

Risk Assessment Meeting Information		Potential Hazards				Monitoring Processes				Control Measures				Risk Ranking & CCPs				
Date of Risk Assessment: October 25 & 26, 2023		Loss of Water Source, Production or Supply Source Water or Environmental Contamination Treated Water Contamination Ineffective Chemically-assisted Filtration Inadequate Primary or Secondary Disinfection Sustained Loss of Pressure (System or Localized) Loss of Automation, Instrumentation, Controls or Alarms Loss of Site Access or Security Threat to Personal or Public Safety Facility, Equipment or Property Damage Regulatory Noncompliance Initiates Additional Hazardous Events Continuous Monitoring (Proximal Parameter) Daily Operational Checks Less Frequent Operational Checks Routine Water Quality Sampling or Testing Monitoring by External Parties Alarm Systems (Including Surrogate Parameters) Preventative Maintenance & Inspection Duty/Standby Configuration Redundant Equipment or Process in Active Service Spare/Repair Parts or Equipment Interchangeability Automatic Shutdown/Process Diversion Capability Isolation and/or Bypass Capability Site Security & Remote/Alternate Facility Access Elevated Water Storage Capacity Treatment Processes & Operational Modifications Response Procedure(s) (Corporate/System-Specific)	Likelihood	Consequence	Detectability	Overall Risk Value	Critical Control Point?	Critical Control Limit										
Risk Assessment Team: Kevin Smith (Operations Manager), Brendan Williams (Senior Operator), Taryn Bulman (Operator), Naresh Chaudhari (Operator), Nirav Chaudhary (Operator), Jessica Happi (Compliance Manager)																		
Assigned Risk Ranking Threshold Value (for High-risk Hazardous Events and CCP Determination): 7																		
Critical Control Limit Information																		
Turbidity = filtrate turbidity > 0.3 NTU (high value process alarm set point with immediate alarm transmission and production shutdown) or filtrate turbidity > 0.6 NTU (high value regulatory alarm set point with immediate alarm transmission and production shutdown)																		
Chlorine = free chlorine residual (primary disinfection - treatment facility) < 1.18 - 1.40 mg/L (low value alarm set point range) or free chlorine residual (secondary disinfection - distribution system) < 0.20 mg/L																		
WTL = water tower level < 7.0 - 8.0 m (low value alarm set point range - proxy measure for water pressure)																		
AWQI = adverse water quality incident (any adverse test result or observation as prescribed by regulations)																		
EHE = evidence of hazardous event (detection of the event by existing monitoring processes)																		
Mandatory Critical Control Points = Hazardous events marked with an asterisk are considered to be mandatory critical control points, irrespective of whether they exceed the risk ranking threshold value.																		
Process Step	Hazardous Events					Emergency Response Procedure Reference												
Source Water & Source Water Handling	ALGAL BLOOM (microcystin contamination and/or interference with treatment processes)												1	2	3	6	No	n/a
	CHEMICAL SPILL IMPACTING SOURCE WATER (e.g. herbicide application for vegetation control, spills associated with residential development around Skookum Bay, spills associated with recreational activities, spills caused by road accidents, etc.)												1	2	3	6	No	n/a
	SUDDEN CHANGES TO RAW WATER CHARACTERISTICS (e.g. changes to turbidity, UVT, pH, etc. caused by heavy rainfall and runoff, changes associated with turnover events that may occur over a span of weeks, etc.)												3	1	2	6	No	n/a
	SOURCE WATER SUPPLY SHORTFALL (e.g. obstructed or collapsed intake pipe or structure)												1	2	1	4	No	n/a
