

City of Kelowna Source Protection Plan

Ref. #	Recommendation	Risk Level	Risks Address	Rec'd Group	Action#	Priority	Recommended Actions	Key Words	Time frame	Action Plans	Actions Taken	Date Updated	Jurisdiction	Factors, Info, Comments	Status
1.1	Giardia & Cryptosporidium monitoring	High	C1	Risk identification	1	High	Ongoing protozoa sampling at City intakes	UV treatment, turbidity, bacteria, pathogens, sampling, samples, Ultraviolet Transmittance (UVT), water quality, water treatment, cryptosporidium, crypto, protozoa	Ongoing	Refer to pages 4-7 of the 2017 Source Assessment Response document. On-going exemption granted by IHA as of 2014.	Already completed (1996-2014)	Jan-08-2019	City of Kelowna	UV Treatment plants in operation at Poplar Point, Swick, Eldorado and Cedar Creek  Exemption granted in 2014 after 18 years of testing	Complete
2.1	Source Protection Plan	Very High	all (C1, C2, C3, C4, C5, C6, C7, C8, L1, L2, W1, W2, S1, S2)	Planning	1	Very High	Develop Source Protection Plan	Source Protection Plan (SPP), planning process	2018-2019	Develop Source Protection Plan	LAC contracted to prepare the Source Protection Plan - see attached report	May-09-2019	City of Kelowna	SPP field work and report drafted in 2018	Complete
2.2					Very High	Maintain Source Protection Plan	Source Protection Plan (SPP), planning process, living document	Ongoing	Maintain SPP document and update with new progress made on issues and add new issues as they arise	LAC contracted to prepare the Source Protection Plan	Nov-20-2018	City of Kelowna	SPP will be continuously updated as a living document.	Active	
2.3					Very High	Periodically update FIM and SHIM data	Source Protection Plan (SPP), planning process, Foreshore Inventory Mapping (FIM), Sensitive Habitat Inventory Mapping (SHIM)	Ongoing	Update FIM and SHIM in conjunction with OCP review	FIM is current as of 2016. Both FIM and SHIM data is in the City's GIS system.	Dec-07-2018	City of Kelowna	FIM current from 2016, SHIM current from 2009	Active	
3.1	Monitoring program	Very High	C2, C3, C6, C7, C8, S2	Risk identification	1	Very High	Continue active monitoring program on intake raw water, Brandt's, Mill, Fascieux, Wilson, Bellevue, Mission, Varty, Lebanon, Bear Creeks focusing on: -raw water -stormwater discharges -creek inflow plumes	Fecal, bacteria, monitoring program, E.coli, total coliforms, stormwater, creeks monitoring	Ongoing	Refer to Drinking Water Filtration Exclusion (DWFE) 2017 report pages 17-21, 31-42, 65-80, SAR report pages 8-11, and Water Quality Sampling Program Summary	The City has an extensive ongoing monitoring program: -Mission, Mill, and Brandt's Creek mouths monitored 5x/month for NH4, Cl, colour, cond., DO, E.coli, pH, TSS, Temp, Turbidity (70+ sample points); also tested once a month are Varty, Bellevue, fascieux and Wilson (plus rain events). Raw water sampled prior to treatment is tested weekly at all intakes. -Creeks are sampled extra when turbidity at an intake >0.8NTU (freshet) -City monitors first flush events of >5mm rain in March-April	May-09-2019	City of Kelowna	Historical data available for over 20+ years -sampling plan reviewed annually	Active
3.2					Very High	Investigate source of fecal contamination during winter at Swick intake	Swick, intake, fecal, bacteria, contamination, E.coli, stormwater, monitoring	2019-2020	-Sample intake, lake, stormwater outfalls, and several sites along Varty Creek regularly. Also above and below any agriculture taking place adjacent to creek. -Perform additional sampling following precipitation events, particularly rain on snow events	City of Kelowna has ongoing monitoring program with Varty Creek monitored once per month and weekly during freshet	May-09-2019	City of Kelowna	This should be a high priority based on findings of this report	Active	
3.3					High	Search for sewer cross connections when bacterial concentrations exceed 25,000 MPN/100mL	Sewer, cross connection, contamination, bacteria, pathogen, monitoring	Ongoing	Refer to DWEF report pages 65-80 and SAR report pages 10-11	City of Kelowna has ongoing program based on creek and stormwater monitoring results.	Jan-08-2019	City of Kelowna	A more proactive system might need to be put in place to address these cross connection occurrences.	Active	

