2017

North Kalamalka Lake Assessment Response Plan

Prepared for: Interior Health
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Regional District of North Okanagan
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Executive Summary

Greater Vernon Water (GVW) presents the following *North Kalamalka Lake Intake Source Assessment Response Plan*, referred to as the *"Response Plan".* As a condition on GVW's Permit to Operate issued by Interior Health (IH), the *Response Plan* is required to address the recommendations presented in the *North Kalamalka Lake Intake Source Assessment* report completed in 2011 by Larratt Aquatic Consulting Ltd., further referred to as the "*Assessment".*

The *Response Plan* provides details of the source protection works carried out by GVW since the *Assessment* was completed and provides a strategy to address the *Assessment* recommendations. This planning document sets goals for implementation and also defines responsibilities for GVW and other organizations.

It is important to note GVW is not a regulator in water source protection and does not have authority to direct or require other agencies to provide the resources necessary to protect the community's drinking water resource. GVW relies on good working relationships with stakeholders, federal and provincial acts, regulations, stewardship plans, best management practices, local government policy and bylaws to protect water sources from various land use impacts within the watershed.

The *Response Plan* is summarized in Table 3 which outlines the risks, goals to reduce risks, actions and strategies to meet those goals, allocation of responsibilities, GVW commitment and a status update. Table 3 is updated annually and is a tool intended to:

- Support stakeholders with deliverable planning objectives
- Track the progress of those responsible for managing land use, emergency response, and the protection of water resources.

The North Kalamalka Lake Intake Source Assessment was endorsed by the Regional District of North Okanagan (RDNO) Board of Directors on November 16, 2011. The North Kalamalka Lake Intake Source Assessment Response Planning process, terms of reference, budget and capacity requirements was adopted by the RDNO Board of Directors on October 17, 2012.

1. North Kalamalka Lake Intake Source Assessment Background

1.1 Introduction

Since 1930, Kalamalka Lake has been a primary source of drinking water for the Greater Vernon area. Over 37,500 residents depend on this primary source for drinking water. Through GVW's interconnected water system, Kalamalka Lake can also act as a secondary drinking water source for an additional 16,500 residents currently supplied from the Duteau Creek System. Kalamalka Lake is also a drinking water source for numerous individual homes and private systems surrounding the lake and approximately 800 residents at the south end delivered by the District of Lake Country.

Defining the value of Kalamalka Lake will assist residents and community leaders to better understand the risks associated with degrading water quality. Initiatives to maintain drinking water quality will help reduce the long term costs of treatment and utility operations. Water protection initiatives can also support the preservation of environmental, economic, and social aspects for the community. Good quality water helps to maintain aesthetic value and supports a vibrant tourism industry. The intrinsic value associated with Kalamalka Lake is of upmost importance for long term economic and social sustainability of the region.

1.2 North Kalamalka Lake Intake Source Assessment

In September of 2011, GVW received the final *North Kalamalka Lake Intake Assessment* report by Larratt Aquatics Consulting Ltd. The *Assessment* was reviewed throughout its development by a Technical Advisory Committee (TAC) and had public consultation via a public open house and survey. In accordance with the regulations and directions of the Drinking Water Officer (DWO), an Assessment Response Plan (*Response Plan)* was also to be prepared.

The *Response Plan* has been prepared by Greater Vernon Water (GVW) to outline the specific actions to address hazards and risks associated with drinking water quality and quantity as identified in the *Assessment* report. The key elements considered within the *Assessment* report are Modules 1, 2, 7 and 8 of the Comprehensive Drinking Water Source to Tap Assessment Guideline.

The *Assessment* has been used as a science based tool to assist GVW to focus efforts on the hazards and risks that have the greatest potential threat to public health through consumption of GVW supplied drinking water. The drinking water hazards are identified within the *Assessment*, and have been evaluated for their likelihood and potential consequence of occurrence. The resulting qualitative risk level for individual hazards provides a basis for allocating GVW's resources to reduce or remove the risk to the Kalamalka Lake source.

In *Figure 1*, the *Assessment* utilized water currents (horizontal transport) and vertical transport (fall velocity) to estimate an "Intake Protection Zone" (IPZ) i.e. maximum speed of water transport at the surface and at the intake depth (Larratt, 2011).

Figure 1: Kalamalka Intake Protection Zone (IPZ)

Figure 1 is interpreted as follows:

A: The white circle encompasses the area that the fastest drogues traveled in two hours with light winds. (A drogue is an object attached to a small float by a thin line. It has a large surface that intercepts the lake currents released at selected depths and tracked by GPS under different wind conditions).

B: The black boundary encompasses the area water currents can travel in two hours with 80% of the wind events that occur on Kalamalka Lake and is the recommended Intake Protection Zone (IPZ) (320 m radius). The extension connecting Coldstream Creek to the intake area is included in the IPZ because it covers the path of storm plumes.

C: The red line represents the area recommended by the TAC for inclusion in the Intake Protection Zone based on limnology and follow District of Coldstream jurisdictional boundary. It allows a larger protection "buffer" for the intake.

An Intake Protection Zone that included the area water currents can travel in wind storm events in two hours or in freshet would include the entire North Arm of Kalamalka Lake. The proposed IPZ is within the District of Coldstream boundaries.

1.3 Why is an Intake Protection Zone important to identify in large lakes?

If we review the requirements in Ontario for surface water intakes, their Clean Water Act requires communities to develop collaborative, locally driven, science based protection plans for their existing and future sources of drinking water. *The Halton Region and Hamilton Region Source Protection Areas (Version 3.2, July 2015)* describes the area closest to the intake as the most vulnerable to contamination. This heightened vulnerability is due to an assumed lack of time for the water system operator to react, and for dilution to reduce the concentration of any contaminant released within the zone nearest the water intake. These protection zone categories are shown in Figure 2: Lake Ontario – Woodland Intake Protection Zone.

In this example from Ontario a circle with a one kilometer radius, projected to the lake bottom, is centered on the intake. This zone is called the intake protection zone one (IPZ-1). Where the circle intersects land, the onshore extent is 120 metres.

The intake protection zone two (IPZ-2) is delineated using a combination of hydrodynamic modelling within the lake and the calculation of time-of-travel within in-land pathways such as creeks and storm sewers that discharge near the lake intakes. Two hours has been set as the minimum amount of time needed for operators of the water treatment plant to react to a contamination concern.

Intake protection zone three (IPZ-3) is an area where modelling has demonstrated that contaminants released during an event may be transported to the intake and cause an adverse effect on raw water quality. The IPZ-3 lies outside of an IPZ-1 and IPZ-2.

