Table 8-7
Environmental Effects Analysis -- Physical Environment

VEC Feature	Project Phase	Potential Effects	Effects Analysis						Likelihood	Effects (without mitigation)	Proposed Mitigation	Residual Effects	Overall Significance	Monitoring-Follow-up
			Ecological Context	Magnitude	Geographic Extent	Duration	Frequency	Premanance / Reversibilty						
Soils and Bedrock														
Bedrock	Predominantly during construction, and localized to selected quarry sites during operations. Bedrock quarries will also be established in areas where suitable quantities of granular or borrow material may not be available from nearby sand or gravel sources obtained from lacustrine soils	Removal of native soils and placement of bedrock in fill areas (potential effect to nature of terrain)	L-M	L-M	L	L	L	H	H	L	Minimize the amount of cut and fill by minimizing alignment crossing through areas requiring fill	L	NS	N
Granular/Lacustrine Soils	Construction and Operations	Removal of native soils (e.g, sand pits and granular material derived from fluvial deposits) and placement of soils in fill areas (potential effect to nature of terrain). Erosion in areas of silt and fine sand may occur during episodes of high runoff and wind.	L-M	L-M	L	L	L	H	H	M	Minimize the amount of cut and fill by minimizing alignment crossing through areas requiring fill. Apply erosion protection measures (e.g., silt fencing, erosion control blankets, revegetation, etc).	L	NS	N
Swampy Areas (Fens, Bog, and Marsh)	Construction and Operations	Construction through swamp areas likely requires larger than average fill quantities. Results in more and/or larger off-ROW quarry sites and access roads. Also requires additional hauling and placing of material. Modifies terrain conditions of swamp areas and local drainage conditions Increases flood susceptibility locally.	L-M	L-M	L	L	L	H	H	M	Minimize alignment through swampy areas. Minimize crossing of swampy areas. Road will be designed to handle drainage during periods of high runoff	L	NS	N

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Peatland and MuskegTerrain	Construction and Operations	Likely requires larger than average fill quantities due to peat compression. Results in more and/or larger off-ROW quarry sites and access roads. Also requires additional hauling and placing of material. Similar to swampy areas, but muskeg terrain is typically low-lying having segments with a water table at or near the ground surface. As a result such areas may be more susceptible to localized flooding during periods of heavy runoff. Long-term - effects of the foundation will continue for the life of the road and will require on-going maintenance with associated environmental effects (e.g., need for borrow materials). In some areas shallow peat materials may be removed and replaced with granular base materials.	L-M	M	L-M	L	L	H	H	L	Due to the compressibility of the peat consolidation of the roadbed in muskeg terrain is expected. Placement of geotextile and scrub trees/brush to reduce the effect of peat consolidation. Road will be designed to handle drainage during periods of high runoff.	L	NS	N
All soil types	Construction and Operations	Soil contamination may occur in localized areas due to spills of fuel or oil from construction equipment or vehicles, and vehicular accidents	L	L-M	L-M	L	L	L	L	M	Designated re-fuelling areas with impermeable barriers and controlled fuel storage. Construction contractors are to maintain spill control and clean-up equipment at designated construction site areas. Highway maintenance crews will also maintain spill control and maintenance equipment during operations. Spills prevention and control plan. Soil remediation to CCME standards.		NS	M-C; M-O