3.4					4	High	Active monitoring of city public beaches	Fecal, bacteria, monitoring program, E.coli, total coliforms, stormwater, creeks, monitoring, formal response plan planning	Ongoing	-Sample water at public beaches regularly throughout the summer from June to September weather dependent	This is sponsored through IHA and sublet to external lab. Refer to DWFE report pages 78-79 -weekly monitoring at major beaches (City Park, Gyro, Rotary, Sarsons, Strathcona, waterfront park)	Jan-08-2019	City of Kelowna	11 sampling sites & 6 beaches in total monitored. Assess other beach populations not on list to determine if monitoring is needed, based on IHA threshold #s.	Active
3.5					5	High	Establish a standard response plan for elevated bacteria or high turbidity in raw water samples. Therefore operators can adjust treatment accordingly.	Bacteria, E.coli, fecal, total coliforms, monitoring, communication, water treatment, stormwater, creeks, formal response plan, planning	Ongoing	Create a formal procedure for when bacteria > X CFU/mL or turbidity > X NTU. This procedure will be included in the next update of the Water Quality Deviation Response Plan.	Currently lab tech follows procedure outlined in annual Water Quality Sampling Plan. Additionally the pump operations follow the elevated response procedure outlined in the Kelowna Water Utility Water Quality Sampling Program. The City is also working with consultants on a revised operating protocol for UV treatment during elevated WQ events. The Drainage tech currently provides an excel report weekly during freshet to the Pump Operations Supervisor.	May-22-2019	City of Kelowna	Creek dashboard in place during freshet. Similar dashboard TBD year round for raw intake samples.	Active
4.1	Upgrade intakes to protect against invasive mussels	High	(Risk not identified in 2011 report)	Infrastructure	1	High	Survey intakes and determine feasibility	Invasive mussels, quagga mussels, zebra mussels, chlorine injection, infrastructure, pipes, upgrades, intakes	2017	Have intakes surveyed and determine conditions.	Divers inspected intakes to determine what would be required to install chlorine injection lines to the mouths of the intakes	Nov-20-2018	City of Kelowna		Complete
4.2					2	High	Prepare and plan for infrastructure changes necessary for invasive mussel infestation.	Invasive mussels, quagga mussels, zebra mussels, chlorine injection, infrastructure, pipes, upgrades, intakes, funding	TBD	Engineered drawings need to be produced, a timeframe for completion will be established and quotes on cost for budget considerations will be completed.	Pre-design has been completed. Active monitoring is done through OBWB as well as prevention programs.	May-23-2019	City of Kelowna	Pre-work has been completed however funding and installation will only occur once there is confirmed positive presence in Okanagan Lake. Lag time will correspond to relative risk to infrastructure infestation.	Active
4.3					3	High	Consider providing separate funds directly to the "Don't Move a Mussel" campaign.	Invasive mussels, quagga mussels, zebra mussels, chlorine injection, infrastructure, pipes, upgrades, intakes, Okanagan Basin Water Board (OBWB)	Ongoing	Continue supporting initiative, possibly provide additional funding to program as needed.	OBWB boat scanning, Clean. Drain. Dry. Campaign, Inspection stations	May-23-2019	City of Kelowna		Active
5.1	Establish Intake Protection Zone (IPZ)	High	all (C1, C2, C3, C4, C5, C6, C7, C8, L1, L2, W1, W2, S1, S2)	Planning	1	High	Investigate Front Counter BC for the possibility of either a License of Occupation, or head-lease, or a License for Community Purposes over the Intake Protection Zone.	IPZ designation, Front Counter, intake protection zone, source water protection, GIS, FIM, foreshore inventory mapping	2019	Contact Front Counter BC	Currently generic IPZs are included in 2016-2017 update to FIM database	Nov-21-2018	City of Kelowna, Front Counter		Active
