Environmentally Significant Areas

The Bistcho Lake peat plateau bog is listed as a provincial environmentally significant area (ESA) (Sweetgrass Consultants 1997). This area is described as one of the most diverse and extensive subarctic wetlands in Alberta, composed of sphagnum peat plateau bogs with collapse scars and channel fens. The pipeline corridor will cross a small portion of this ESA along its western edge (see Figure 9-3).

Persistent or Invasive Non-Native Plants

For rankings of weed species potentially present in the South Taiga Plains and the Dickins Lake and Vardie River sections of the project, see Table 9-5.

Table 9-5: Potential Weeds of Concern in the South Taiga Plains in Alberta

Scientific Name	Common Name	CWS	CWF	Northwest Territories and Yukon[1]	Alberta
Avena fatua	Wild oats	–	–	Occasional	Nuisance
Berteroa incana	Hoary alyssum	Minor invasive	–	–	–
Brassica napus	Rape, turnip	–	–	Often on waste ground	–
Brassica rapa	Wild mustard	–	–	Reported from Yellowknife	–
Bromus inermis[2,3]	Smooth brome	Moderate invasive	–	Occasional	–
Butomus umbellatus	Flowering rush	Principal invasive	–	–	–
Centaurea diffusa	Diffuse knapweed	–	Potential concern (Yukon and Northwest Territories)	–	Restricted
Centaurea maculosa	Spotted knapweed	Minor invasive	Potential threat (Yukon and Northwest Territories)	–	Restricted
Centaurea repens	Russian knapweed	–	–	Reported	Restricted
Cirsium arvense	Canada thistle	Moderate invasive	–	Reported	Noxious
Descurainia sophia	Flixweed	–	–	Readily spreads to abandoned camps	Nuisance

Table 9-5: Potential Weeds of Concern in the South Taiga Plains and Alberta (cont'd)

Scientific Name	Common Name	CWS	CWF	Northwest Territories and Yukon[1]	Alberta
Elytrigia repens	Quackgrass	–	–	Southern District of Mackenzie	Nuisance
Euphorbia esula	Leafy spurge	Principal invasive	–	Seen east of Dawson	Noxious
Hordeum jubatum	Foxtail barley	–	–	Troublesome weed	–
Lappula squarrosa	Stickseed	–	–	Occasionally in town sites	Nuisance
Linaria vulgaris	Yellow toadflax	–	–	Seen at town sites of upper Mackenzie drainage	Noxious
Lythrum salicaria	Purple loosestrife	Principal invasive	–	–	Noxious
Matricaria perforata	Scentless chamomile	–	Moderate concern (Yukon)	–	Noxious
Medicago lupulina	Black medic	–	–	Reported from Fort Smith	–
Melilotus alba[3]	White sweetclover	Moderate Invasive	–	Common in upper Mackenzie Valley	–
Melilotus officinalis	Yellow sweetclover	Moderate Invasive	–	Reported from south Mackenzie Valley	–
Phalaris arundinacea[2,3]	Reed canarygrass	Principal invasive	–	Upper Mackenzie drainage north to Fort Simpson	–
Raphanus raphanistrum	Wild radish	–	–	–	Nuisance
Sonchus arvensis	Field sowthistle	–	–	Reported north of 60° along Mackenzie Highway	Noxious

NOTES:
– = not ranked
CWS = Canadian Wildlife Service
CWF = Canadian Wildlife Federation
1 Comment on distribution from Porsild and Cody (1980) or Cody (2000)
2 Plants observed during revegetation surveys
3 Plants observed during vegetation classification surveys

SOURCES: Canadian Wildlife Federation (2004), Canadian Wildlife Service (2004)
Province of Alberta *Weed Control Act - Weed Regulation* (2001)