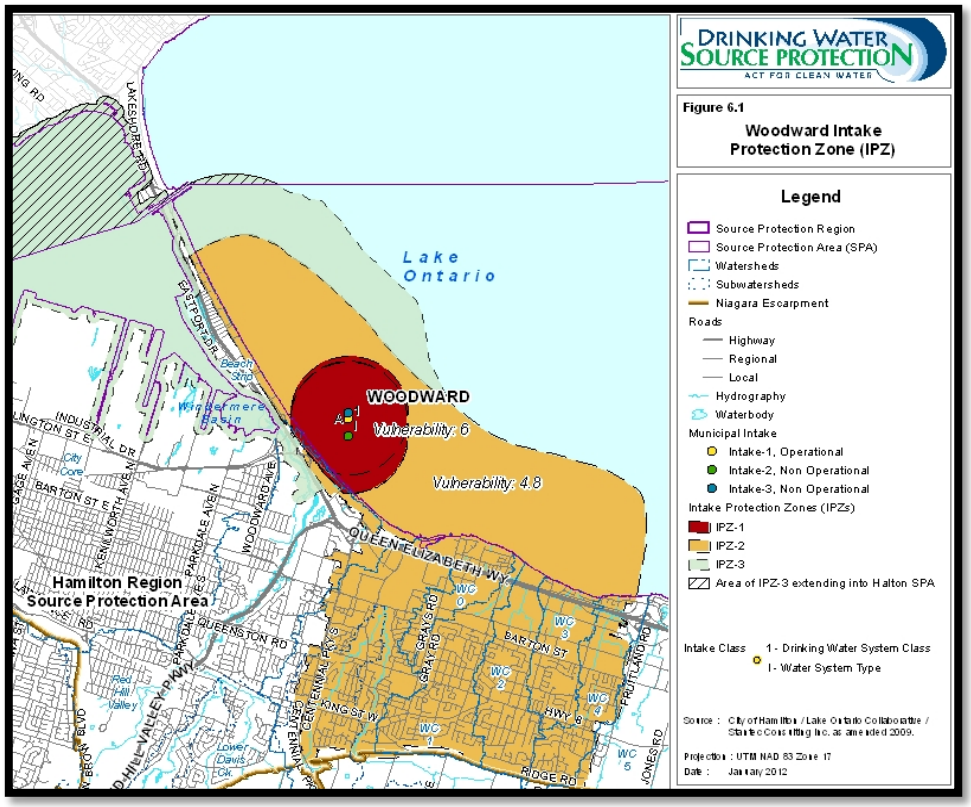

Figure 2: Lake Ontario – Woodland Intake Protection Zone (IPZ)

Based on the *Assessment*, Table 1: "Assessment" Risks Inside Intake Protection Zone (IPZ) with the Potential to Impact the North Kalamalka Intake and Table 2**:** "Assessment" Risks Outside Intake Protection Zone (IPZ) with the Potential to Impact the North Kalamalka Intake were prepared to summarize the hazards and level of risk to the Kalamalka Lake drinking water source, in and outside the IPZ. The tables are based on the following ratings in *Figure 3*:

a) Likelihood of an event on a scale of A to E; A is a probable event and E is rare,

b) Assessment of the potential consequence of an event on water quality on a scale with a 1 being the most insignificant while a 5 would have catastrophic consequences.

Qualitative Risk Analysis Matrix

Likelihood	**Consequences**				
	1 Insignificant	**2 Minor**	**3 Moderate**	**4 Major**	**5 Catastrophic**
A almost certain	Moderate	High	Very High	Very High	Very High
B likely	Moderate	High	High	Very High	Very High
C possible	Low	Moderate	High	Very High	Very High
D unlikely	Low	Low	Moderate	High	Very High
E rare	Low	Low	Moderate	High	High

Figure 3: Assessment Risk Analysis

After the likelihood and consequences were taken into consideration, the risk to the water quality at the intake was rated as high, moderate or low. The risk characterization in *Tables 1 and 2*, is an excerpt from the *Assessment*. The recommendations for mitigation of "high and moderate" risks are presented in *Table 3* of this document.

Table 1: "Assessment" Risks Inside Intake Protection Zone (IPZ) with the Potential to Impact the North Kalamalka Intake

Drinking Water Hazard	Likelihood	Consequence	Risk	Comments/Assumptions
Inflows				
1 Coldstream Creek Plume	**A**	**2**	High	Coldstream Creek has the single biggest impact on N-Kal intake including pathogens
2 Long-shore current transport	**A**	**2**	High	Transport contaminants quickly over short distances; IPZ needs vigilant monitoring
3 Sediment re-suspension	**A**	**1**	Mod	Common during seiches; *E. coli* were found in sediment under intake
4 Lost Lagoon Kalavista Dr	**A**	**1**	Mod	Risk increases with dredging or increased storm water through-put
5 Flood, overland, subsurface	**D**	**3**	Mod	Kal Lk level controls assist to minimize the downstream flooding potential; subsurface flow to IPZ is important
Sewage				
6 Lift stations, sewer mains spill	**E**	**4**	High	Unlikely event but major impact expected if spill occurs within IPZ
7 Septic fields active/old seepage	**D**	**3**	Mod	Some seepage can be expected, most likely from decommissioned fields
8 McKay Reservoir spill to intake	**E**	**4**	High	Unlikely event but major impact expected if spill is transported to IPZ
Stormwater				
9 Stormwater plume to intake	**B**	**3**	High	Storm water carries many contaminants, outfalls currently in IPZ
10 Stormwater pathogens	**C**	**2**	Mod	Large bacterial introductions possible from pet/avian/dairy feces
Motorboats				
11 Chemical, septic, garbage spill	**E**	**3**	High	Depending on spill location and type, emergency response may be needed
12 Launch hydrocarbon PAH spill	**D**	**3**	Mod	Unlikely event with moderate impact expected if spill occurs within IPZ
Land Use				
13 Shoreline Residential	**A**	**2**	High	Building/storing materials below high water line
14 Hwy 97, railway spill	**D**	**4**	High	Chemical spill emergency possible, depends on density, toxicity, currents
15 Adjacent subdivisions	**C**	**2**	Mod	Subsurface drainage can carry pesticides, inappropriately stored chemicals
16 Effluent spray irrigation	**C**	**2**	Mod	Diluted, attenuated effluent may travel towards the intake
17 Beaches	**D**	**3**	Mod	Disease carrier swims at beach or beach-goer releases contaminant
18 Agriculture: tree fruit, dairy, etc.	**D**	**3**	Mod	Toxicity and persistence of pesticides varies; nutrients can stimulate algae
Natural				
19 Geese and gulls	**A**	**2**	High	These birds can carry difficult to treat medically pathogens
20 Cyanobacteria blooms	**C**	**3**	High	Chronic low-dose exposure to Cyanotoxins >2000 cells/mL is undesirable
21 Algae blooms	**A**	**1**	Mod	Algae increase TOC, THM precursors, odor, chlorine consumption
22 Natural marl event in summer	**A**	**1**	Mod	Turbidity will exceed 1 NTU at intake after summer marl event
23 Sediment loading	**A**	**1**	Mod	Sedimentation is high in the N Arm with damaged riparian areas

Table 2: "Assessment" Risks Outside Intake Protection Zone (IPZ) with the Potential to Impact the North Kalamalka Intake

Drinking Water Hazard	Likelihood	Consequence	Risk	Comments/Assumptions
24 Sediment re-suspension	**C**	**1**	Low	Sediment re-suspension is common but exerts minor impact
25 Long-shore current transport	**C**	**2**	Mod	Transport contaminants over long distances, can remain concentrated
26 Flood, overland, subsurface	**D**	**3**	Mod	Flooding along Coldstream valley can increase contaminant load in plume
Sewage				
27 McKay Reservoir spill	**E**	**4**	High	Unlikely event but impact expected if spill transported by currents
28 Lift stations, sewer mains spill	**E**	**3**	Mod	Unlikely event but impact expected if spill occurs outside the IPZ
29 Septic field (active or old)	**C**	**2**	Mod	Seepage from cottages possible, would be diluted before reaching IPZ
Stormwater				
30 Storm water plumes	**D**	**3**	Mod	Storm water contaminants may reach IPZ
31 Stormwater pathogens	**D**	**2**	Low	Large bacterial introductions possible, may reach IPZ when lake is mixed
Motorboats				
32 Launch hydrocarbon PAH spill	**D**	**2**	Low	Unlikely event with minor impact expected if spill occurs outside IPZ
33 Boat chemical, garbage spill	**E**	**2**	Low	Depending on spill location and type, monitoring may be needed
Land Use				
34 Shoreline Residential	**A**	**2**	High	Building/storing materials below high water line
35 Hwy 97, railway spill	**D**	**3**	Mod	Chemical spill could be serious, depending on density, toxicity, currents
36 Residential subdivisions	**C**	**2**	Low	All Okanagan residents must protect the watershed; drainage would dilute
37 Effluent spray irrigation	**C**	**2**	Mod	Diluted, attenuated effluent may travel towards the intake
38 Beaches	**D**	**2**	Low	Any pathogen introduction would be diluted and have a chance to settle
39 Agriculture: eg tree fruit, dairy	**D**	**2**	Low	Large nutrient inflows could increase the algae production of Kal Lake
Natural				
40 Algae blooms	**A**	**1**	Mod	Algae blooms can be transported around North Arm by currents
41 Cyanobacteria blooms	**C**	**2**	Mod	Concentrated cyanobacteria may travel in "water packet" or disperse
42 Natural marl event in summer	**A**	**1**	Mod	Turbidity exceeds 1 NTU at intake after summer marl event
43 Geese and gulls	**C**	**2**	Mod	Bacteria can be deactivated/consumed in the lake; cysts settle
44 Sediment loading	**A**	**1**	Mod	Sediment transport from Coldstream Valley is high