5.2					2	High	Request that any application to Front Counter BC within the IPZ be forwarded to City of Kelowna for comment, regardless of the license application outcome.	IPZ, applications, Front Counter, intake protection zone, development, source water, protection, GIS	2019	Contact Front Counter BC, potential for developing a new/updated docks and marina bylaw.	-	Nov-21-2018	City of Kelowna, Front Counter		Active
5.3					3	High	Integrate IPZ in City of Kelowna GIS system	IPZ, applications, Front Counter, intake protection zone, development, source water, protection, GIS	2019	LAC has supplied GIS data of IPZs to be included in the City's GIS system	IPZ polygons have been created.	Nov-21-2018	LAC, City of Kelowna		Active
5.4					4	High	City of Kelowna consider methods to protect the IPZ in updates to OCP.	IPZ, OCP, RGS bylaw, intake protection zone, official community plan (OCP), development, source water protection, GIS	2019-2020	Include IPZs in next OCP revision, specifically into the natural environment section.	OCP is currently under review and revision.	Nov-21-2018	City of Kelowna		Active

5.5					5	High	City of Kelowna, in cooperation with the Province, could draft a Foreshore Structures Bylaw to specifically prohibit multi-slip marinas within the IPZ, particularly those designed for power boats and houseboats.	Bylaw, foreshore-structures, source water protection, IPZ, intake protection zone, development, marinas, boating	TBD	Response to development plans received by City of Kelowna	Process currently under review.	Nov-21-2018	City of Kelowna	Not likely to be a risk at Killiney Beach but could be at West shore Estates	Active
6.1	Maintain redundancy in intakes	Very High	all (C1, C2, C3, C4, C5, C6, C7, C8, L1, L2, W1, W2, S1, S2)	Infrastructure	1	Very High	Maintain multiple intakes in both the north and central basins (North Basin: Poplar Point; Central Basin: Cedar Creek, Eldorado, Swick)	Intake redundancy, infrastructure, planning, upgrades, multiple intakes	Ongoing	Maintain multiple intakes in both the north and central basins	Eldorado intake will be phased out over the next few years and Cedar Creek will get a second intake line when the next upgrade is required (20+years). Integrated water plan (with BMID and GEID amalgamation) would provide additional water supply sources.	Jan-08-2019	City of Kelowna	This discourages focusing on one main intake - and implies the value of back-up water supplies.	Active
7.1	Stormwater management	Very High	C3, C4	Analysis	1	High	Analyze water chemistry data and weather data to determine if first flush phenomenon affects water quality at Kelowna intakes.	Intake, water quality, turbidity, first flush, stormwater, analysis, data, statistics	Ongoing	Analyze water chemistry data collected by City of Kelowna and publically available weather data for patterns	-LAC has conducted these analysis as part of the Source Protection Plan Report -City of Kelowna monitors stormwater for first flush events at numerous locations as part of routine monitoring	Jan-08-2019	City of Kelowna, LAC		Active
7.2					2	High	Annual review and inspection of storm catch basins or oil-grease separators to identify if an increase in frequency in cleaning is needed.	Water quality, turbidity, catch basin, oil/grease separator, stormwater, analysis, data statistics	Ongoing	Analyze water chemistry data collected by City of Kelowna and publically available weather data for patterns	-City of Kelowna monitors stormwater at numerous locations as part of routine monitoring, this data can be analyzed for review of cleaning and maintenance	Jan-08-2019	City of Kelowna	Stormwater Strategic Plan & Bylaw 7900	Active
8.1	Public education	High	C2, C3, C5, C6, C7, S2	Public Education	1	High	Boat launch signage of the IPZ (low-wake zone in and around IPZ), encouraging off-water refueling, who-to-call after a spill, etc. at all City boat launches	IPZ, signage, spills, contamination, prevention, boat launch, signs, intake protection zone, fuel, gas, emergency response, public education campaign	2019-2020	Produce or use existing communication pamphlet and have available at launches and boat gas up locations.	Confirm signage is present at boat launches and if not have them installed.	Jan-08-2019	City of Kelowna	Can only be acted upon once IPZs are finalized and in OCP. Launches: Cook, Sutherland, Cedar Crk, Water	Active
