

Table 6.3 Environmental Effects Analysis Summary.

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Biophysical				
Air Quality				
Increased SO ₂ and NO _x from vehicle and equipment emissions during construction	Minor	<ul style="list-style-type: none"> • Optimize/balance use of equipment haul distance/routes • Use low sulphur fuels • Ensure high standard of maintenance • Minimize unnecessary idling 	Minor	Insignificant
Increased SO ₂ and NO _x from commercial trucks passenger vehicles during construction	Minor	<ul style="list-style-type: none"> • Minimize traffic delays due to construction • Provide warning to truck drivers and motorists • Provide detour routes around construction area 	Minor	Insignificant
Increased VOC levels from fuel storage and dispensing during construction	Minor	<ul style="list-style-type: none"> • Prevent fuel leaks and spills • Minimize fuel spillage • Store fuel in airtight containers • Recover spilled fuel to minimize evaporation using remediation equipment • Ensure high standard of maintenance 	Minor	Insignificant
Increased VOC levels from asphalt paving during construction	Minor	<ul style="list-style-type: none"> • Monitor paving activities during high wind events 	Minor	Insignificant
Increased dust levels from materials handling during construction	Moderate	<ul style="list-style-type: none"> • Limit dust causing activities • Use approved dust control agents 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Increased dust levels from materials handling during construction (cont'd)	Moderate	<ul style="list-style-type: none"> Suspend material handling activities during high wind events 	Minor	Insignificant
Increased dust levels from surface activities during construction	Moderate	<ul style="list-style-type: none"> Limit dust causing activities Use approved dust control agents Haul on gravel rather than clay, if feasible 	Minor	Insignificant
Increased dust levels from vehicle and equipment use during construction	Minor	<ul style="list-style-type: none"> Limit dust causing activities Use approved dust control agents Haul on gravel rather than clay, if feasible 	Minor	Insignificant
Decreased SO ₂ and NO _x from vehicle and equipment emissions during operation	Positive	<ul style="list-style-type: none"> N/A 	Positive	Positive
Increased dust levels from road cleaning activities during operation	Minor	<ul style="list-style-type: none"> Wet area with water prior to cleaning 	Minor	Insignificant
Greenhouse Gases				
Increased GHGs from vehicle and equipment emissions during construction	Minor	<ul style="list-style-type: none"> Optimize/balance use and idling of vehicles and equipment Ensure high standard of maintenance Use fuel efficient equipment Limit unnecessary idling 	Minor	Insignificant

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Increased GHGs from passenger vehicles and commercial trucks emissions during construction	Minor	<ul style="list-style-type: none"> • Provide detour routes around construction area • Provide warning to truck drivers and motorists • Minimize traffic delays due to construction 	Minor	Insignificant
Decreased GHGs from commercial trucks and passenger vehicles emissions during operation	Positive	<ul style="list-style-type: none"> • N/A 	Positive	Positive
Increased GHGs from clearing of vegetation	Minor	<ul style="list-style-type: none"> • Use previously disturbed or cleared areas • Limit clearing of vegetation • Limit clearing adjacent to treed areas • Landscape with grass, shrubs and trees • Plant additional trees to offset loss of trees 	Minor (Potentially positive)	Minor (Potentially positive)
Decreased GHGs from draining low-lying methane-producing areas	Positive	<ul style="list-style-type: none"> • N/A 	Positive	Positive
Geology & Soils				
Disturbance of surface soils during construction	Minor	<ul style="list-style-type: none"> • Limit extent of construction activities • Plan work so construction activities on previously disturbed areas, where feasible • Remove and stockpile topsoil for landscaping 	Minor	Insignificant
Loss of surface soils due to erosion from surface water runoff during construction	Minor	<ul style="list-style-type: none"> • Limit extent of construction activities • Plan work so construction activities on previously disturbed areas, where feasible 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Loss of surface soils due to erosion from surface water runoff during construction (cont'd)	Minor	<ul style="list-style-type: none"> • Contour construction area to control runoff • Provide adequate land drainage capability • Provide settling basins • Landscape exposed areas with grass • Provide erosion control as required 	Minor	Insignificant