P. 74 Source Assessment of the Regional District of North Okanagan – Greater Vernon Water Utility North Kalamalka Lake Intake

2. Kalamalka Lake Intake Assessment Response Plan

The *Response plan* objective is to focus on the risks identified in the *Assessments* and prepare a realistic plan to address the recommendations within a reasonable time period. The *Response Plan* will apply the multi-barrier source protection approach to protect drinking water at the source. This approach will maintain protection barriers against drinking water hazards in the event of the failure of one or more source protection barriers (IH - Source to Tap guideline). The basis for the *Response plan* will be to address activities that pose significant threat to the drinking water source and have a high risk assessment will be managed or eliminated as a higher priority than low risk activities to provide the greatest reduction of impacts to the water source in the shortest period of time.

GVW also focuses attention to emerging hazards that have developed or changed since the original source assessment completed in 2011, e.g.: Zebra and Quagga mussels, climate change, etc. GVW works collaboratively with stakeholders to identify emerging future threats to water quality, and seeks diverse viewpoints to develop appropriate responses.

3. Kalamalka Lake Watershed

The inflow of water to the north end of Kalamalka Lake includes groundwater, Coldstream Creek and its tributaries Deer, Larch, Brewer and Craster Creeks, and other small tributaries. Prior to entering Kalamalka Lake these waterways receive additional inflow from urban and rural environments within the Coldstream Valley. Most of the hazards identified in the *Assessment* occur as water flows through the agricultural lands and populated areas, especially the most densely populated area at the north end of Kalamalka Lake.

4. Source Protection Governance

The level of influence government regulators and land use managers have within the Kalamalka Lake IPZ catchment area can greatly influence the risk level associated with providing drinking water. Responsibility for protecting water quantity and quality are shared among federal, provincial and local governments, First Nations, land owners, residents, and industry. Interior Health (IH) has a mandate to protect water sources and could exercise its legislative authority to implement many of the strategies that have been recommended for source water protection.

There is legislation that protects water quality and watershed hydrology; however, there is also legislation that allows hazardous activities to occur within the IPZ catchment area. GVW and IH are dependent on various levels of government to enforce current legislation and protect water quality. For these reasons, collaboration and the establishment of formal communication links between government agencies and stakeholder groups are an integral component of source water protection.

5. Kalamalka Lake Stakeholder Technical Advisory Committee (STAC)

Managing source water protection initiatives requires involvement from all levels of government, environmental practitioners, industry, residents and a wide range of other stakeholders. It is essential all stakeholder groups are represented at the decision making table as their combined actions can negatively impact or provide benefits to source water quality.

In 2013 with the *Assessment* as a guide, GVW initiated a multi-jurisdictional Stakeholder Technical Advisory Committee (STAC) to assist GVW staff in developing strategies to protect the Kalamalka Lake water source. Terms of reference for the STAC were developed and identified key members as representatives from provincial and federal government agencies, First Nations, companies with forest and range tenders within the watershed, the District of Coldstream, the City of Vernon, industry, agricultural groups and the public (see Appendix 1 for a complete list of participants). The terms of reference for the STAC were adopted by the RDNO Board (Appendix 2) and a Kick-off meeting was held in June 2013 at the District of Coldstream office. Minutes and agendas for the STAC are provided in Appendix 1.

The *Response Plan* development has incorporated stakeholders, and District of Coldstream staff feedback. Following Interior Health's (IH) acceptance of the *Response Plan*, the STAC will meet semi-annually to review action plans, progress and source protection initiatives. The purpose of these meetings will be to determine available options to address risks, identify gaps in source water protection and any emerging risks that should be included in the *Response Plan*.

6. Kalamalka Lake Intake Source Assessment Response Plan

The *Response Plan* provides an outline of the risks identified in the *Assessment* with the goals to reduce the risk, recommended actions, summary of actions completed, responsible parties, and status.

GVW provides financial support, staff time, and other in-kind support to help protect Kalamalka Lake and enhance water quality. Efforts are also required by other organizations and agencies to assist GVW in this endeavor as many actions required are outside of the scope of GVW authority. A collaborative approach with all stakeholders provides the best prospect of success to reduce or eliminate environmental impacts from both point and non-point sources.

Implementation strategies within the *Response Plan* are focused into the following areas or programs:

- The Intake
- The Intake Protection Zone
- The Watershed Protection Program
- Public Education
- Emergency Response

Table 3 provides a detailed summary of the *Response Plan* while the following provides more detail for the strategies proposed for high priority initiatives.

6.1 Improve Current 20 metre North Kalamalka Intake

The Assessment notes GVW's Kalamalka Lake Pump station is located on Westkal Road where water is pumped from an intake pipe that extends 252 metres out from the station at a depth of 20 metres, (2011). In 2016, GVW extended the intake pipe 72 metres into the lake and two new intake screens were installed to provide a 3 meter clearance (instead of 0.6 meters) from the lake bottom with a goal to improve raw water quality. The extension of the intake pipe was required to maintain a 20 meter intake depth.

The Kalamalka Lake Water Quality Study (2004 - 2015) provided further information needed to predict water quality benefits of extending the intake beyond the current 20 metres to a depth of 30 or 40 metres.

Through the master water planning process, the costs and benefits of extending the North Kalamalka Lake intake were reviewed in context with the proposed filtration and/or filtration exclusion qualification criteria. The results did not support an option to extend the intake to a deeper depth at this time.

6.2 The Intake Protection Zone (IPZ)

Through research and observations of water currents within the north arm of Kalamalka Lake, the *Assessment* delineated three geographic zones where contaminants in the lake could reach the intake within 2 hours under three different climatic conditions. The identified zones are currently collectively referred to as the Intake Protection Zone (IPZ) (Figure 1).

The IPZ is of concern to GVW because contaminants within this area have the greatest potential to impact water quality by entering the distribution system with minimal dilution *(Larratt, 2011)* and minimal time for GVW operations to react.

The Kalamalka Lake IPZ is vulnerable to contamination from urban and rural land uses and activities. Along with multiple urban storm water outfalls discharging directly into the IPZ, Coldstream Creek can also deliver an "intact" plume toward the intake area with little dilution (*Larratt, 2011).* This plume has the potential to transport a variety of contaminants to the intake that are typically contained in agricultural and urban runoff. Activities occurring within the rainwater catchment area that drain into the IPZ are of greatest concern to GVW and have been identified as high risk and given priority (see Table 1).

