

Hazard, exposure pathway, endpoint and effect					Maximum risk - no preventative measure (uncontrolled)						Control points (CP) and preventative measures		Maximum risk - no preventative measure (uncontrolled)						Comment/s
Pollutant Group	Use or exposure entry	Receiving Environment or receptor	Environmental Endpoint		Likelihood		Impact		Level of risk		Critical CP or CP in environmental pathway	Preventative measure/s	Likelihood		Impact		Level of risk		
Aluminium sulphate (dosing for P removal)	Quarry storage Dam	Water bodies - surface	Aquatic Biota	Toxicity	3	Possible	1	Insignificant	3	Low	Storage and Distribution System		3	Possible	1	Insignificant	3	Low	
	Discharge from storage (unintentional)	Water bodies - surface	Aquatic Biota	Toxicity	3	Possible	2	Minor	6	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam; OEMP	2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Water bodies - surface (Clear Creek)	Aquatic Biota	Toxicity	3	Possible	2	Minor	6	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program	2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Water bodies - groundwater	Aquatic Biota	Toxicity	3	Possible	2	Minor	6	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program	2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Soil	Plants	Toxicity	3	Possible	2	Minor	6	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program	2	Unlikely	2	Minor	4	Low	
Boron	Quarry storage Dam	Sediments	Sediments	Toxicity	2	Unlikely	1	Insignificant	2	Low	Storage and Distribution System	Recycled water is fit for irrigation prior to placement in Quarry Dam	1	Rare	1	Insignificant	1	Low	If boron in recycled waters is < 0.5mg/L, it may build up in soils and become toxic to plants with repeated applications (NMHRC 2006, Table A4.1). There are no thresholds for native plants, the most sensitive threshold is applied (<0.3mg/L).
	Recycled water for snowmaking	Soil	Plants	Toxicity	2	Unlikely	2	Minor	4	Low	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Boron concentration in recycled water leaving quarry dam is predicted to be well below critical value for very sensitive plants (threshold 0.3 mg/L)	1	Rare	2	Minor	2	Low	If boron in recycled waters is < 0.5mg/L, it may build up in soils and become toxic to plants with repeated applications (NMHRC 2006, Table A4.1). There are no thresholds for native plants, the most sensitive threshold is applied (<0.3mg/L).
Cadmium	Quarry storage Dam	Water bodies - surface	Aquatic Biota	Toxicity	2	Unlikely	2	Minor	4	Low	Storage and Distribution System	Recycled water is fit for irrigation prior to placement in Quarry Dam	1	Rare	2	Minor	2	Low	
	Discharge from storage (unintentional)	Water bodies - surface	Aquatic Biota	Toxicity	2	Unlikely	2	Minor	4	Low	Storage and Distribution System	Water is fit for irrigation prior to storage in Quarry Dam	1	Rare	2	Minor	2	Low	
	Application to land (snowmaking/irrigation)	Water bodies - surface (Clear Creek) and groundwater	Aquatic Biota	Toxicity	2	Unlikely	2	Minor	4	Low	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program	1	Rare	2	Minor	2	Low	
	Application to land (snowmaking/irrigation)	Soil	Plants	Toxicity	2	Unlikely	2	Minor	4	Low	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program	1	Rare	2	Minor	2	Low	
Chlorine residuals (including DBPs)	Quarry storage Dam	Water bodies - surface	Aquatic Biota	Toxicity	3	Possible	1	Insignificant	3	Low	Storage and Distribution System	Online STP chlorine monitoring; Storage in effluent tank, prior to transfer into Quarry Dam; Sufficient dilution is achieved in the Quarry Dam; Water monitoring program for Quarry Dam and Clear Creek	2	Unlikely	1	Insignificant	2	Low	
	Discharge from storage (unintentional)	Water bodies - surface (Clear Creek) and groundwater	Aquatic Biota	Toxicity	3	Possible	2	Minor	6	Moderate	Storage and Distribution System	Online STP chlorine monitoring; Storage in effluent tank, prior to transfer into Quarry Dam; Sufficient dilution is achieved in the Quarry Dam; OEMP	2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Water bodies - surface (Clear Creek) and groundwater	Aquatic Biota	Toxicity	3	Possible	2	Minor	6	Moderate	Storage and Distribution System	Online STP chlorine monitoring; Storage in effluent tank, prior to transfer into Quarry Dam; Sufficient dilution is achieved in the Quarry Dam; Water monitoring program for Quarry Dam and Clear Creek	2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Soil	Plants	Toxicity	3	Possible	2	Minor	6	Moderate	Storage and Distribution System	Online STP chlorine monitoring; Storage in effluent tank, prior to transfer into Quarry Dam; Sufficient dilution is achieved in the Quarry Dam; Water monitoring program for Quarry Dam and Clear Creek	2	Unlikely	2	Minor	4	Low	
Nitrogen	Quarry storage Dam	Water bodies - surface	Water - surface	Eutrophication	3	Possible	1	Insignificant	3	Low	Storage and Distribution System	Recycled water is fit for irrigation prior to placement in Quarry Dam	2	Unlikely	1	Insignificant	2	Low	
	Discharge from storage (unintentional)	Water bodies - surfacewater (Clear Creek)	Water - surface	Eutrophication	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam; OEMP	2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Water bodies - surface (Clear Creek)	Water - surface	Eutrophication	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program	2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Water bodies - groundwater	Water - groundwater	Contamination	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program	2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Soil	Plants	Nutrient imbalances	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program	2	Unlikely	2	Minor	4	Low	