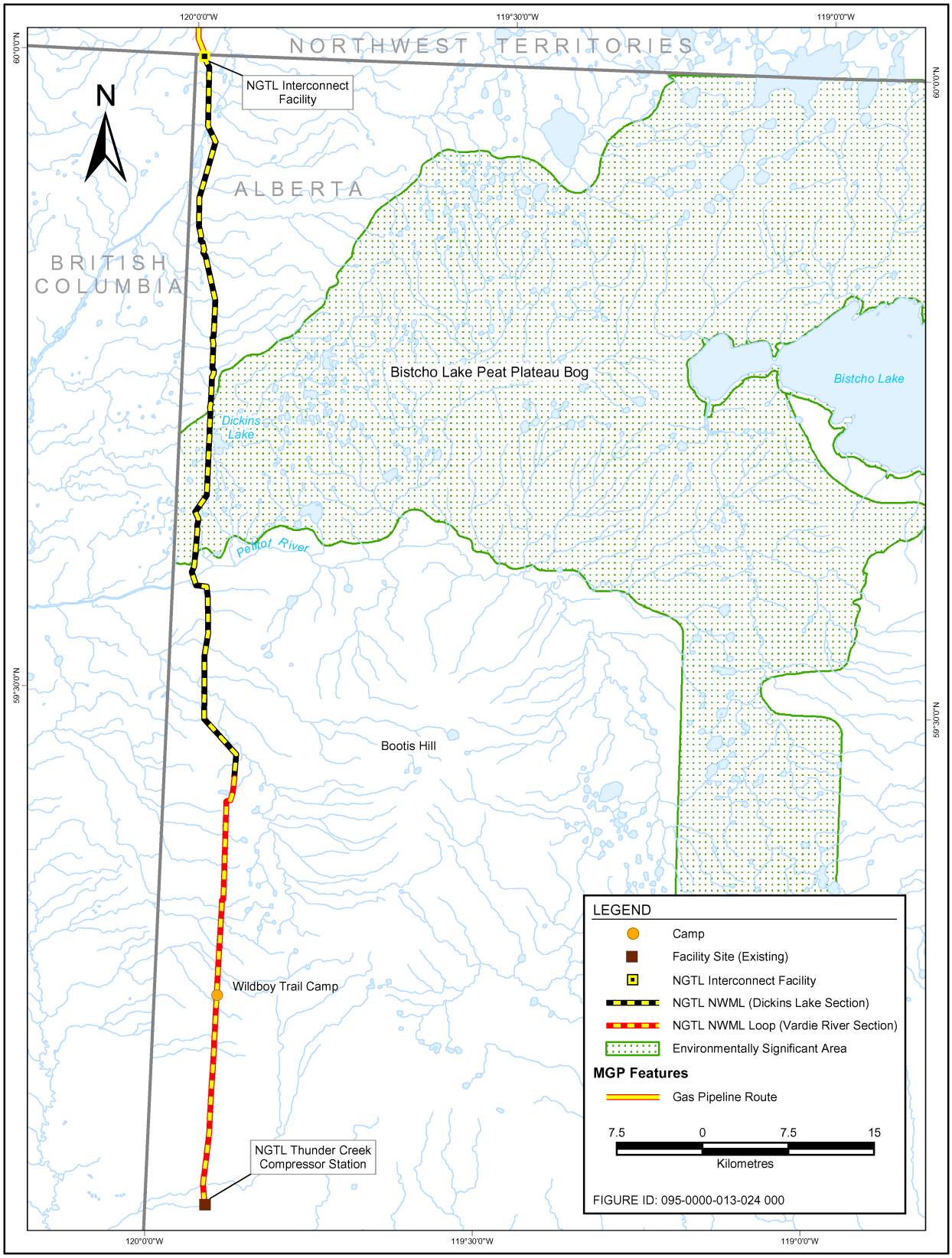

Figure 9-3: Environmentally Significant Area

Effects on Vegetation Distribution and Abundance

Effect Pathways

The pathway diagram for northwestern Alberta (see Figure 9-4) is consistent with that in EIS Volume 5, Section 9. It shows key and intermediate pathways, indicating how the Dickins Lake and Vardie River sections could affect vegetation abundance and distribution. Direct effects from activities such as clearing, and indirect effects, such as changes in soils and permafrost, are considered. Direct loss of vegetation will occur by removing or burying vegetation and substrate. Direct alteration of vegetation includes clearing of trees and shrubs, damage to surface vegetation and compaction of surface vegetation.

