on wildlife movement, but moderate-magnitude effects on barren-ground and woodland caribou during construction. No significant effects on wildlife movement are predicted (see Table 5-11).

Table 5-10: Significance of Effects on Wildlife Habitat Availability

Valued Component	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Barren-ground grizzly bear	Construction	Adverse	Moderate ¹	Regional	Long term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Barren-ground caribou	Construction	Adverse	Moderate ² Low ³	Local	Long term ² Far future ³	No
	Operations	Adverse	Moderate ² Low ³	Regional	Long term ² Far future ³	No
	Decommissioning	Adverse	Low	Local	Far future ³	No
Woodland caribou	Construction	Adverse	Low	Local	Far future ³	No
	Operations	Adverse	Low	Local	Far future ³	No
	Decommissioning	Adverse	Low	Local	Far future ³	No
Moose	Construction	Adverse	Moderate	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Marten	Construction	Adverse	Low	Local	Far future ⁴	No
	Operations	Adverse	Low	Local	Far future ⁴	No
	Decommissioning	Positive	Low	Local	Far future ⁴	No
Lynx	Construction	Adverse	Low	Local	Long term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Beaver	Construction	Adverse	Low	Local	Long term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Amphibians	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Birds ⁵	Construction	Adverse	Low	Local	Long term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Beluga whale ⁶	Construction	Adverse	Moderate ⁷	Local	Short term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Moderate ⁸	Local	Short term	No
Bowhead whale ⁶	Construction	Adverse	Low ⁹	Local	Medium term ¹⁰	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning	Adverse	Low	Local	Medium term ¹⁰	No
Ringed seal ⁶	Construction	Adverse	Low ⁹	Local	Short term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Medium term	No

Table 5-10: Significance of Effects on Wildlife Habitat Availability (cont'd)

Valued Component	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Polar bear ⁶	Construction	Adverse	Low ¹¹	Local	Long term	No
	Operations	Adverse	Low ¹²	Local	Long term	No
	Decommissioning	Adverse	Low ¹¹	Local	Medium term	No

NOTES:

N/A = not applicable because no effect has been predicted

- 1 Moderate-magnitude effects are related to sensory disturbance related to infrastructure and increased access for hunters
- 2 Moderate-magnitude effects are related to sensory disturbance and increased predator and human access. These are long-term effects.
- 3 Far-future duration is related to vegetation changes that require time to recover after decommissioning. These are low-magnitude effects.
- 4 Far-future effects are related to length of time required for old-growth forest to recover
- 5 Bird species addressed in the effects assessment are the greater white-fronted goose, snow goose, tundra swan, scaup, peregrine falcon, whimbrel, Arctic tern, lesser yellowlegs and boreal chickadee
- 6 Marine mammals assessed only for barge option at Niglintgak
- 7 Moderate-magnitude effects are related to potential dredging and facility installation
- 8 Moderate-magnitude effects are related to potential dredging
- 9 Effect might occur through impact on habitat for species that form part of the food chain, e.g., plankton – bowhead, plankton and fish for seal
- 10 Medium-term duration is related to potential dredging and facility installation and removal
- 11 Effect might occur through impact on habitat for species that form part of the polar bear food chain, e.g., plankton – fish – seal – polar bear
- 12 Effect is related to sensory disturbance from operations at Niglintgak

Table 5-11: Significance of Effects on Wildlife Movement

Valued Component ¹	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Barren-ground caribou and woodland caribou	Construction	Adverse	Moderate ²	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Grizzly bear	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term ²	No
Moose	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Marten	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Lynx	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No

Table 5-11: Significance of Effects on Wildlife Movement (cont'd)

Valued Component	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Beaver	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Amphibians	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Short term	No
Beluga whale ^{4,5}	Construction	Adverse	Low	Local	Short term	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning ⁶	Adverse	Low	Local	Short term	No
Bowhead whale ^{4,5}	Construction	Adverse	Low	Local	Short term	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning ⁶	Adverse	Low	Local	Short term	No
Ringed seal ^{4,5}	Construction	Adverse	Low	Local	Short term	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning ⁶	Adverse	Low	Local	Short term	No
Polar bear ^{4,5}	Construction	Neutral	No effect	N/A	N/A	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning ⁶	Neutral	No effect	N/A	N/A	No

NOTES:

N/A = not applicable because no effect has been predicted

1 Analysis of the pathways through which the project could affect movement of birds indicated assessment of project effects on birds was not required

2 Moderate-magnitude effects on movement are related mainly to sensory disturbance at Parsons Lake, the gathering pipelines and associated facilities, and the pipeline corridor

3 Long-term effects relate to the pipeline corridor and infrastructure that allows long-term hunter access

4 Marine mammals assessed only for Niglintgak barge-based option

5 Effects on marine mammal movements identified here are not associated with marine mammal migration corridors. They are related to minor local movements within the habitat.

