Rosehill Recycled Water Scheme Preliminary Risk Assessment Risk Register

Risk Category	Assessment Category	Risk Title	What could go wrong?	Describe the impact if this negative event eventuate.	Do you own this risk? If not, then who is the owner?	Location or Name the application used	Likelihood 5 = Almost certain 4 = Likely 3 = Moderate 2 = Unlikely 1 = Rare	Consequence 4 = Extreme 3 = Major 2 = Moderate 1 = Minor	Inherent Risk Level = Likelihood x Consequence	Current Risk Rating	Describe how existing control activities can mitigate the likelihood or consequence. *(NB: More than 1 controls attached to one risk is allowed. Insert new row to separate control activities)*	Is it a Preventative or Monitoring control?	Control Frequency (Continuous, Daily, Weekly, Monthly, Quarterly, Half-Yearly, Yearly)	Is it a key control? (Y/N) (Critical control)	Is it an automatic (system or application) or manual control?	Who is the owner of this control?
Public Health	Water Quality - chemical	Ammonia	Legionaire's disease infection resulting from poorly disinfected cooling tower water (ammonia in recycled water exceed specification of 1 mg/L (raw sewage can contain up to 40 mg/L)	Cooling tower disinfection processes compromised. - one or more cases per year of legionaire's disease	WRP		3	3	9	High	Existing WWTP do not have any ammonia remoal Reverse osmosis will remove 80% of ammonia	Preventative	Continuous	Y	Automatic	
											Ion exchange remove additional ammonia to reach <1 mg/L of ammonia in recycled water	Preventative	Continuous	Y	Automatic	
											Chlorination -dose to free chlorine setpoint break - some ammonia	Preventative	Continuous	N	Automatic	
Environmental	Water Quality - Chem	Phosphorus	High phosphorus in Rosehill racecourse dam could cause proliferation of blue green algae (around 9 mg/L in raw sewage)	High level of algae could block up irrigation system - blue green algae toxins could cause health impacts on ingestion	WRP		2	2	4	Medium	No P-removal at WWTP Reverse Osmosis - 99% removal	Preventative	Continuous	Y	Automatic	
Public Health	Water Quality - Biological	Viruses	Pathogenic viruses present in raw sewage can cause illness when ingested. Exposure assessment revealed the maximum log removal required for viruses from raw sewage is 6.5.	Ingestion of recycled water through exposure to use of recycled water in industry and irrigation	WRP		4	3	12	High	WWTP Delivery of diversion system to ensure only secondary treated effluent is discharged into LAP Montoring on LAP - can decide to take or not based on surrogates such as SCAN	Preventative	Continuous	Y	Automatic	
											Microfiltration	Preventative	Continuous	Y		
											Reverse Osmosis	Preventative	Continuous	Y		
											Chlorination at plant - residual 0.7-5 mg/L, 95 percentile 3 mg/L.- 1 hour contact time	Preventative	Continuous	Y		
Public health	Water Quality - Biological	Viruses in pipeline	Contamination occur in treated recycled water pipeline, mains break, huge amount of dirt - pumped system - pressure system	Illness caused in population exposed to water used in industry and irrigation	Aquanet/Jemena		1	3	3	Low	Maintaining chlorine residual In pipeline Backflow prevention and air gaps at customer end					
Public Health	Water Quality - Biological	Bacteria	Pathogenic bacteria present in raw sewage can cause illness when ingested. Exposure assessment revealed the maximum log removal required for viruses from raw sewage is 5.3	Illness caused by ingestion of pathogens in recycled water through exposure to use of recycled water in firefighting, industry and irrigation			4	3	12	High	WWTP Delivery of diversion system to ensure only secondary treated effluent is discharged into LAP Montoring on LAP - can decide to take or not based on surrogates such as SCAN	Preventative	Continuous	Y	Automatic	
											Microfiltration	Preventative	Continuous	Y		
											Reverse Osmosis	Preventative	Continuous	Y		
											Chlorination at plant - residual 0.7-5 mg/L, 95 percentile 3 mg/L.- 1 hour contact time	Preventative	Continuous	Y		
											Treated water spec requires protoxzoa indicators to be <1/50 L.	Monitoring	Monthly	N		
Public health	Water Quality - Biological	Bacteria in pipeline	Regrowth or Contamination occur in treated recycled water pipeline (short retention, covered storages and plastic pipes reduce inherent likelihood	Illness caused in population exposed to water used in idnustry and irrigation	Aquanet/Jemena		2	3	6	Medium	Maintaining chlorine residual - chlorine boosting in pipeline (this does not impact entire pipeline)	Preventative	Continuous	N	Automatic	
Public Health	Water Quality - Biological	Protozoa	Pathogenic protozoa present in raw sewage can cause illness when ingested. Exposure assessment revealed the maximum log removal required for viruses from raw sewage is 5.1.	Illness cause by Ingestion of protozoa in recycled water through exposure to use of recycled water in industry and irrigation			4	3	12	High	WWTP Delivery of diversion system to ensure only secondary treated effluent is discharged into LAP Montoring on LAP - can decide to take or not based on surrogates such as SCAN	Preventative	Continuous	Y	Automatic	
											Microfiltration	Preventative	Continuous	Y		
											Reverse Osmosis	Preventative	Continuous	Y		
											Chlorination at plant - residual 0.7-5 mg/L, 95 percentile 3 mg/L.- 1 hour contact time (not for cryptosporidium)	Preventative	Continuous	Y		
											Treated water spec requires protozoa indicators to be <1/50 L.	Monitoring	Monthly	N		
Public health	Water Quality - Biological	Protozoa in pipeline	Contamination occur in treated recycled water pipeline (refer to virus assessment) - covered storages would prevent recontamination	Illness caused in population exposed to water used in idnustry and irrigation	Aquanet/Jemena						Maintaining chlorine residual In pipeline	Preventative	Continuous	Y	Automatic	
Public health	water Quality Chemical	Heavy metals	Ingestion of heavy metals could lead to long term health effects.	Levels in treated waste water generally below health guideline values for drinking water - no risk at levels of exposure assessed			1	1	1	Low	Reverse osmosis removal >99% for all heavy metals (divalent)	Preventative	Continuous	Y	Automatic	
Public health	water Quality Chemical	Organic micro pollutants (herbicides, pesticides, pharmaceuticals, hormones, THMS)	Ingestion of micro pollutants could lead to long term health effects.	Levels in treated waste water generally below health guideline values for drinking water - no risk at levels of exposure assessed			1	1	1	Low	Reverse Osmosis	Preventative	Continuous	Y	Automatic	
Environmental	Water Quality - chemical	Salinity	High saline water is irrigated onto racecourse	High salinity in irrigation water can lead to sodificatioin of soil and limit plant growth			3	2	6	Medium	Reverse Osmosis removes TDS	Preventative	Continuour	Y	Automatic	
Environmental	Water Quality - chemical	Boron	Boron > 1 could impact certain plants used by irrigation customer	Boron can impact grasses used in golf courses					0	Low						