Indirect effects, such as changes in thermal regime or drainage patterns, can result in thermokarst, slumps, landslips or ponding during construction or operations. Changes in exposure to sunlight can also affect the response of vegetation communities. Indirect effects might also be induced through the inadvertent introduction of invasive, non-native plant species.

Effect Attributes

The attributes of the effects on vegetation abundance and distribution were rated for direction, magnitude, geographic extent and duration (see Table 9-6). These attributes are the same as those used in the EIS.

Analysis and Significance

For the results of the assessment of effects on vegetation distribution and abundance in the Dickins Lake and Vardie River sections, see Table 9-7. The information is presented by project phase and for individual vegetation VCs.

The significance of effects for each VC for each phase is the same as that determined in the EIS, i.e., all are not significant.

Construction activities will disturb surface vegetation and remove vegetation and soils in ditched or graded areas. Peat plateaus underlain by permafrost have the potential for considerable subsidence and thaw settlement. Widening the existing pipeline right-of-way and, potentially, seismic lines, will increase fragmentation, and could potentially aid invasive species and cause increased edge effects in adjacent forests.

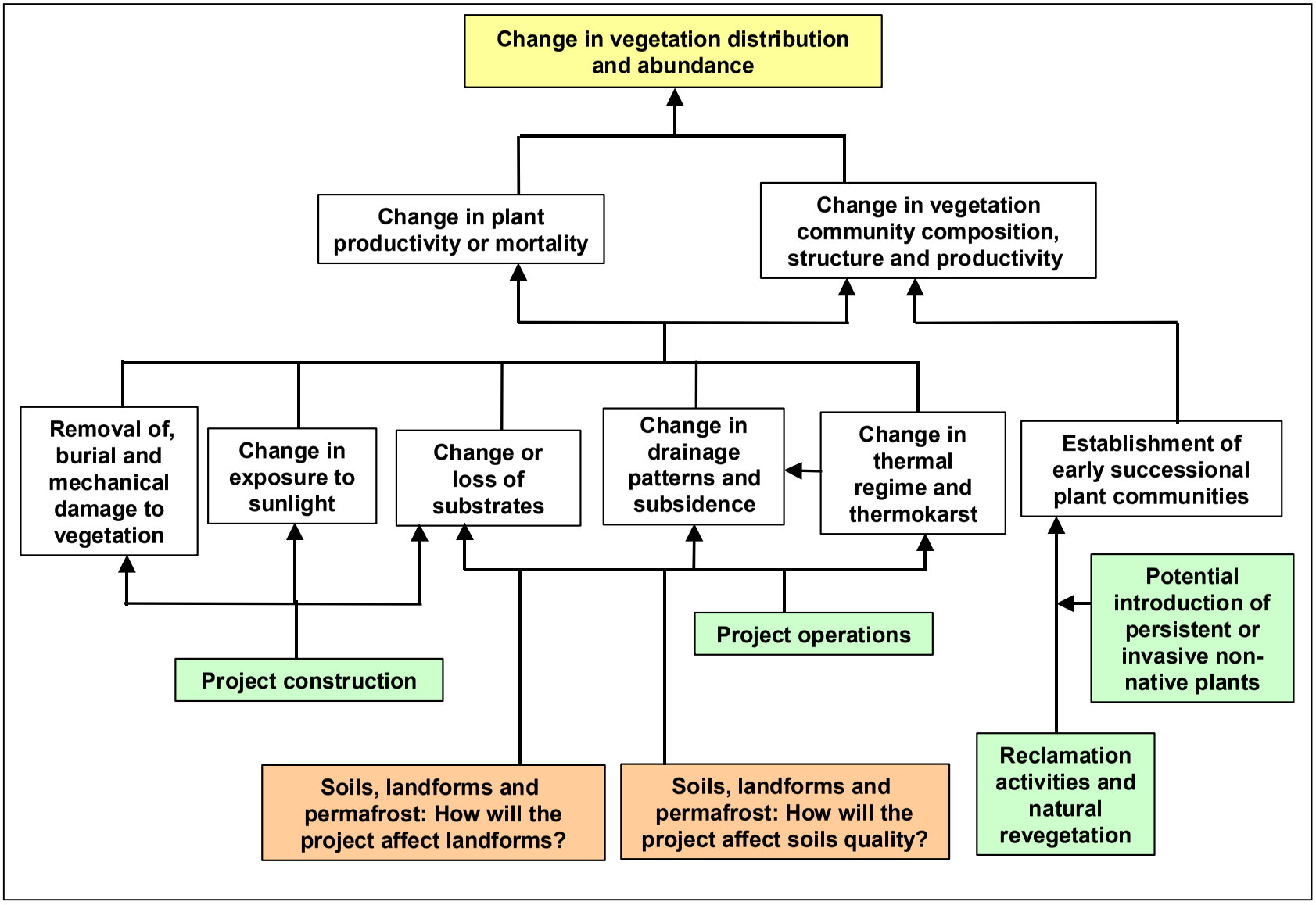

Figure 9-4: Effect Pathways – Abundance and Distribution of Vegetation Species and Associations

Table 9-6: Definitions of Effect Attributes for Vegetation

Attribute		Definition
Direction	Adverse	Effect on VC is worsening
	Neutral	Effect on VC is not changing compared with baseline conditions and trends
	Positive	Effect on vegetation type or VC is improving
Magnitude[1]	No effect	Effect does not occur
	Low	Effect occurs that might or might not be detectable, but is within the normal range of variability or the effect is predicted to result in a change to the VC of <5% in area
	Moderate	Effect occurs but unlikely to pose a serious risk to the VC or the effect is predicted to result in a change to the VC of 5 to 10% in area
	High	Effect is likely to pose a serious risk to the VC or the effect is predicted to result in a change to the vegetation type or VC of >10% in area
Geographic extent	Local	Effect on VC within LSA
	Regional	Effect on VC within RSA
	Beyond Regional	Effect on VC extends beyond RSA
Duration[2]	Short term	Effect on VC is limited to less than three years
	Medium term	Effect on VC occurs between three and nine years