The *Response Plan* identified that attention must be given to developing strategies to reduce the risk of contaminants entering the storm drainage system and affecting the water quality at the intake. Strategies include identifying hazardous activities within the catchment areas that drain into the IPZ with the goal of reducing the risk and eliminating the hazards. This sometimes involves working within a regulatory framework of conflicting economic and social interests.

GVW staff have worked with the District of Coldstream to investigate options for managing and regulating activities that occur on Kalamalka Lake and directly within the IPZ area. In response, the District of Coldstream has implemented bylaws to control and manage shoreline and off-shore activities to assist in risk reduction.

For example, within the District of Coldstream Zoning Bylaw 1382, the District of Coldstream has established a W1 Zone that regulates activities near the shoreline; it restricts large docks, marinas, marine fueling stations and long term moorage. Through the development permitting process, provincial riparian regulations are also administered. In addition, the District of Coldstream's Official Community Plan (OCP) (Bylaw No. 1673, 2015) identifies protection zones and measures for Kalamalka Lake. GVW will continue to work closely with the District of Coldstream and the City of Vernon planning staff to promote environmentally sustainable development and encourage other land use activities that do not create hazards to the drinking water source.

Other options reviewed in an effort to regulate hazardous activities on the lake were a License of Occupation, Head Lease, Resource Management Zone, Sponsored Crown Grant, or offshore park. GVW consulted with Front Counter BC staff responsible for tenures but have found them to be limiting. The Ministry of Forests Lands Natural Resource Operations (FLNRO) advised GVW that current legislation does not provide a means for a formal application to be submitted for the purposes of protecting water resources. GVW has had limited success with pursuing opportunities that would allow municipal jurisdictions to control activities presenting risks to source water because local governments have limited jurisdiction on surface waters.

GVW will continue to pursue options that can provide greater protection around the IPZ, and other areas influencing water quality within the IPZ. GVW plans to continue discussions with Front Counter BC and FLNRO in attempts to create a management area focused on protecting the drinking water source. GVW continues to investigate opportunities to assist in protecting the IPZ. In 2017, the new intake and any modifications to the IPZ will be mapped on GIS. GVW also plans to install buoys labelled as "No Anchor Area" around the intake.

6.3 Watershed Control Program

Source water protection by means of a successful watershed control program is an important component of the multi-barrier approach to drinking water management. The characterization of the watershed, inventory of possible contaminants, and the recommendations within the *Assessment* created a foundation for a watershed control program. By working collaboratively with the District of Coldstream and other stakeholders responsible for watershed protection, GVW has taken a proactive approach to reducing the potential for source water contamination.

A major component of source water protection includes a comprehensive source water monitoring program. The GVW source water quality monitoring program has expanded substantially since the *Assessment* was released:

- GVW Water Quality Program monitors four sites along Coldstream Creek to assess water quality changes as it flows through the Coldstream valley. Parameters include bacteria, nutrients, temperature, turbidity, conductivity and pH.

- GVW and the FLNRO have worked together and installed a water quality monitoring station at Kirkland Drive (near the mouth of Coldstream Creek). This site provides real-time in situ water parameters and is linked to GVW's Supervisory Control and Data Acquisition (SCADA) so changes in turbidity, flow, pH, temperature and conductivity can provide an early warning to operations.

Coldstream Creek has also been a focus of a number of studies and projects including:

- Coldstream Creek Water Quality Monitoring: 2008-2009 (Ministry of Environment, 2009*)*
- Coldstream Creek Sensitive Habitat Mapping Inventory (Ecoscape, 2010)
- Riparian Protection Projects - 2012 Coldstream Creek SHIM 3 and SHIM 4, Deer Creek, and King Edward FSR/Larch Creek (Coldstream Ranch)
- Phase I - Coldstream Creek Water Quality Assessment, 2015 (SPRKL, Western Water)
- The Ministry of Environment has set Water Quality Objectives for Coldstream Creek.

Since the *Assessment* was released and contact with the STAC, a number of initiatives have already been undertaken and are outlined as follows:

- Through grant funding provided by the Okanagan Basin Water Board (OBWB), GVW complete a detailed water quality study of the storm water outfalls that discharge directly into the North Arm of Kalamalka Lake. The first phase of the study took place over the fall of 2011 and spring of 2012, with the report completed in September 2012 (Summit 2012). The study results identified and prioritized the outfalls with the highest contaminant loading requiring remedial action. One limitation of this study was some of the outfalls could not be sampled because the discharge pipes were in the lake. As a follow up, GVW is assessing water quality at one of these outfalls within the IPZ (Kerr Wood Leidal 2016).

- GVW and the Ministry of Environment have completed independent Bacterial Source Tracking studies using *E.coli* DNA to identify sources (animal, avian or human) of fecal contamination. The Ministry of Environment focussed on Coldstream Creek (2009) and GVW on the Kalamalka Lake Intake (2012).

- In 2014, GVW completed a year of Giardia and Cryptosporidium monitoring to determine cyst levels at the Intake and at a possible 30 meter intake site.

- GVW continues to work with OBWB to reduce risk to human health during Milfoil Rototilling activities by establishing a work window, a communication strategy between operators and procedures to turn off Kalamalka Lake when turbidity compromises UV Disinfection (GVW Water Quality Deviation Response Plan).

Another key element to a successful watershed control program are the initiatives directed towards reducing the potential for contaminants to enter the drinking water source. This includes pollution prevention initiatives such as establishing the IPZ, public education, and emergency preparedness.

6.4 Public Education

It is a challenge for GVW to reduce the contaminant risk from private land use activities, non-point sources of pollution or other public activities. Increasing public awareness and knowledge about source water protection helps citizens understand their connections to their drinking water source and how they can make changes to protect water quality.

GVW hires seasonal water ambassadors to educate the public, at boat launches, the farmers' market and other community events, about the GVW IPZ and activities that pose a risk to water quality, such as invasive species. In the upcoming year, GVW will inventory existing signage located at boat launches, beaches, dog parks, and other public areas where activities can affect

water entering the IPZ. The signs' message and design will be updated if required and additional signage locations identified. GVW will seek financial assistance from member municipalities and the Okanagan Basin Water Board (OBWB) to enhance the signage planning initiative and attempt to provide a consistent message for all Kalamalka Lake users.

Examples for education topics include:

- *Living by Water* directed at those residents living next to or along Kalamalka Lake and Coldstream Creek, (developed by the Federation of BC Naturalists),
- *Riparian areas and their importance 101* (offered through Alberta Riparian Habitat Management Society),
- manure storage management,
- storm water management,
- goose and gull control mechanisms, and
- the importance of cleaning up after your dog.

More rigorous source control programs (e.g. bylaws and enforcement) may also become necessary as land use intensifies. GVW and other STAC members have a responsibility to ensure people living within the watershed understand how their activities and choices can influence water quality. The STAC will be encouraged to provide input and seek ideas for public education programs. Public Education initiatives will be reviewed as part of the initial STAC meeting(s) to help ensure the most value can be gained for the limited resources available.

6.5 Emergency Preparedness

Protecting the health of greater Vernon's residents and visitors is of primary importance to GVW. There are many hazardous high risk activities within the Kalamalka Lake catchment area that have been identified in the *Assessment* and are being addressed by programs to reduce risk. However, there are many activities that can cause a sudden hazard by spilling into our waterways and draining to the GVW intake. These include accidentals spills along Hwy 6, Hwy 97 and the railway, overtopping of above ground bulk gas and fuel storage facilities, spills from pesticide and fertilizer storage facilities, or overtopping of agriculture lagoons or sewage lift stations. High concentration fecal or chemical loading into the drainage ways can also occur from extreme weather events causing runoff from agricultural, industrial, and residential land use. Possible contaminants include manure, fertilizers, pesticides, chemicals, or fire retardants from recent fire suppression activity.