Contamination of soil from accidental spills and releases during construction	Moderate	<ul style="list-style-type: none"> • Prevent spills and releases • Limit on-site use and storage of hazardous substances • Use drip trays under stationary equipment • Provide double-walled fuel storage tanks with leak detection or use fuel trucks • Provide spill clean-up equipment • Prepare/implement emergency response plan 	Minor	Insignificant
Exposure of existing soil contamination	Moderate	<ul style="list-style-type: none"> • Test for suspected contamination • Contact Manitoba Conservation if remediation criteria are exceeded • Prepare remedial action plan • Follow Manitoba guidelines for remediation of contaminated sites 	Minor	Insignificant
Soil contamination from asphalt paving activities	Minor	<ul style="list-style-type: none"> • Limit asphalt paving during high precipitation events 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Loss of surface soils due to erosion from surface water runoff during operation	Minor	<ul style="list-style-type: none"> • Contour disturbed areas to control runoff • Provide adequate land drainage capability • Landscape exposed areas with grass, shrubs and trees • Provide erosion control as required 	Minor	Insignificant
Contamination of soil from accidental spills and releases during operation	Moderate	<ul style="list-style-type: none"> • Prevent spills and releases • Limit on-site use of hazardous substances • Use drip trays under stationary equipment • Provide spill clean-up equipment 	Minor	Insignificant
Contamination of soil from salt use during operation	Moderate	<ul style="list-style-type: none"> • Use alternatives to salt if practical • Limit amount of salt used • Remove snow when built up to approved snow disposal area 	Minor	Insignificant
Surface Water				
Modification of surface water drainage during construction	Moderate	<ul style="list-style-type: none"> • Contour area to direct surface water towards drains • Install drains to receive surface water drainage • Connection to storm sewer system 	Minor	Insignificant
Increased suspended solids discharged to storm sewers during construction	Moderate	<ul style="list-style-type: none"> • Contour area to direct surface water towards drains • Install silt curtains and erosion control mats • Provide settling ponds • Place rip rap • Landscape with grass 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Contamination of surface water from accidental spills and releases during construction	Moderate	<ul style="list-style-type: none"> • Prevent spills and releases • Limit on-site use of hazardous substances • Use drip trays under stationary equipment • Provide double-walled fuel storage tanks with leak detection or use fuel trucks • Provide spill clean-up equipment • Prepare/implement emergency response plan 	Minor	Insignificant
Accumulation of surface water drainage during operation	Moderate	<ul style="list-style-type: none"> • Contour area to direct surface runoff to drains • Provide adequate drainage • Install pumps to excavate stormwater in underpass 	Minor	Insignificant
Increased suspended solids discharged to storm sewers during operation	Moderate	<ul style="list-style-type: none"> • Contour area to direct surface water towards drains • Provide additional controls such as rip rap in erosion prone areas • Landscape with sod, shrubs and trees 	Minor	Insignificant
Groundwater				
Modified shallow groundwater regime during construction	Minor	<ul style="list-style-type: none"> • Limit extent of excavation and trenching • Minimize surface disturbance activities • Provide drainage around underpass structure 	Minor	Insignificant

	Assessment	Mitigation Measures	Residual Effect	Significance
Modified shallow groundwater regime during construction (cont'd)	Minor	<ul style="list-style-type: none"> • Fill and compact excavated areas 	Minor	Insignificant
Groundwater contamination from accidental spills and releases during construction	Major	<ul style="list-style-type: none"> • Prevent accidental spills and releases • Limit on-site use of hazardous substances • Use drip trays under stationary equipment • Provide double-walled fuel storage tanks with spill prevention and leak detection or use fuel trucks • Prepare/implement emergency response plan 	Minor	Insignificant
Contamination of groundwater from existing soil contamination	Moderate	<ul style="list-style-type: none"> • Test for suspected contamination • Contact Manitoba Conservation if remediation criteria are exceeded • Prepare remedial action plan • Follow Manitoba guidelines for remediation of contaminated sites 	Minor	Insignificant