	Long term	Effect on VC lasts longer than nine years, but does not extend more than 30 years after decommissioning and abandonment
	Far future[2]	Effect on VC extends beyond 30 years after decommissioning and abandonment

NOTES:
1 Excluding rare plants
2 Effects on some VCs might be permanent

Table 9-7: Effects on Vegetation Abundance and Distribution

Valued Component	Phase When Impact Occurs	Effect Attribute				
		Direction	Magnitude	Geographic Extent	Duration	Significant
Vegetation types	Construction	Adverse	Low	Local	Far future	No
	Operations	Adverse	Low	Local	Far future	No
	Decommissioning	Adverse	Low	Local	Far future	No
Vegetation communities of concern	Construction	Adverse	Low	Regional	Far future	No
	Operations	Adverse	Low	Regional	Far future	No
	Decommissioning	Adverse	Low	Regional	Far future	No
Rare plants	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:
Effects on traditionally used plants and collecting sites will be assessed after traditional knowledge studies are completed

In areas where vegetation is removed but the ground surface is not disturbed, native vegetation will recover. Other areas will be reclaimed after being used. Vegetation on disturbed soils and pads on permafrost soils will remain in an early successional stage for many years. Affected areas are expected to reclaim to self-sustaining native plant communities within 10 years. Trace amounts of non-native reclamation species or accidental introductions of weed species might persist into the far future, but effects will be low magnitude. Effects on vegetation and known locations of vegetation VCs in the pipeline right-of-way are similar to the South Taiga Plains and are predicted to be not significant. Effects on rare plants and uncommon communities of concern are also predicted to be not significant.

Detailed rare plant surveys of the pipeline corridor will be done before construction, as part of NGTL's preconstruction work. In consultation with provincial regulators and local communities, the data from these surveys will be used to develop appropriate mitigation measures.

Construction

An area of about 290 ha will be affected by camp and right-of-way construction. Impacts on vegetation types will be low magnitude relative to their extent in the landscape, as much of the disturbance will occur on existing clearings, cutlines and rights-of-way. No vegetation types will be disproportionately affected by the pipeline route. The largest losses will occur in the common vegetation types, including black spruce/Labrador tea/mountain cranberry, and upland white spruce–trembling aspen–jack pine (see Table 9-8).