To prepare for the unexpected events, GVW maintains an Emergency Response Plan (ERP) that follows the standards of the BC Emergency Response Management System. The plan is reviewed by staff on an annual basis to ensure emergency contact lists and procedures are up to date. The plan also considers several emergency scenarios and provides steps to follow, approved protocols, agencies to notify, and public notification procedures.

When an environmental emergency or spill occurs, GVW is largely dependent on others to respond to emergencies with the appropriate resources. In British Columbia, the party responsible for the spill is required to take all reasonable measures to contain and stop the release and notify provincial authorities. GVW is highly reliant on others for notification, emergency response, and environmental clean-up activities.

If notified about an environmental emergency, GVW has the option to turn off the Kalamalka Lake intake, and supply customers with water from the Duteau Creek Water source. GVW operations staff would need time to respond and complete the necessary procedures to abate the environmental emergency. If the loss of source due to contamination occurs during the growing season, water to GVW's agricultural customers could be reduced or interrupted to provide for basic domestic needs. If the loss of water source occurs for an extended period of time, the potential economic losses to the agricultural community and to tourism could be extremely damaging to the community; therefore, it is in everyone's best interest to avoid a spill.

Effective emergency response requires teamwork among governments, industry, communities and local organizations. These partnerships are best formed during non-emergency periods. GVW plans to seek opportunities that will aid in spill prevention such as public education and enforcement of existing regulations (e.g.: Observe, Record and Report).

To further communication efforts during the event of a spill, GVW hosted an Interagency Response and Communication meeting in November 2016. Staff from IH, the Ministry of Environment and the RDNO were in attendance. A decision tree was provided by IH for events that affect drinking water. A follow up meeting is planned for May 2017 to further solidify the communication process.

In 2017, GVW will complete vulnerability mapping that encompasses the Kalamalka Watershed. This tool will be provided to IH, the Ministry of Environment, Ministry of Transportation, municipal partners and RDNO staff and will assist in identifying possible risks and pathways of a major emergency event to assist in spill response.

GVW has contacted the local emergency teams and found there are currently no spill kits readily available for deployment in the event of a sizable spill. GVW will consider this within the ERP update and develop instructions for staff, operators and the public for spill response procedures and contacts. This will also include ERP training to staff on procedures developed for spill response and reporting.

7. Response Plan Summary

In *Table 3* GVW has developed a summary of the *Response Plan* in a detailed matrix.

Table 3, is used to document tasks, in detail, undertaken since the report was completed, as well as contributing factors, responsibilities, timelines if warranted, GVW commitment, STAC comments and suggestions.

The *table* is intended to be a living document that will continue to address new hazards and responses as they are identified and removal of old hazards and responses when they are no longer applicable.

Table 3	**North Kalamalka Intake Assessment Response Plan**					
#	Goals to Reduce Risk	Risk Reference Table 1 & 2	Recommendations and Actions	Actions to date	Responsible Party	Status
1	***Goal:*** Greater protection from sediment and pathogen re-suspension. ***Risk:*** Long shore current transport of contaminants, resuspension of E.coli in sediment under intake.	**2, 3, 22, 24, 25, 42**	**1. Improve current 20 m N-Kal intake to reduce turbidity and pathogen re-suspension.** 1.1 Lift intake from 0.6 to 3 meters from lake bottom 1.2 The cost-effectiveness can be determined option 1.3 When divers clear the intake screens, they could recover some of the material they clean off the screens for testing, measure the clearance and photograph the intake.	The options include extending the current intake 100 m out and raising it 3 m or flexing the current pipe to achieve the recommended clearance. Cost effectiveness looked at in MWP and through Engineering Capital Project planning October 2016, Intake lifted to 3 meters off lake bottom and extended 72 meters in length.Intake maintained at 20 m depth but now 323 meters in length. Two New screens installed, replaced singular screen.	Greater Vernon Water (RDNO)	1.1 Completed in 2016 1.2 Completed --Capital Project. 1.3 Adopted into maintenance program
2	***Goal:*** Cost Benefit - Extending intake deeper into the lake or expanding Water Treatment Plant. ***Risk:*** Impact from Coldstream Creek and other inflows of contaminants via stormwater, sewage lift stations, transportation routes.	**1, 2, 3, 6, 7, 8, 9, 10, 13, 18**	**2. Selection of best possible gain in water quality for the expenditure between intake extension and expanding the Water Treatment Plant** 2.1 Under GVW's guidance, one full year of detailed sampling twice monthly at 0, 20m, 30m, 40m, and 47m 2.2 GVW could complete a cost benefit analysis on intake extension to 30 m or to 40 m based on all available studies	Completed one full year of sampling at 20, 30, 35, 40 , and 47 metres in 2011. Depth samples continued May -October 2012 - 2016. 47 metre location removed from 2014 sampling. Through the master water planning process, GVW has reviewed the cost-effectiveness of North Kal Lake intake improvements in context with proposed filtration and/or filtration exclusion qualification criteria.	Greater Vernon Water (RDNO)	2.1 Completed 2.2 Master Water Plan Update Review in 2016
3	***Goal:*** Establish an Intake Protection Zone (IPZ) ***Risk:*** Two hours has been set as the minimum amount of time needed for operators of the water treatment plant to react to a contamination concern.	**1, 3, 4, 7, 9, 10, 12, 13, 15**	**3. Increased source protection by pre-empting or placing limits on future developments (e.g. marinas, house boat moorage) and also public education, spill prevention.** 3.1 DoC and GVW investigate applying to Front Counter BC for either a License of Occupation (or head-lease) or a License for Community Purposes over the Intake Protection Zone 3.2 A letter outlining the IPZ area and its purpose/importance could be submitted to Front Counter BC with a formal request that any application to Front Counter BC within the IPZ be forwarded to RDNO and DoC for comment, regardless of the license application outcome.	GVW has investigated available options to manage and regulate activities occurring within areas that can impact the IPZ. District of Coldstream Bylaw No. 1673, 2015 Official Community Plan (OCP) identifies protection zone. DoC Zoning Bylaw 1382, the district has established a W1 Zone that that regulates activities near the shoreline. GVW has contacted Front Counter BC and as been referred to staff responsible for tenures. GVW staff have discussed available options, and found them to be limited. GVW was advised by FLNRO staff that current legislation does not provide a means for an application to be submitted for the purposes of protecting water resources. GVW would need to find other reasons to apply that may provide an associated benefit. Review with DoC the options that will provide for municipal regulation of activities where there is a risk to drinking water source.	District of Coldstream, Greater Vernon Water (RDNO)	3.1 IPZ is recognized in the District of Coldstream OCP (Section 16.6.3), Bylaw 1382 W1 Zone 3.2 . On-going
4	***Goal:*** Prevent contaminants from reaching IPZ ***Risk:*** Stormwater release directly to lake	**9, 10, 14, 15, 18**	**4. Storm water outfall improvements** 4.1 RDNO to support DoC to develop BMP's for the 1/100 year flood at new developments. The volume carried by new storm water outfalls that would discharge within the intake protection zone to be minimized or eliminated by on-site storm water management. BMPs may include soak-away zones, detention ponds, rain gardens etc**.** 4.2 RDNO with co-operation of DoC could implement a monitoring plan for existing storm water outfalls to include first flush, mid, and late sampling of storm events for at least one year for at least: Cl to monitor for salt; nitrate to monitor for nutrients and E. coli to monitor for fecal contamination. The data can be used to rank the threat posed to the intake.	GVW has met and discussed the item with the Engineering Group at DoC. BMP can be implemented as a condition of development as so far as permitted by the Local Government Act. GVW has met with DoC planning staff and reviewed proposed development activity that contributes to the IPZ. DoC Council policy is to Review stormwater management policies/regulations to minimize potential contamination of the water supply; (OCP Section 16.6.5 - review stormwater policies and 16.8.11 -Require all developments to provide a major drainage route for the safe conveyance ofthe 1-in-100-year rainfall event.) OBWB Grants- GVW retained Summit Environmental Consultants in August of 2011 to complete a detailed water quality study of the of the storm water outfalls that discharge directly into the North Arm of Kalamalka Lake, study completed in Sept 2012 - identified the stormwater outfalls most at risk to IPZ. GVW retained KWL in August 2015 through an OBWB grant phase 2. Capture zones were delinated and mapped on storm drains on north west side of Kal Lake. Remediation and reclamation options were outlined in report. In Jan 2017 - these options were discussed with RDNO Trails and DOC.	District of Coldstream, Greater Vernon Water (RDNO)	4.1 On- going 4.2 Completed
5	***Goal:*** Increased source protection by pre-empting future marina development and spill prevention ***Risk:*** Hydrocarbon, PAH, chemical, sewage and garbage	**11, 12**	**5. Bylaw to prohibit multi-slip marinas within the IPZ** 5.1 RDNO should encourage and assist DoC and CoV to draft a bylaw to specifically prohibit multi-slip marinas within the IPZ, particularly those designed for power boats and houseboats, that could be incorporated into the DoC or CoV bylaws. 5.2 RDNO should encourage and assist DoC and CoV in notifying the development community so they can devise alternates such as boat storage warehouses and valet service.	DoC has zoning ability, but some items fall under navigable water act. Municipality has control over more permanent moorage DoC has created a W1 Zone (area 250 feet from shore from 12904 Kinlock to 7607 Westkal). - no overnight moorage currently permitted within W1 Zone. - any proposed marina would have to comply with W1 Zoning rules. Fueling facilities are currently prohibited within the W1 Zone. Current bylaw imposes some restrictions. Dock sizes are already restricted. May be risk of larger docks constructed for multifamily zones. Resort Commercial Zone (C7 Zone) already exists at the DoC The zone is the primary commercial zone within the immediate area surrounding the lake the IPZ. The bylaw currently restricts forms of commercial land use within the foreshore are of the IPZ. the C7 Zone currently restricts rentals of motorized watercraft and only allows business to rent non-motorized watercraft. RDNO Planning and District of Coldstream provide GVW with Provincial referrals on future Marina and dock expansions	District of Coldstream, Greater Vernon Water (RDNO)	5.1 On-going 5.2 On-going