Groundwater contamination from asphalt paving activities	Minor	<ul style="list-style-type: none"> • Limit asphalt paving during high precipitation events 	Minor	Insignificant
Groundwater contamination from accidental spills and releases during operation	Major	<ul style="list-style-type: none"> • Prevent accidental spills and releases • Limit on-site use of hazardous substances • Use drip trays under stationary equipment 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Contamination of groundwater from salt use during operation	Moderate	<ul style="list-style-type: none"> • Use alternatives to salt if practical • Limit amount of salt used • Remove snow build up 	Minor	Insignificant
Vegetation				
Loss of vegetation from clearing and construction activities	Moderate	<ul style="list-style-type: none"> • Limit construction to previously disturbed areas, where applicable • Avoid damage to adjacent vegetated areas • Re-vegetate to obtain net gain in vegetation cover 	Minor	Insignificant
Physical damage to trees during construction	Minor	<ul style="list-style-type: none"> • Limit construction activities to previously disturbed areas • Prohibit off-site use by construction vehicles 	Minor	Insignificant
Physical damage to tree root systems	Minor	<ul style="list-style-type: none"> • Prevent damage to roots of adjacent trees • Provide buffer around adjacent natural areas • Use of designated stockpile areas 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Damage to vegetation from salt use during operation	Moderate	<ul style="list-style-type: none"> • Use alternatives to salt if practical • Limit amount of salt used • Remove snow build up by plowing 	Minor	Insignificant
Mammals				
Loss of mammal habitat/displacement of mammals	Minor	<ul style="list-style-type: none"> • Limit extent of clearing • Use previously disturbed areas • Re-vegetate disturbed areas with deer deterrent species • Enhance previously disturbed areas 	Minor	Insignificant
Disturbance to mammals due to increased noise from construction activities	Minor	<ul style="list-style-type: none"> • N/A 	Minor	Insignificant
Increased problem mammals due to waste handling and disposal activities during construction	Minor	<ul style="list-style-type: none"> • Use animal-proof garbage containers • Prevent access to garbage containers • Remove garbage regularly • Dispose of garbage in approved waste disposal grounds 	Minor	Insignificant
Attraction of mammals to re-vegetated road medians and shoulders during operation	Moderate	<ul style="list-style-type: none"> • Limit palatable grass planting on medians and shoulders • Limit mammal habitat adjacent to roadways • Erect fences to restrict deer movement • Post signage to warn motorists • Use deterrents 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Increased mammal kills due to vehicles and equipment during construction	Moderate	<ul style="list-style-type: none"> • Post signage to warn construction workers and motorists • Use deterrents 	Minor	Insignificant
Attraction of mammals to roadways due to salt used to melt ice during operation	Moderate	<ul style="list-style-type: none"> • Use alternatives to salt if practical • Limit amount of salt used • Remove snow build up 	Minor	Insignificant
Increased mammal kills from passenger vehicles and commercial trucks during operation	Minor	<ul style="list-style-type: none"> • Post signage to warn motorists • Use deterrents 	Minor	Insignificant
Birds				
Loss of bird habitat/ displacement of birds	Minor	<ul style="list-style-type: none"> • Limit extent of clearing • Use previously disturbed areas • Re-vegetate disturbed areas • Enhance previously disturbed areas 	Minor	Insignificant
Disturbance to birds due to increased noise from construction activities	Minor	<ul style="list-style-type: none"> • N/A 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Increased problem birds during waste handling and disposal activities during construction	Minor	<ul style="list-style-type: none"> • Dispose of construction wastes in containers • Use animal-proof garbage containers for foodstuffs • Regular garbage pick-up/disposal • Use licenced waste disposal grounds 	Minor	Insignificant
Increased bird kills due to vehicles and equipment during construction	Moderate	<ul style="list-style-type: none"> • Use deterrents • Types of plantings 	Minor	Insignificant