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How do you rate the effectiveness of the current control? 1.5 = Very Effective 2 = Effective 4.5 = Ineffective 9 = Very Ineffective 0 = No Control	Likelihood 5 = Almost certain 4 = Likely 3 = Moderate 2 = Unlikely 1 = Rare	Consequence 4 = Extreme 3 = Major 2 = Moderate 1 = Minor	Mitigated Risk Level = Likelihood x Consequence	Mitigated Risk Rating	Accept? (Y/N)	If the mitigated risk level is rated high or extreme and is accepted, justification must be provided and required Senior Management's approval.	Describe the action to be taken to further mitigate (likelihood or consequence) and ensure that the mitigated risk level is within the Company risk appetite.	Action by Name	Action Due Date	Action Status	Likelihood 5 = Almost certain 4 = Likely 3 = Moderate 2 = Unlikely 1 = Rare	Consequence 4 = Extreme 3 = Major 3 = Moderate 2 = Minor	Projected Risk Level = Likelihood x Consequence	Projected Risk Rating	Comments
1.5	1	3	3	Low	Y								0	Low	
1.5	**1**	2	2	Low									0	Low	
1.5	1	3	3	Low									0	Low	
1.5	1	3	3	Low									0	Low	
	2	3	6	Moderate											
1.5	1	3	3	Low									0	Low	
	2	3	6	Moderate											
1.5	1	1	1	Low			Obtain records of salt rejection properties of membranes and supplier specification						0	Low	
1.5	1	1	1	Low			Obtain records of salt rejection properties of membranes and supplier specification						0	Low	
1.5	1	2	2	Low									0	Low	
			0	Low									0	Low	

Rosehill Recycled Water Scheme Preliminary HACCP Analysis

WATER QUALITY MANAGEMENT & CCP ANALYSES												
Activity or Process Step	Decision Tree					CCP/QCP	Potential Hazards	Monitoring	Critical Limits	Corrective Actions	Supporting programs	Records
	Q1	Q2	Q3	Q4	Q5							
Wastewater Treatment	Y	Y	Y			CCP	BOD	(DO)				
Diversion of untreated and poorly treated wastewater	Y	Y	Y			CCP	Wet weather event causes Micro organisms, organic pullutants, heavy metals.					
Treated wastewater offtake on LAP online measurement and shutdown at WRP	Y	Y	N	N		QCP	Micro organisms, organic pullutants, heavy metals					
Chemical dosing (chloramine)	N			N		No	Free chlorine and chloramine - not a health hazard					
Micro filtration	Y	Y	Y			CCP	Bacteria and Protozoa and viruses					
Reverse Osmosis	Y	Y	Y			CCP	Ammonia, phosphorus, organic pollutants, heavy metals, micro organisms					
Ion exchange	Y	Y	Y			CCP*	Ammonia. (may not be health or environmental hazard)					
Chlorination and 1 hour retention	Y	Y	Y			CCP	Bacteria and Protozoa and viruses	Monitoring on distribution system				
Treated recycled water offtake point monitoring	Y	Y	N	N		QCP	Ammonia, phosphorus, organic pollutants, heavy metals, micro organisms					
Distribution line chlorine boosting	N						Bacteria and Protozoa and viruses					
Irrigation practices												
Discharge - unintentional							Erosion from mains breaks					
Storage in lakes							Ammonia, phosphorus, nitrogen,chlorine					
Cooling tower uses												