Table 3			North Kalamalka Intake Assessment Response Plan			
#	Goals to Reduce Risk	Risk Reference Table 1 & 2	Recommendations and Actions	Actions to date	Responsible Party	Status
6	***Goal*** **:** Significantly improved water quality entering North Arm and at intake; supports Filtration Exclusion ***Risk:*** Contaminants entering lake from urban and agriculture land use, infrastructure and run-off	**1, 3, 5, 7, 18, 39**	**6. Watershed control program** 6.1 RDNO to continue to encourage DoC to to carry out the recommendations of the Ecoscape SHIM report on Coldstream Creek that improve water quality. The report recommendations are aimed at enhancing natural habitats which assist the goal of the IHA directed watershed control program. 6.2 RDNO should encourage DoC to (and MoE) develop a storm water monitoring program that includes agricultural land runoff that reaches the Coldstream storm drain system and the stormwater ditches in Lavington. 6.3 RDNO and DoC could request assistance from the Regional Drinking Water Team on watershed issues on Crown land where they have no formal jurisdiction. 6.4 A ground water monitoring program using existing wells and monitoring wells would answer several outstanding questions on nutrient sources to Coldstream Creek. 6.5 DoC and RDNO could develop specific objectives and deliverables for managing fecal contamination from Coldstream Creek with guidance from IHA. This should probably focus on establishing/maintaining functional riparian buffers and minimizing direct inputs (e.g. storm water; animal access points).	The DoC is moving forward with implementation of recommendations within the SHIM Assessment. Projects include construction of wetland and bioswale adjacent to Coldstream Creek, replanting of riparian area impacted by cattle. SHIM work completed in the Coldstream Ranch - GVW worked with Coldstream Ranch to plant vegetation around a riparian area previously impacted by cattle. Land owned by DoC. Emergency response plan for Coldstream Ranch Lagoon - IH Watershed clean up - Vernon Off-Road Motorcycle Club participated in clean-up activities. GVW covers landfill fee. Greater Vernon Water provided in-kind support to DoC for a wetland project undertaken near School Road in Lavington. DoC retained consultants for design and construction of the wetland.Completed in 2016. Western Water (contracted by SPKL) has completed Phase 1 and 2 monitoring the length of Coldstream Creek and identified priority sites with land use and drainage issues. GVW/ WQ has 3 monitoring sites on Coldstream Creek for watershed water quality changes, plus a water quality monitoring station (online) at Kirkland. Ground water quality monitoring the responsibility of the Province of BC Ministry of Environment has completed Water Quality Objectives for Coldstream Creek In the Fall of 2013 and Fall of 2014, GVW staff organized and facilitated stakeholder planning group meetings attended by representatives for CoV, MoE, IH, MoA, MoE (4), SPRKL, DoC (3), DoLC, MFLNRO, RDNO (3) and a Meeting Facilitator. In the spring of 2017 the TAC will be invited to view the process on this Response Plan.	District of Coldstream, Greater Vernon Water (RDNO) Ministry of Forest Lands, Natural Resources Ministry of Environment	6.1 Completed and some on-going projects 6.2 Completed and ongoing work 6.3 On-going work with FLNRO 6.4 Ministry of Environment 6.5 On-going
7	***Goal*** **:** Increased source protection ***Risk:*** Contaminants entering lake from properties and activities adjacent , near and on the lake	**12, 13, 14**	**7.Bylaw to protect Kalamalka Lake foreshore** 7.1 The DoC land use planning department could use other foreshore policies and BMP's to draft enforceable (no-build, no-disturb) set-backs from the high water mark, recognizing the limitations of DoC's jurisdiction	GVW has met with Coldstream Planning Staff and reviewed implementation strategy with recommendations of the Kal Lake Assessment report. DoC has approved a W1 water zone to define the use of foreshore. The W1 Zone (Recreational Water Use and Moorage Zone) applies to an area 75 metres from shore from around the perimeter of the North Arm from 12904 Kinloch Rd. to 7607 Westkal Road. The bylaw places limitations on waterfront development, recreational water use and moorage. The DoC recently established a Development Permit area that includes the Kal Lake Foreshore, Kalavista Lagoon, and all surface drainages and tributaries to Coldstream Creek and Kal Lake. A special Development Permit must be acquired for all development and building applications within the District. and assurances are made to ensure provincial riparian development standards form part of development approvals. The DoC has identified that many lakefront property owners have retaining walls and other erosion control features without authorization. District of Coldstream OCP Section 16	District of Coldstream, Greater Vernon Water (RDNO)	7.1 Completed - implementation
8	***Goal:*** Better voluntary control of contaminants to Kalamalka Lake Prevent contaminants from reaching IPZ **Risk:** Hydrocarbon, PAH, chemical, pesticides, sewage, animal feces and garbage	**12, 13, 15, 17**	**8 Public education** 8.1 RDNO to provide public education through boat launch signage of the IPZ, including encouraging off-water refueling and providing who-to-call after a spill would be beneficial at boat launches. 8.2 Public education through open houses, targeted mailings and other initiatives encourage responsible public behavior. For example, a directed mailer to shoreline owners could highlight their rights, ownership and responsibility, and explain best practices to protect the lake. Mailers to subdivisions with storm water entering the North Arm could explain where their storm water goes in relation to the intake and how to improve storm water quality. 8.3 RDNO should ensure that dog feces collection bags continue to be provided, and continue education for dog-owners regarding the costs of not collecting dog feces in DoC/RDNO parks. This initiative can improve storm water quality and could be implemented here.	GVW has hired seasonal water ambassadors for placement at boat launches during the summer to increase public awareness of the IPZ and watch for activities that pose a risk to water quality such as invasive species. Boaters made aware of Drinking water source protection. In 2015 a survey was developed and distributed with questions about water stewardship.Outcome not applicable due to low numbers. GVW has provided support to the "Yellow Fish" program with Allan Brooks Center. Looking at options for a glass of water stencil, delinating capture zones in communities to stormwater. Continue to work with Park staff on the importance of Dog feces management and Bylaws to enforce pickup. Communicate with the Rail Trail task team and support strategies that meet the goals and risk reductions of this response plan.	Greater Vernon Water, RDNO, District of Coldstream	8.1 Completed 8.2 On -going 8.3 On- going - working with Park staff and RDNO Parks