Construction effect attributes for vegetation types in northwestern Alberta are the same as those identified for the pipeline corridor in EIS Volume 5, Section 9.

Operations

Operation of the pipeline will require only minor direct disturbance to vegetation, such as shrub and tree management. Thermokarst effects are possible. Ground stability, reclamation progress and drainage impedance will be monitored, but the right-of-way surface will begin to recover and early seral plant communities will become established.

Operations effects on the vegetation types on the pipeline are the same as those identified for the pipeline corridor in EIS Volume 5, Section 9.

Decommissioning and Abandonment

Some indirect impacts, such as vegetation compaction, and changes in thermal regime or drainage patterns, might occur during decommissioning and abandonment.

Decommissioning and abandonment effects on the vegetation types along the pipeline route are the same as those identified in EIS Volume 5, Section 9.

Table 9-8: Area of Vegetation Types Affected During Construction – South Taiga Plains Ecological Zone in Northwestern Alberta

Vegetation Map Label	Mapped Vegetation Type	LSA Baseline Area		Project Effect Area		LSA Residual Area	
		(ha)	(%)	(ha)	(%)	(ha)	(%)
Sa1	Upland jack pine	517.6	4.95	14.0	0.13	503.6	4.81
Sd1	Upland trembling aspen/prickly rose	658.9	6.30	8.6	0.08	650.3	6.21
Sd2	Upland white spruce–trembling aspen–jack pine	784.4	7.50	19.8	0.19	764.6	7.31
Sd3	White spruce/stair-step moss	10.3	0.10	0.0	0.00	10.3	0.10
Sd4	Black spruce–white spruce/stair-step moss	196.2	1.87	3.7	0.04	192.5	1.84
Sd5	Alaska birch–white spruce	401.1	3.83	10.3	0.10	390.8	3.73
Sf4	Riparian willow	2.6	0.02	0.1	0.00	2.5	0.02
Sg1	Black spruce–tamarack	101.3	0.97	1.8	0.02	99.5	0.95
Si1	Black spruce/Labrador tea/mountain cranberry	1,337.4	12.78	31.0	0.30	1,306.4	12.48
Si3	Black spruce/cloudberry–lichen bog	2,781.4	26.58	58.0	0.55	2,723.4	26.03
Si4	Leatherleaf/bog rosemary/peat moss	363.3	3.47	7.5	0.07	355.8	3.4
Sk3	Graminoid fen	839.7	8.02	21.3	0.20	818.4	7.82
Sk4	Shrub fen	430.9	4.12	12.5	0.12	418.4	4.00
Sk5	Treed fen	18.1	0.17	0.8	0.01	17.3	0.17
C	Recent burn	1,500.7	14.34	32.8	0.31	1,467.9	14.03
W	Water	129.6	1.24	0.2	0.00	129.4	1.24
CL	Clearings	6.0	0.06	0.2	0.00	5.8	0.06
PL	Pipeline rights-of-way	130.7	1.25	24.4	0.23	106.3	1.02
PD[1]	Permanent disturbances	254.0	2.43	42.1	0.40	211.9	2.02
	Total	10,464.2	100.00	289.1	2.76	10,175.1	97.25

NOTES:
1 Includes seismic cutlines and trails in Alberta portion of the RSA only

Vegetation Communities of Concern

Potential effects on vegetation communities of concern are expected to be similar to those cited for the South Taiga Plains vegetation communities of concern in the Mackenzie Gas Project pipeline corridor in the Northwest Territories (see EIS Volume 5, Section 9).

Rare Plants

The potential effect on rare plants is expected to be similar to the South Taiga Plains (see EIS Volume 5, Section 9).

After rare plant surveys have been done, any identified rare plant sites that might be affected will be delineated. For a discussion of mitigation options for rare plant occurrences, see EIS Volume 7.

Traditionally Used Plants and Collecting Sites

Community-based information on traditional plant use is not available along the pipeline corridor. Currently, NGTL is developing a traditional land use report with the DTFN. NGTL will consider this information in its project design and when refining mitigation options.