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	Application to land (snowmaking/irrigation)	Soil	Plants	Pests and diseases	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program		2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Soil	Plants	Eutrophication	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program		2	Unlikely	2	Minor	4	Low	
Phosphorous	Quarry storage Dam	Water bodies - surface	Water - surface	Eutrophication	3	Possible	1	Insignificant	3	Low	Storage and Distribution System, STP Treatment Process	Aluminium sulphate dosing for increased P removal Sufficient dilution is achieved in the Quarry Dam Water Quality Monitoring Program phosphate free soaps can be used in resort		2	Unlikely	1	Insignificant	2	Low	Resort is in alpine region, there are no prior issues with algal blooms within the storage dam, water quality is not predicted to differ from natural variability considering maximum scenario  Water quality monitoring will be required to verify the modelling and continued environmental assessment
	Application to land (snowmaking/irrigation)	Water bodies - surface (Clear Creek)	Water - surface	Eutrophication	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System, STP Treatment Process	Aluminium sulphate dosing for increased P removal Sufficient dilution is achieved in the Quarry Dam Water Quality Monitoring Program phosphate free soaps can be used in resort		2	Unlikely	2	Minor	4	Low	Resort is in alpine region, there are no prior issues with algal blooms within the storage dam, water quality is not predicted to differ from natural variability considering maximum scenario  Water quality monitoring will be required to verify the modelling and continued environmental assessment
	Application to land (snowmaking/irrigation)	Water bodies - groundwater	Water - surface	Eutrophication	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System, STP Treatment Process	Aluminium sulphate dosing for increased P removal Sufficient dilution is achieved in the Quarry Dam Water Quality Monitoring Program phosphate free soaps can be used in resort		2	Unlikely	2	Minor	4	Low	Resort is in alpine region, there are no prior issues with algal blooms within the storage dam, water quality is not predicted to differ from natural variability considering maximum scenario  Water quality monitoring will be required to verify the modelling and continued environmental assessment
	Application to land (snowmaking/irrigation)	Soil	Plants	Nutrient imbalances	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System, STP Treatment Process	Aluminium sulphate dosing for increased P removal Sufficient dilution is achieved in the Quarry Dam Water Quality Monitoring Program		2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Soil	Plants	Pests and diseases	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System, STP Treatment Process	Aluminium sulphate dosing for increased P removal Sufficient dilution is achieved in the Quarry Dam Water Quality Monitoring Program		2	Unlikely	2	Minor	4	Low	
	Application to land (snowmaking/irrigation)	Soil	Plants	Eutrophication	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System, STP Treatment Process	Aluminium sulphate dosing for increased P removal Sufficient dilution is achieved in the Quarry Dam Water Quality Monitoring Program phosphate free soaps can be used in resort		2	Unlikely	2	Minor	4	Low	Resort is in alpine region, there are no prior issues with algal blooms within the storage dam, water quality is not predicted to differ from natural variability considering maximum scenario  Water quality monitoring will be required to verify the modelling and continued environmental assessment
Salinity (EC TDS)	Quarry storage Dam	Sediments	Sediments	Salinity	3	Possible	1	Insignificant	3	Low	Storage and Distribution System	Recycled water is fit for irrigation prior to placement in Quarry Dam		2	Unlikely	1	Insignificant	2	Low	Dilution assessment indicates no changes to natural variability of receiving environment salinity based on discharges. Water quality monitoring program will continue to verify the modelling.
	Quarry storage Dam	Water bodies - surface (dam)	Water - surface	Salinity	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Recycled water is fit for irrigation prior to placement in Quarry Dam		2	Unlikely	2	Minor	4	Low	Dilution assessment indicates no changes to natural variability of receiving environment salinity based on discharges. Water quality monitoring program will continue to verify the modelling.
	Application to land (snowmaking/irrigation)	Water bodies - surface (Clear Creek)	Biota - aquatic	Loss of biodiversity	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam, further uncontrolled dilution by natural snow on land prior to discharge into Clear Creek  Water and soil monitoring program		2	Unlikely	2	Minor	4	Low	Dilution assessment indicates no changes to natural variability of receiving environment salinity based on discharges. Water quality monitoring program will continue to verify the modelling.