Table 3			North Kalamalka Intake Assessment Response Plan			
#	Goals to Reduce Risk	Risk Reference Table 1 & 2	Recommendations and Actions	Actions to date	Responsible Party	Status
9	***Goal:*** Knowledge of changes to aid planning, processing applications and compliance ***Risk:*** Land Use changes and impacts to Water Quality	**13, 15, 17, 23, 44**	**9. Annual overview of changes to North Arm, Kalamalka Lake** 9.1 RDNO with DoC assistance and/or a FIM consultant could prepare a date-stamped video survey of the North Arm from a boat to provide a permanent record of shoreline change. This recommendation will capture any modifications made without permits and identify those with the potential to incrementally degrade water quality in the North Arm.	The Okanagan Conservation Collaborative Program, with support of local, provincial, and federal governments, initiated a process to document the current condition of the foreshore. Foreshore Inventory Mapping (using GIS) has been completed on Kalamalka Lake, and GIS has been used to record and facilitate identification of high, medium and low categories of aquatic values using an Aquatic Habitat Index. Keyfindings of the FIM report for Kalamalka Lake are as follows: It is estimated that 53.7% of the shoreline has a high level of impact which accounts for 25.0 km of shoreline. The most predominant land use around the lake was natural area parks (28%), followed by transportation (23.3 %). Single family areas were the third most commonly observed land use type, accounting for 22.3% of the shoreline; Stream confluences were the most rare shore type around the Kalamalka Lake, accounting for only 2.3 % of the shoreline length. The most predominant shore types around the lake are Gravel beaches and rocky shores, which account for about 45% and 27% of the shoreline length respectively. Docks were the most common modification observed, with a total of 360 structures recorded. Retaining walls were the next most common modification, with a total of 213 separate structures stretching over an estimated 7 km (15%) of the shoreline. There were a total of 11 boat launches and 9 marinas with over 6 slips; and Substrate modification was observed on 40% of the shore length and was most commonly associated with retaining walls, transportation land uses, and beach grooming.	RDNO, District of Coldstream, Greater Vernon Water, OBWB,	9.1 Completed, 2010 (FIM), 2012 (AHI) + On-going
10	***Goal :*** Preventing pathogen and other contamination within IPZ ***Risk:*** Sewage Lift Stations, sewer main breaks, Motorboat chemical, septic, garbage, hydrocarbons	**6, 11, 12, 14, 18**	**10. Clean-up preparedness for a petroleum hydrocarbon or sewage spill** 10.1 GVW with assistance from DoC and Parks co-operate to provide a clean-up kit for a petroleum hydrocarbon (gas/oil etc.) spill into Kalamalka Lake Spills should be reported and cleaned up in accordance with the Spill Reporting Regulation (B.C. Reg.263/90). 10.2 RDNO could outline their concerns about risks to drinking water quality identified in this report and ensure that the local HAZMAT team are equipped and trained to handle lake spills from all possible sources, particularly within the IPZ. 10.3 RDNO may wish to consider encouraging non-motorized recreation by planning facilities that promote sailing, kayaking, canoeing, all of which have far less potential to impact intake water quality than motorized watercraft.	GVW will review spill clean-up kit availability and ensure first responders are well equipped to avoid contamination of the IPZ where possible. This may include securing a location for spill kit materials. GVW will add potential sources of contamination (lift stations, bulk fueling, manure lagoons) to GIS mapping as data becomes available.. Discussion with MOE, CoV, DoC and Protective services on spill kits and locations GVW will seek funding toward a Hazard, Risk, and Vulnerability Assessment to assess the possible risks of a major event occurrence, and available spill response resources.Could spill kits be stored with the CoV Fire Department or Search and Rescues, and at the major boat launches (Kekuli Bay, Kalavista). Build into GVW Emergency Response Plan - spill reponse. Interagency meeting held on Nov 28, 2016 to build strong communication protocol. Boat Capacity Study taking place in 2016-2017 to determine recommendation on motorized boating impacts on water quality	Ministry of Transportation, Ministry of Environment,PEP, IH, Greater Vernon Water, RDNO	10.1 On - going 10.2 On-going 10.3 On-going
11	***Goal:*** Provide basis for decision on lagoon modifications **Risk:** within IPZ , resuspension of pathogen and sediment, stormwater plume, land use	**4, 7, 9, 10, 13**	**11. Study effects of Kalavista (Lost) Lagoon on North Arm, Kalamalka Lake** 11.1 RDNO with help from proponents could hire a consultant to study impacts on lake/intake from flushing or dredging of Kalavista Lagoon. Pathogen assessment will be essential prior to flushing. The impacts of additional stormwater inflows could also be determined.	The DoC owns the land under the lagoon, and manages lagoon operations and planning functions. GVW is committed to the preservation of the high water quality in Kalamalka Lake. Possible management strategies for the lagoon include: (1.) be managed as natural habitat or wetland, where the shoreline and littoral areas are considered an extension of lakeshore riparian with 15 metre no-disturb setback, and the shoreline be re-established with natural vegetation. (2.) be considered for intercepting and treating storm water from the DoC storm water catchment system, (3.) until such time as stormwater inflow can be increased, is provided with mechanical aeration to avoid development of anaerobic microorganisms. (4.) if used as a public launching area for non motorized watercraft, the launch point should be designed with controlled entry and egress with low impact to the littoral zone.	District of Coldstream	11.1 On- going - aeration installed
12	***Goal:*** Preventing pathogen contamination within IPZ **Risk:** Elevated fecal loading as numbers increase	**2, 4, 17, 18, 19, 43**	**12. Discourage waterfowl and gulls on public beaches** 12.1 Erect signage discouraging waterfowl feeding 12.2 Daily garbage pick-up from the beach and parking lots will help limit waterfowl feces contamination of the public beaches adjacent to the intake 12.3 Providing barriers to prevent walk-on goose access to docks is important. 12.4 RDNO could continue to support the Okanagan Goose Management Program that successfully implements an addling program.	Kal Beach has daily garbage pick-up and a weekly general litter clean-up. Surf Rake Cleaning occurs two times monthly water testing completed by parks staff weekly in three locations. By Alexander's, South Side of Pier, and the North Side of Pier. The Okanagan Valley Goose Management Program continues its annual egg addling program. The program has prevented the exponential increase of the non-migratory resident goose population in the Okanagan. Discussion with DoC and RDNO Parks for a budget for Goose adling and Goose Control on Beaches and in parsk such as the Lagoon, Soveriegn, Coldstream Creek and Kal Beach. Discuss Gull control at GVRD Landfill with RDNO.	District of Coldstream, RDNO, Greater Vernon Water	12.1 On-going 12.2 Complete 12.3 On-going 12.4 On-going