Prediction Confidence

Because of the precautionary approach used to predict effects on vegetation distribution and abundance, there is a high degree of confidence in the assessment of significance of effects. The level of confidence is consistent with that in EIS Volume 5, Section 9.

Effects on Vegetation Health

Effect Pathways

The pathway diagram for northwestern Alberta (see Figure 9-5) is consistent with that in EIS Volume 5, Section 9. It shows key and intermediate pathways, indicating how the Dickins Lake and Vardie River sections could affect vegetation health. Direct project effects, such as dust deposition or air emissions, and indirect effects, such as changes in permafrost or substrate, are considered for effects on vegetation health.

Effect Attributes

Construction, operations and decommissioning will result in direct and indirect effects on vegetation health. For definitions of the effect attributes used to describe vegetation health, see Table 9-6, shown previously.

Analysis and Significance

All-weather roads and borrow sites are not planned for the Dickins Lake and Vardie River sections, and existing camps will be used. Construction is planned for winter only. Therefore, impacts from dust will be limited. Potential impacts on vegetation will be low magnitude for all VCs.

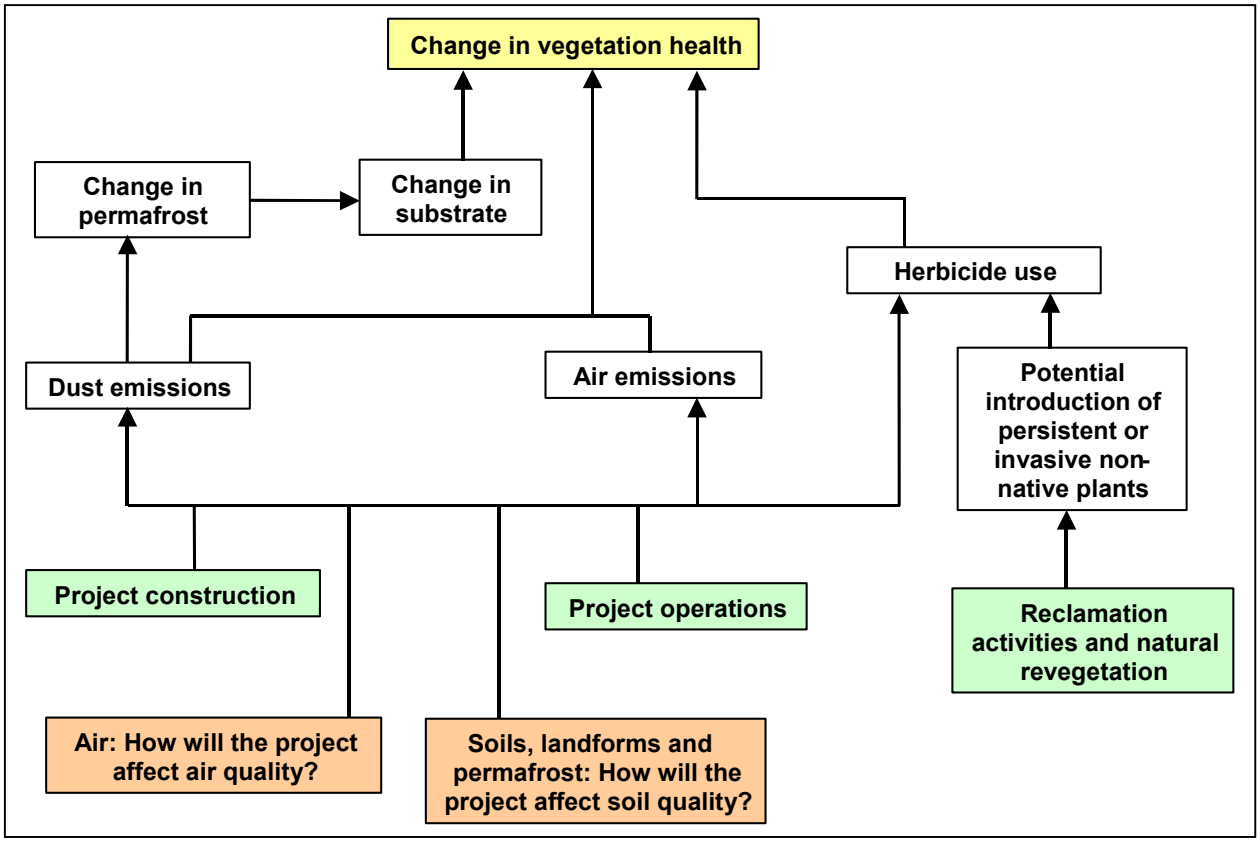

Figure 9-5: Effect Pathways – Health of Vegetation Species and Associations

Herbicides will be restricted to persistent or invasive non-native species only, and restricted to areas where manual control is not effective. Potential effects on vegetation will be low magnitude for all VCs.