Chemically-assisted Filtration	RAW WATER FLOW METER MALFUNCTION OR FAILURE (e.g. interference with flow-paced chemical dosing)												1	2	2	5	No	n/a
	COAGULANT CHEMICAL SYSTEM FAILURE - UPSTREAM FROM FLOW MONITOR (e.g. chemical pump failure)												3	1	1	5	No	n/a
	COAGULANT CHEMICAL SYSTEM FAILURE - DOWNSTREAM FROM FLOW MONITOR (e.g. discharge line rupture/blockage)												3	2	2	7	Yes	Turbidity, EHE
	COAGULANT FLOW MONITOR FAILURE OR MALFUNCTION												3	2	1	6	No	n/a
	POLYMER CHEMICAL SYSTEM FAILURE												2	1	2	5	No	n/a
	PRE-TREATMENT SODA ASH CHEMICAL SYSTEM FAILURE												2	1	1	4	No	n/a
	*FILTER BREAKTHROUGH (i.e. high filtrate turbidity)												2	2	1	5	Yes	Turbidity
	FILTRATE TURBIDIMETER MALFUNCTION OR FAILURE (e.g. caused by component failure, fouled vials, etc.)												2	2	1	5	No	n/a
	TREATMENT UNIT CONTROL VALVE FAILURE - INFLUENT												2	1	2	5	No	n/a
	TREATMENT UNIT CONTROL VALVE FAILURE - RINSE-TO-WASTE												1	1	2	4	No	n/a
	TREATMENT UNIT CONTROL VALVE FAILURE - EFFLUENT												1	2	3	6	No	n/a
	BACKWASH SYSTEM FAILURE (e.g. valve failure, etc.)												1	2	2	5	No	n/a
BLOWER SYSTEM FAILURE												1	2	2	5	No	n/a	
Disinfection	MINOR CHLORINE GAS LEAK (chlorine gas concentration less than 10 ppm)												2	1	1	4	No	n/a
	MAJOR CHLORINE GAS LEAK (chlorine gas concentration 10 ppm or greater)												1	4	1	6	No	n/a
	HEATING FAILURE IN CHLORINE GAS ROOM (e.g. disinfection interruption due to frozen equipment)												1	2	1	4	No	n/a
	FREE CHLORINE RESIDUAL ANALYZER FAILURE OR MALFUNCTION (failure of regulatory analyzer)												1	2	1	4	No	n/a
	*FAILURE OF PRIMARY/SECONDARY DISINFECTION EQUIPMENT OR PROCESS (e.g. a low chlorine event caused by a gas chlorinator system malfunction or failure)												2	2	1	5	Yes	Chlorine
Power & Automation	STANDBY POWER SYSTEM FAILURE - WATER TREATMENT PLANT (occurs in the absence of the main power supply and includes generator or transfer switch failure)												2	3	1	6	No	n/a
	PLC FAILURE (component failure or catastrophic failure)												1	3	1	5	No	n/a
	ALARM TRANSMISSION FAILURE NOT CAUSED BY PLC FAILURE (i.e. failure of internet, phone, radio, autodialer or cell service).												2	4	3	9	Yes	EHE
Water Distribution	TREATED WATER FLOW METER MALFUNCTION OR FAILURE												1	1	3	5	No	n/a
	*SUSTAINED PRESSURE LOSS (<20psi for >15 minutes)												1	3	1	5	Yes	WTL
	*LOW OR ADVERSE CHLORINE RESIDUAL IN WATER DISTRIBUTION SYSTEM												1	3	3	7	Yes	Chlorine
	BACKFLOW (caused by backpressure or backsiphonage)												1	3	4	8	Yes	EHE; AWQI
	TRANSMISSION LINE BREAK BETWEEN WTP AND WATER TOWER												1	3	2	6	No	n/a
	CATASTROPHIC WATER TOWER FAILURE (e.g. tower freezing, structural integrity failure, etc.)												1	3	2	6	No	n/a
System Threats or Emergencies	EXCESSIVE FLOWS (flows exceeding WTP operational capacity caused by a major water main break, major fire, etc.)												3	1	2	6	No	n/a
	SUSTAINED EXTREME TEMPERATURES (e.g. heat wave and changes in water temperature requiring operational adjustments, deep freeze and changes to system flows to prevent lines from freezing, etc.)												3	1	3	7	Yes	EHE
	LONG TERM IMPACTS OF CLIMATE CHANGE (e.g. increase in mean temperatures)												1	1	3	5	No	n/a
	EXTREME WEATHER EVENT OR NATURAL DISASTER (e.g. forest fire, ice storm, severe wind storm, microburst, etc.)												2	3	3	8	Yes	EHE
	VANDALISM												1	2	3	6	Yes	EHE
	TERRORIST THREAT												1	5	3	9	Yes	EHE; AWQI
	SUSTAINED PERSONNEL SHORTAGE (e.g. 3 or less Operators for a month)												2	3	3	8	Yes	EHE
CYBERSECURITY												1	4	4	9	Yes	EHE	
DISEASE PANDEMIC												2	2	5	9	Yes	EHE	