8.2					2	High	Public education through open houses, targeted mailings, quarterly newsletters, and other initiatives to encourage best practices	Public education campaign, contamination prevention, best practices, septic, antibiotic-soap, sewage, septic tanks, foreshore camping, campground, treatment, source water protection	Ongoing	-City of Kelowna can work with RDCO, OBWB, and EcoAction. They already have several initiatives underway: -a campaign for the region "to contact foreshore owners and educate them on the implications of owning lakeshore property" -Could use city tax invoices/ water bills to run articles for public education	Water Kind and Water Wise already do a lot of this kind of education and outreach.	Jan-08-2019	City of Kelowna, RDCO, OBWB, EcoAction (Fed)	Should be an ongoing, repeated periodically	Active
8.3					3	High	City to put out a lakeshore property "primer document" with shoreline protection guidance or utilize existing document produced by OCCP "Lakeshore Living"	Public education, campaign, neighborhood awareness, mail, mailer, document, lakeshore property owners	TBD	Could use city tax invoices/ water bills to run articles for public education	Would most likely include some house to house or neighborhood education plans	Jan-08-2019	City of Kelowna		Active
8.4					4	High	City of Kelowna should ensure that dog feces bags are provided at their parks	Dog feces, pet waste, public parks, contamination, prevention, public education campaign	ongoing	info needed	RDCO already has a program in place through Parks department	Nov-21-2018	City of Kelowna, RDCO	This requires verification.	Active
8.5					5	Moderate	City will upload Source Assessment and Report to EcoCat and onto their water system webpage.	Source assessment, source protection report, ecocat, ministry of environment, web, website, webpage, internet, public information, public education campaign, contamination, prevention	2019	Once finalized both the Source Protection Assessment and Report will be uploaded to EcoCat and the City's website	Source Protection Assessment has been uploaded to EcoCat	May-09-2019	City of Kelowna		Active
8.6					7	Moderate	Educate public on value of the lake as a drinking water supply	Public education campaign, contamination, prevention, best practices, drinking water supply, source protection	Ongoing	Add mailers to city tax invoices/ water bills to provide articles for public education	Will work out details with communications department	Jan-08-2019	City of Kelowna		Active

8.7					8	Moderate	Encourage public involvement with Yellow-Fish program and Adopt-a-stream program	Public education campaign, contamination prevention, best practices, wildlife control, waterfowl, riparian protection, restoration	Ongoing	Bring info to events and encourage involvement. Create a better presence for these programs on the City website and City social media.	Requires further discussion with other City groups and Regional District	Nov-21-2018	City of Kelowna, RDCO	Requires further discussion with other City groups and Regional District. Contact for both programs is Caroline Ivey.	Active
8.8					9	High	The public should be educated on decontaminating their boat and equipment	Boat decontamination, public education campaign, contamination prevention, clean drain dry, invasive species, don't move a mussel, boating, cleaning boats	Ongoing	OBWB is spearheading this initiative, the city provides support and funding.	OBWB has ongoing campaign for "Clean, Drain, Dry"	Nov-21-2018	City of Kelowna, RDCO, OBWB		Active
9.1	Extend Intakes	High	C1, C2, C3, C4, C5, C6, C7, C8, L1, L2, S1, S2	Infrastructure	1	High	Investigate water quality at potential extension sites for >1 year to determine potential improvement	Intake extension, upgrades, infrastructure, new intake, depth, deeper, water quality	2019-2020	Lake profiling should be done in and around the intakes to determine further actions required.	TBD	Jan-08-2019	City of Kelowna	Poplar Point and Cedar Creek probably wouldn't benefit but Eldorado certainly would	Active