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Air Quality	Construction	Any blasting will reduce local air quality with dust, noise and vibrations	L-M	L	L	L	L	H	H	M	Best management practices will be employed to minimize the impacts of construction noise and dust	L	NS	M
	Construction	Other construction activities (such as rock crushing, stockpiling, roadbed construction, and hauling) will create noise and dust that will temporarily reduce local air quality and create noise and vibrations in the area of the ROW and associated temporary access roads. Ecological effects are localized to the construction site activities in the Project Area	L-M	L	L	L	L	H	H	M	Timing of blasting activities employed and daily and seasonal timing constraints applied. For example, limit blasting activities near communities between hours of 7am to 7 pm. Also limit blasting in proximity of nesting areas.	L	NS	M
	Operations	Maintenance activities involving slope repairs,grading, and hauling activities will create noise and dust that will temporarily reduce local air quality.	L	L	L	L	L	H	H	M	Mitigation measures would include dust control wetting and the use of surfactants (calcium/magnesium chloride or suitable substitutes) and setbacks from sensitive receptors (e.g., communities and waterways)	L-M	NS	M
	Operations	Maintenance will require blasting and crushing of rock in selected quarry sites or extraction of material from selected borrow pit sources for surfacing material that will produce noise and dust	L	L	L	L	L	H	H	M	Mitigation measures would include dust control wetting and the use of surfactants (calcium/magnesium chloride or suitable substitutes) and setbacks from sensitive receptors (e.g., communities and waterways)	L	NS	M
	Operations	Road Usage - Traffic Dust and Noise	L	L	L	L	L	L	H	M	Maintain road surface in good condition, through regular maintenance and apply surfactants near communities or other sensitive features	L	NS	M

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Surface Water Resources - Quality	Construction	Deteriorated surface water quality as result of increased sedimenation from erosion	L	M	M	L	M	L	Likely	M	Watercourse isolation; construction erosion control measures such as silt fencing and turbidity curtains.	L	NS	M-C
	Operations	Deteriorated surface water quality as result of increased sedimenation from erosion	L	M	M	M	L	L	UN	M	Stormwater controls such as ditching and collection ponds; erosion control measures such as rip-rap and vegetation; reclamation of disturbed areas.	L	NS	M-O
	Construction and Operations	Deteriorated surface water quality as result of deleterious substance spills	M	H	M	L	L	L	UN	M	Spill prevention BMPs such as designated re-fuelling areas, re-fuelling pads, emergency spill kits, spill response plans. Rehabilitation of construction staging areas, camps and areas used for fuel storage and re-fuelling during construction.	L	NS	M-C; M-O
Surface Water Resources - Quantity	Construction	Potential disruption of surface drainage and flow systems from highway, access road, crossing construction, and road drainage	L	L	L	L	L	L	H	M	Bridges and major culverts designed/constructed in accordance with 1:100 design storm standard. Crossings to be designed to reduce or minimize backwater effects. Rock weirs in ditches may be used where grades are steep in lacustrine segments.	L	NS	M-C
	Operations	Potential disruption of surface drainage and flow systems from highwat and culvert maintenance (e.g. slope failures, flooding)	L	LM	L	L	M	L	M	M	Sormwater management control systems, culvert sizing (1:100), regular cleanouts	L	NS	M-O
	Construction	Potential disruption of surface drainage and flow systems from construction quarry and borrow areas	M	L	L	H	H	H	H	M	Divert surface drainage. Energy dispersion at outlet of quarry de-watering. Winter construction. Seasonal de-watering if necessary.	L	NS	M-C
	Operations	Potential disruption of surface drainage and flow systems from on-going quarry operations	M	L	L	M	M	L	H	M	Stormwater controls such as ditching and collection ponds; erosion control measures such as rip-rap and vegetation; reclamation of disturbed areas.	L	NS	M-O

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Groundwater Resources Quality	Construction and Operations	Deteriorated ground water quality as result of deleterious substance spills	L	M	M	L	L	L	UN	M	Spill prevention BMPs such as designated re-fuelling areas, re-fuelling pads, emergency spill kits, spill response plans. Rehabilitation of construction staging areas, camps and areas used for fuel storage and re-fuelling during construction.	L	NS	M-C; M-O
Groundwater Resources Quantity	Construction and Operations	Temporary dewatering of local groundwater table	L	L	L	L	L	L	L	L	Monitor groundwater levels and adjust de-watering as necessary. Quarry rehabilitation following completion. Monitor and respond to issues raised by local communities.		NS	M