Attraction of birds to re-vegetated road medians and shoulders during operation	Moderate	<ul style="list-style-type: none"> • Limit palatable grass planting on medians and shoulders • Limit bird habitat adjacent to roadways • Use deterrents 	Minor	Insignificant
Increased bird kills from passenger vehicles and commercial trucks during operation	Minor	<ul style="list-style-type: none"> • Use deterrents 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Socio-Economic Environment				
Increased noise/ vibration due to vehicles and equipment during construction	Moderate	<ul style="list-style-type: none"> • Limit construction activities to normal working hours near residences • Muffle heavy equipment • Provide hearing protection • Limit long-term idling of construction vehicles 	Minor	Insignificant
Increased noise/ vibration due to trains during construction	Moderate	<ul style="list-style-type: none"> • Limit speeds through detour • Maintain City of Winnipeg no-whistle policy 	Minor	Insignificant
Increased noise/ vibration due to trains during construction (cont'd)	Moderate	<ul style="list-style-type: none"> • Limit delays, if possible 	Minor	Insignificant
Increased noise/ vibration due to vehicles during operation	Moderate	<ul style="list-style-type: none"> • Design underpass and parkway to limit noise to adjacent residences • Install noise barrier fence along parkway • Plant trees for additional noise dampening 	Minor	Insignificant
Risk to worker safety during construction	Moderate	<ul style="list-style-type: none"> • Comply with workplace safety and health legislation • Provide worker orientation • Conduct safety briefings • Prepare/implement safety and health plan 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Risk to worker safety during construction (cont'd)	Moderate		Minor	Insignificant
Risk to worker health during construction	Moderate	<ul style="list-style-type: none"> • Comply with workplace safety and health legislation • Provide worker orientation • Control dust levels and provide dust masks • Minimizing noise and vibration • Provide hearing protection • Manage hazardous substances • Prepare/implement safety and health plan 	Minor	Insignificant
Risk to public safety during construction	Moderate	<ul style="list-style-type: none"> • Provide project information to adjacent property owners and residents • Comply with public safety legislation • Provide information to adjacent property owners and residents • Limit/enforce vehicle speeds through construction areas • Provide warning signage • Maintain safe pedestrian passage procedures 	Minor	Insignificant
Risk to public health during construction	Moderate	<ul style="list-style-type: none"> • Provide information to adjacent property owners and residents • Comply with public health legislation • Provide information to property owners and residents • Control noise/vibration levels • Control dust levels • Manage hazardous substances 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Risk to public health during construction (cont'd)	Moderate	<ul style="list-style-type: none"> • Minimize noise and vibration 	Minor	Insignificant
Impaired human well-being during construction	Moderate	<ul style="list-style-type: none"> • Provide information to adjacent property owners and residents • Conduct public communication sessions • Responding effectively to public concerns • Managing construction noise • Limiting atmospheric emissions • Controlling dust 	Minor	Insignificant
Impaired human well-being during operation	Moderate	<ul style="list-style-type: none"> • Responding effectively to public concerns • Managing operational noise • Enhancing aesthetic values • Provide landscaping to address public aesthetics concern 	Minor	Insignificant
Impaired aesthetic values during construction	Minor	<ul style="list-style-type: none"> • Provide project information to neighbours • Project design to address aesthetic values • Provide greenspace • Designate construction staging areas • Erect barrier fences if deemed necessary • Control dust as required • Manage noise 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Impaired aesthetic values during construction (cont'd)	Minor	<ul style="list-style-type: none"> • Re-vegetate disturbed areas as completion to each phase • Landscape boulevards and medians • Discourage/clean-up graffiti 	Minor	Insignificant
Impaired aesthetic values during operation	Positive	<ul style="list-style-type: none"> • Maintain condition of facilities – underpass, fences, etc. • Maintain greenspace • Maintain landscaping – trees, shrubs, grass, etc. • Manage noise • Discourage/clean-up graffiti 	Minor	Insignificant