	Application to land (snowmaking/irrigation)	Water bodies - surface (Clear Creek)	Water - surface	Salinity	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam, further uncontrolled dilution by natural snow on land prior to discharge into Clear Creek  Water and soil monitoring program		2	Unlikely	2	Minor	4	Low	Dilution assessment indicates no changes to natural variability of receiving environment salinity based on discharges. Water quality monitoring program will continue to verify the modelling.
	Application to land (snowmaking/irrigation)	Soil	Grasses	Salinity	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam, further uncontrolled dilution by natural snow on land  Water and soil monitoring program		2	Unlikely	2	Minor	4	Low	The pathway of recycled water application and runoff is <b>not</b> through vegetated areas. The estimated salinity (electrical conductivity) in recycled water following dilution in quarry dam is sufficiently low. Assessment will need to occur following application to soils in comparison to the critical thresholds (ECe - electrical conductivity in soil water extract) for grasses (most sensitive = 3 ECe).
	Application to land (snowmaking/irrigation)	Soil	Plants	Salinity	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam, further uncontrolled dilution by natural snow on land  Water and soil monitoring program		2	Unlikely	2	Minor	4	Low	As above
Sodium	Application to land (snowmaking/irrigation)	Water bodies - surface (Clear Creek)	Biota - aquatic	Loss of biodiversity	3	Possible	1	Insignificant	3	Low	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam, further uncontrolled dilution by natural snow on land  Water and soil monitoring program		2	Unlikely	1	Insignificant	2	Low	
	Application to land (snowmaking/irrigation)	Soil	Plants	Salinity	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam, further uncontrolled dilution by natural snow on land  Water and soil monitoring program		2	Unlikely	2	Minor	4	Low	Plant sensitivity to chloride is below recycled water chloride concentrations. Chloride concentrations in quarry dam are modelled to be well below critical thresholds (<175 mg/L) and well below critical sodium thresholds (115 mg/L). The soils at the site have sufficient drainage to manage chloride and sodium build up over time (i.e. they are typically characteristic of well drained soils from sandy gravel to silty sand, with shallow top soil layer). They are not heavy clay soils that would be expected to accumulate soils as per AGWR. The risk (and occurrence) of soil sodicity in sandy soils is much lower than for clay soils.

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Chloride	Application to land (snowmaking/irrigation)	Water bodies - surface (Clear Creek)	Biota - aquatic	Loss of biodiversity	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam, further uncontrolled dilution by natural snow on land Water and soil monitoring program	2	Unlikely	2	Minor	4	Low	Plant sensitivity to chloride is below recycled water chloride concentrations. Chloride concentrations in quarry dam are modelled to be well below critical thresholds (<175 mg/L) and well below critical sodium thresholds (115 mg/L). The soils at the site have sufficient drainage to manage chloride and sodium build up over time (i.e. they are typically characteristic of well drained soils from sandy gravel to silty sand, with shallow top soil layer). They are not heavy clay soils that would be expected to accumulate soils as per AGWR. The risk (and occurrence) of soil sodicity in sandy soils is much lower than for clay soils.
	Application to land (snowmaking/irrigation)	soil	Plants	Salinity	3	Possible	3	Moderate	9	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam, further uncontrolled dilution by natural snow on land Water and soil monitoring program	2	Unlikely	2	Minor	4	Low	
Surfactants	Recycled water for snowmaking	Water bodies - surfacewater (Clear Creek)	Biota - aquatic	Contamination	2	Unlikely	3	Moderate	6	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam Water and soil monitoring program phosphate free soaps can be used in resort	2	Unlikely	2	Minor	4	Low	
	Unintentional Discharge	Water bodies - surfacewater (Clear Creek)	Biota - aquatic	Contamination	2	Unlikely	3	Moderate	6	Moderate	Storage and Distribution System	Sufficient dilution is achieved in the Quarry Dam; phosphate free soaps can be used in resort; OEMP	2	Unlikely	2	Minor	4	Low	
Hydraulic loading	Application to land (snowmaking/irrigation)	soil	plants	Salinity	2	Unlikely	2	Minor	4	Low	Storage and Distribution System	Recycled water is fit for irrigation prior to placement in Quarry Dam Sufficient dilution is achieved in the Quarry Dam	2	Unlikely	2	Minor	4	Low	Waterlogging of soils can result in secondary salinity from groundwater rise or movement of nutrients into groundwater from irrigation. Not unlike natural processes - soils are regularly inundated during snow melt events. Soils are expected to be well drained.
	Application to land (snowmaking/irrigation)	Water bodies - groundwater	Biota - terrestrial	Nutrient imbalances	2	Unlikely	2	Minor	4	Low	Storage and Distribution System		2	Unlikely	2	Minor	4	Low	