Expected air emissions are well below critical levels or monitoring loads (see Table 9-9). Emissions will be restricted to small areas around the NGTL Thunder Creek compressor station. The magnitude of effects will be low and geographic extent local. Predicted effects on vegetation health are not significant.

For a summary of the results of the assessment of effects on vegetation health, see Table 9-10.

Prediction Confidence

Because of the precautionary approach used to predict effects on vegetation of adding the Vardie River Section, there is a high degree of confidence in the assessment of significance of effects. The level of confidence is consistent with that in EIS Volume 5, Section 9.

Table 9-9: Summary of Maximum Air Quality Predictions

	Sulphur Dioxide (SO_2)		Nitrogen Dioxide (NO_2)		Maximum PAI (keq/ha/a)	Area PAI[a] (keq/ha/a)	Nitrogen Deposition	
	24-hour (µg/m³)	Annual (µg/m³)	24-hour (µg/m³)	Annual (µg/m³)			(kg/ha/a)	(meq/m²/a)
NGTL Thunder Creek heater	0.8	0.1	9.6	1.1	0.02	0.001	0.27	1.90
Critical Level[b] Critical Load[c] Monitoring Load	None recommended[b]	15[b] winter mean 10[b] for certain lichen sp.	None recommended[b] (NO_x is 75)[b]	15–20[b] (NO_x is 30)[b]	None recommended[b]	0.17[d] for sensitive soils 0.35 for moderately sensitive soils 0.7 for soils of low sensitivity	5–35[c] depending on vegetation type	20–25[c] in Class 1 soils, north of Norman Wells 35–55[c] in Class 2 soils, south of Norman Wells
Authority	WHO[1]	WHO[1]	WHO[1]	WHO[1]	—	CASA[2]	WHO[1]	UNEP[3]

NOTES:

a Area PAI represents integrated PAI levels over the entire 40,000 ha LSA, which is considerably smaller than 1° by 1° grid cells that are more than 500,000 ha in size at this latitude

b Critical level is "the concentration in the atmosphere above which direct adverse effects on receptors, such as plants, ecosystems or materials, might occur according to present knowledge" (WHO 2000)

c Critical load is "the highest load that will not cause chemical changes leading to long-term harmful effects on the most sensitive ecological systems (Van der Eerden et al. 1994; WHO 2000)

d Target load is "a level of deposition that considers the critical load, and that is practically and politically achievable" (CASA 1999)

SOURCES:

1 World Health Organization (WHO 2000)

2 Clean Air Strategic Alliance and Alberta Environment (CASA 1999)

3 United Nations Environment Program (UNEP) (Bouwman and van Vuuren 1999)

Table 9-10: Effects on Vegetation Health

Valued Components	Phase When Impact Occurs	Effect Attribute				
		Direction	Magnitude	Geographic Extent	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	Short term	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning	Adverse	Low	Local	Short term	No
Rare plants[1]	Construction	Adverse	Low	Beyond regional	Far future	No
	Operations	Neutral	No effect	N/A	N/A	No
	Decommissioning	Neutral	No effect	N/A	N/A	No

NOTES:
N/A = no applicable effect pathway
1 No effect on known occurrences, but potential for effects on unidentified occurrences

Combined Project Effects

The EIS concluded that the Mackenzie Gas Project in combination with NGTL's Dickins Lake Section would produce no significant effects on:

- vegetation distribution and abundance
- vegetation health

This assessment for northwestern Alberta concludes that the Mackenzie Gas Project combined with NGTL's Dickins Lake and Vardie River sections will also produce no significant effects.