Loss/damage to archaeological resources during construction	Minor	<ul style="list-style-type: none"> • Notify Heritage Resources prior to excavation • Provide instructions to contractors • Contact Heritage Resources if artefacts are found 	Minor	Insignificant
Improved recreational facilities – pedestrian and bicycle paths	Positive	<ul style="list-style-type: none"> • Provide greenspace along paths • Pave paths • Provide safety/use signage along paths • Provide linkages to adjacent path networks 	Positive	Positive
Improved economic conditions due to construction and operation	Positive	<ul style="list-style-type: none"> • None 	Positive	Positive
Increased employment due to construction	Positive	<ul style="list-style-type: none"> • None 	Positive	Positive
Increased business opportunities due to construction and operation	Positive	<ul style="list-style-type: none"> • None 	Positive	Positive

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Decreased property values due to construction and operation	Moderate	<ul style="list-style-type: none"> • Provide project information to property owners • Consult with property owners • Evaluate property owner concerns/ complaints 	Minor	Insignificant
Increased property values due to operation	Positive	<ul style="list-style-type: none"> • None 	Positive	Positive
Accidents & Malfunctions				
Risk of fires and explosions during construction and operation	Major	<ul style="list-style-type: none"> • Adhere to National Fire Code • Conduct fire potential audit • Provide fire suppression equipment on-site • Prepare emergency response plan - include fires and explosions 	Minor	Insignificant
Risk of road transportation accidents during construction and operation	Major	<ul style="list-style-type: none"> • Provide signs for driver awareness during construction • Provide warning signage for conditions • Limit vehicle speeds when workers present • Minimize risk of transportation accident • Prepare emergency response plan - include transportation accidents 	Minor	Insignificant
Risk of rail transportation accidents during construction and operation	Major	<ul style="list-style-type: none"> • Provide warning signage • Minimize risk of transportation accident • Limit train speeds to conditions – CN • Provide crossing signals and gates, where applicable • CN to provide emergency response plan – include transportation accidents 	Minor	Insignificant
Risk of petroleum product spills during underpass/road construction and operation	Moderate	<ul style="list-style-type: none"> • Limit on-site storage of petroleum products • Store fuel in approved storage tanks/ containers • Provide barriers around petroleum products • Underpass to include emergency shut off valves for control of hazardous substances • Prepare emergency response plan – include petroleum spills 	Minor	Insignificant

Environmental Effects	Assessment	Mitigation Measures	Residual Effect	Significance
Risk of hazardous substance release during underpass/road construction and operation	Moderate	<ul style="list-style-type: none"> • Limit on-site storage of hazardous substances • Store hazardous substances in approved containers • Remove hazardous substances using licenced contractors • Underpass to include emergency shut off valves for control of hazardous substances • Prepare emergency response plan – include hazardous substance release 	Minor	Insignificant
Risk of petroleum project spills or hazardous substance release during rail construction and operation	Major	<ul style="list-style-type: none"> • CN to provide emergency response plan – include petroleum and hazardous substance release • Keep CN ditch separate from underpass project 		Insignificant

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Effects of the Environment on the Project				
Risk of severe weather conditions	Moderate	<ul style="list-style-type: none"> • Provide adequate drainage and storage capacity in project area • Provide adequate pumping capacity in underpass to handle extreme precipitation events • Protect against soil erosion from extreme precipitation events • Design fences to withstand high winds • Protect new trees from blow-down by staking • Prepare emergency response plan - include procedures for severe weather conditions 	Minor	Insignificant
Climate Change	Minor	<ul style="list-style-type: none"> • Project design to address implications of climate change such as warmer temperatures, increased precipitation, increased variability 	Minor	Insignificant
Risk of overland flooding	Minor	<ul style="list-style-type: none"> • Prepare emergency response plan - include risk of flooding • City of Winnipeg Emergency Response Plan in place. 	Minor	Insignificant