9.2					2	Moderate	Increase clearance of intakes to 3 m when extending/upgrading them	Intake extension, upgrades, infrastructure, new intake, depth, deeper, water quality, intake clearance	TBD	Pending outcome of study findings	TBD	Jan-08-2019	City of Kelowna	Clearance at all intakes is lower than current BMPs	Active
10.1	Extend sewer outfall	High	C1, C2, C3, C4, C5, C6, C7, C8, L1, L2, S1, S2	Infrastructure	1	Moderate	Investigate water quality at potential extension sites for >1 year to determine potential impacts	Outfall extension, upgrades, infrastructure, new intake, depth, deeper, water quality, sewer system, outfall, treated effluent	2019	Requires further discussion	Annually the Okanagan Lake Collaborative Agreement completes a Report on effects of outfalls from various municipal treatment plants.	Jan-08-2019	City of Kelowna	Existing outfall is 60m deep on lake floor and ~1.2km from shore on the edge of a lake shelf.	Active
11.1	Information sharing	Moderate	all (C1, C2, C3, C4, C5, C6, C7, C8, L1, L2, W1, W2, S1, S2)	Interjurisdictional Cooperation	1	High	Share City of Kelowna water quality data with other Okanagan Lake water purveyors and with MoE. Also utilize the extensive MoE data base for Okanagan Lake water	Information sharing, database, data management, ministry of environment (MoE), water quality, historical data, web, internet, Cityworks, City of Kelowna, cooperation	TBD	Find the right avenue for data sharing.	OBWB database soon to be available for valley wide information sharing between purveyors.	Jan-08-2019	City of Kelowna, OBWB, RDCO, City of West Kelowna, WFN, IHA, Provincial Gov't	Should be ongoing	Active
12.1	Basin-wide issue partners	Moderate	all (C1, C2, C3, C4, C5, C6, C7, C8, L1, L2, W1, W2, S1, S2)	Interjurisdictional Cooperation	1	High	Sharing of reports and presentations could be coordinated by the OBWB or City of Kelowna on the Okanagan Lake watershed. These meetings should improve communication and reduce duplication of effort among water purveyors using Okanagan Lake.	Report sharing, OBWB, Okanagan basin water board water, suppliers, purveyor, data management, web, internet, coordination, cooperation, stakeholders	TBD	Requires a coordinated effort and agreement between purveyors	City in the process of developing an Area Based Water Management Plan (ABWMP)	Jan-08-2019	City of Kelowna, OBWB, RDCO, City of West Kelowna, WFN, IHA, Provincial Gov't	TAC Meetings, SPC meetings	Active
12.2					2	High	Work with the BC Ministry of Agriculture to maximize the effectiveness of Best Management Practices for cattle to minimize the potential input of Cryptosporidium, E. coli and nutrients into the lake	Intergovernmental cooperation, interjurisdictional, agriculture, cattle, range, ranch, watershed, disturbance	Ongoing	Would be part of a Technical Advisory Committee group	RDCO is working with stakeholders to manage this issue. City is helping with coordination of ABWMP.	Jan-08-2019	City of Kelowna, IHA, Provincial Gov't	TAC Meetings, SPC meetings	Active
13.1	Climate Change	High	C8, C3, C6, C7	Infrastructure & Planning	1	high	Changing weather patterns have lead to increased flooding in recent years and will continue to be an emerging issue with regards to our infrastructure conveying and controlling water.	Flooding, drought, water quantity, conservation	Ongoing	OBWB is currently drafting a wetland protection primer document to guide local government. Updated supply and demand modelling, new flood management plans	Wetland protection and creation. Wetlands and riparian areas to slow the water & retaining natural stream meander and conditions to slow the flow. Risk profiles being developed to determine infrastructure most at risk.	May-09-2019	City of Kelowna, OBWB, RDCO & Province	Ongoing	Active
13.2				Infrastructure & Planning	2	High	Drought conditions are likely to increase therefore a need for better conservation	Flooding, drought, water quantity, conservation	2019-2020	Create a new Drought management plan for the city to address new drought conditions seen in recent years. OBWB has a primer for drought trigger scenarios now available. Once the drought management plan is implemented a long term water conservation plan can be developed.	Water Conservation initiatives.	May-09-2019	City of Kelowna, OBWB, RDCO & Province	Ongoing	Active

Future Recommendations below