6 Decommissioning involves the same components as construction, i.e., potential dredging and barge transport

5.10.3 Wildlife Mortality

Wildlife mortality can be affected by the project through several pathways, including change to special habitats, energetic stress, removal of individuals and exposure to chemicals. A moderate level of effects might occur to barren-ground grizzly bear because of attraction to camps (see Table 5-12). Beaver could also experience a moderate level of effects during construction when beaver dams would be removed. Otherwise, the most important source of mortality will be from increased access for hunters and predators, which could result in moderate-magnitude effects on moose during project construction and operations.

No significant effects on wildlife mortality are predicted.

Table 5-12: Significance of Effects on Wildlife Mortality

Valued Component	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Barren-ground grizzly bear	Construction	Adverse	Moderate ¹	Regional	Medium term	No
	Operations	Adverse	Moderate ¹	Regional	Short term	No
	Decommissioning	Adverse	Low	Regional	Long term	
Barren-ground caribou	Construction	Adverse	Low	Regional	Medium term	No
	Operations	Adverse	Low	Regional	Long term	No
	Decommissioning	Adverse	Low	Regional	Long term	No
Woodland caribou	Construction	Adverse	Low	Regional	Medium term	No
	Operations	Adverse	Low	Regional	Long term	No
	Decommissioning	Adverse	Low	Regional	Long term	No
Moose	Construction	Adverse	Moderate ²	Regional	Medium term	No
	Operations	Adverse	Low	Regional	Long term	No
	Decommissioning	Adverse	Low	Regional	Long term	No
Grizzly bear	Construction	Adverse	Moderate ¹	Regional	Medium term	No
	Operations	Adverse	Low	Regional	Long term	No
	Decommissioning	Adverse	Low	Regional	Long term	No
Marten	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Lynx	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Beaver	Construction	Adverse	Moderate ³	Local	Medium term	No
	Operations	Adverse	Moderate ⁴	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Long term	No
Amphibians	Construction	Adverse	Low	Local	Medium term	No
	Operations	Adverse	Low	Local	Long term	No
	Decommissioning	Adverse	Low	Local	Short term	No
Beluga whale ⁵	Construction	Adverse	Low	Local	Medium term	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning	Adverse	Low	Local	Medium term	No
Bowhead whale ⁵	Construction	Adverse	Low	Local	Medium term ⁶	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning	Adverse	Low	Local	Medium term ⁶	No

Table 5-12: Significance of Effects on Wildlife Mortality (cont'd)

Valued Component	Phase When Impact Occurs	Effect Attribute				Significant
		Direction	Maximum Magnitude	Maximum Geographic Extent	Maximum Duration	
Ringed seal ⁵	Construction	Adverse	Low	Local	Medium term ⁶	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning, i.e., barge transport	Adverse	Low	Local	Medium term	No
Polar bear ⁵	Construction	Adverse	Low	Local	Medium term ⁶	No
	Operations	Adverse	Low	Local	Medium term	No
	Decommissioning	Adverse	Low	Local	Medium term ⁶	No

NOTES:

N/A = not applicable because no effect is predicted

1 Moderate-magnitude effects are related to attraction to camps

2 Moderate-magnitude effects on moose are related to increased access for hunters and predators along the pipeline corridor and pipeline infrastructure

3 Moderate-magnitude effects on beaver are related to removal of beaver dams to allow for pipeline and infrastructure construction

4 Moderate-magnitude effects might result from a potential for transportation rights-of-way to cross beaver dams

5 Marine mammals were assessed only for the Niglintgak barge-based gas conditioning facility option

6 Medium-term effects are related to physical disturbance of habitat from potential dredging and facility construction