Table 3	**North Kalamalka Intake Assessment Response Plan**					
#	Goals to Reduce Risk	Risk Reference Table 1 & 2	Recommendations and Actions	Actions to date	Responsible Party	Status
13	***Goal:*** Better risk abatement with knowledge of goods hauled and cars sided along the North Arm ***Risk:*** Chemical spill	**14, 35**	**13. Discussions with railway on potentially hazardous goods they transport** 13.1 GVW and DoC could open discussions with CN Rail concerning what they carry on the line paralleling Kalamalka Lake shoreline within 30 m. Currently, their emergency response plan is to call the local Hazmat Team. 13.2 GVW and DoC can question the practice of siding chemical cars for extended periods beside Kalamalka Lake should be reviewed. RDNO and DoC could formally request that no chemical cars be stored (sided) near the lake, particularly along the North Arm	GVW Greater Vernon Water will continue to assess vulnerability CN Rail concerning what they carry on the line paralleling Kalamalka Lake / Coldstream Creek. Currently, their emergency response plan is to call the local Hazmat Team. Message sent to Transport Canada May 15, 2014 June 12/2014 - Transport Canada TDG Division representative returned call- Pointed to Protective Directive #32, Noted that TC spoke to representative of CN. 2017- Since the Assessment the the railway along the west side of the lake has been removed (rails and ties) GVW will request that the trail portion along the North Arm of Kalamalka Lake be developed in a manor that protects (reduces risk to) water quality within the North Arm. GVW will support re-establishment of natural habitat along the shoreline. Continue to review identified risks with CN as railway runs east to Lavington (North side of lake and close to Coldstream creek)	GVW, CN	13.1 On-going 13.2 On-going
14	***Goal:*** Better understanding of source protection and supports deferral application ***Risk:*** Contamination from overland and subsurface leaching at these facilities	**5, 16, 19, 27, 37, 43**	**14. Collaboration with City of Vernon reclaimed water and RDNO landfill** 14.1 GVW water quality manager could meet annually with the manager of the reclaimed water program and the solid waste manager to review on-going environmental programs, protection measures and monitoring results. Data collected from monitoring wells on both the landfill and the MacKay Reservoir subsurface drainage could be reported annually to the GVW water manager. Spills (if any) should be reported. 14.2 Recommendations regarding further protection work (if required) and bringing in MoTH can be discussed and developed at an annual meeting.	GVW source water protection staff have met with RDNO Solid Waste staff and reviewed a recent environmental impact study and current environmental sampling program. A report on any changes to water quality or spills should be forwarded to GVW. Reporting should be formal. 2015 Vernon Water Reclamation results were provided to GVW. GVRDF report is available on-line at www.rdno.ca. Request to both facilities for ERP to contact RDNO/ GVW so operators can assess if the intake should be shut down in the case of overland flow, dam breach.	GVW, GVRDF, COV/ VWRC, MOTH	14.1 Complete 14.2 On-going
15	***Goal:*** Maintaining and improving Kalamalka Lake water quality through agency co-ordination. ***Risk:*** Contamination from septic, sewer main spills, residental and agriculture land use. Introduction of invasive species.	**28, 29, 36, 39**	**15. Basin-wide issue partners** 15.1 Reports and possibly meetings/presentations could be co-coordinate by the OBWB whose mandate includes facilitating integrated management of the Kalamalka Lake watershed. These meetings should improve communication and reduce duplication of effort.	Since the late 1990's the District of Lake Country , RDNO/ GVW, MOE have collabratively worked togther on a Water Quality Study of Kalamalka Lake with Larratt Aquatic. Annual reports available Kalamalka Lake Boat Capacity Study in 2016/17 - RDCO, Lake Country and GVW OBWB - WSC Renee Clark member. In 2017/18 Source Protection Committee, will develop valley wide source protection strategies. GVW worked with MFLNRO to set up Water Quality sample station at Kirkand Rd and Coldstream Creek Okanagan Goose Management Program - Annual reports available. DoC and GVW working on a budget to apply to this work. Support SPRKL on their efforts to keep "Kal Lake Blue", including summer staff sampling and data entry. Support the 'DON'T MOVE A MUSSEL"Campaign, including summer staff boat launch presence and public information.	OBWB, GVW, RDNO, DoC, CoV, DLC	15.1 On-going
16	**Goal:** Minimize the frequency of water quality advisories in the winter, possibly by roto-tilling during freshet **Risk:** Long- shore current transport, re-suspension of sediment and pathogens	**2, 3, 25**	**16. Timing of rototilling for milfoil control** 16.1 The impact of the milfoil roto-tilling on the N-Kal intake turbidity and UV transmissivity is under investigation and OBWB and GVW could co-ordinate the monitoring. 16.2 The milfoil roto-tilling will be targeted in the Bacterial Source Tracking study, currently underway with funding assistance from OBWB.	Working with the OBWB staff - communication of where and when rototiller is in the northend of lake. A response plan has been developed to assess turbidity and UV transmissivity which includes shutting down the Kal intake if needed.	OBWB, GVW	16.1 Completed + on-going annual
17	***Goal:*** Kalamalka Protected Area has a key role in the preservation of surface and ground water input quality into Kalamalka Lake along its length . ***Risk:*** Residential development, septic fields,transportation spills, road development	**29, 30, 34, 36, 37**	**17. Maintain Kalamalka Protected Area** 17.1 RDNO, DoC and Vernon could petition the Province to maintain its status as a natural park in perpetuity and to encourage a zero-tolerance policy to recreational or land development activities within its boundaries that have the potential to adversely impact water quality. 17.2 All Park regulations pertaining to aquatic protection should be vigorously enforced by Park's staff.	Recognize Kalamalka Lake Provincial Park located on the boundary of the District of Coldstream Support WQ studies related to the park and development on adjacent lands that may affect long term water quality Friends of Kal Park stakeholder in TAC. Park Staff to be included in TAC invite	BC Parks, GVW, RDNO, DoC	17.1 Not completed as Kal Park is not within IPZ, but will support initiatives that support and protect Water Quality 17.2 On-going
18	***Goal:*** Determines intake-land use conflicts; faster emergency responses **Risk:** Storm water pathogens, Hwy 97 or railway spill, inundation area, leachate ponds, manure lagoons	**10, 13, 14, 15, 16, 18**	**18. Mapping of Kalamalka Lake** 18.1 RDNO could incorporate source water protection objectives into their current GIS systems and continue to update the GIS system as studies and information becomes available. Discussions with GIS staff could be initiated to determine what types of information should be entered into GIS, identify data gaps and enter data relevant to regional emergency response.	GVW has developed a GIS database specifically for Kal Lake Watershed Source Protection initiatives. Data sets have been developed and are continually updated as information becomes available. GIS data used to complete water source protection studies, such as SHIM mapping, storm outfall monitoring, Storm outfall capture zones on west side of Kal Lake, sample site locations in Coldstream Creek WQ study (SPRKL) and foreshore inventory have been acquired by GVW and added to GIS. Vulnerability Mapping of Kalamalka Lake Watershed including Coldstream Creek will take place in 2017	GVW	18.1 On-going

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19	***Goal:*** Faster warning of algae blooms and turbidity spikes ***Risk:*** Cynobacteria blooms, alagae blooms	**20, 21, 40, 41**	**19. Information exchange** 19.1 Exchange GVW turbidity data for Okanagan Springs Brewery ATP data on Kal Lk water. GVWs SCADA turbidity would provide the Brewery with useful information at no charge and their ATP data would likewise provide data on the amount of algae in the water at no cost to GVW.	Kal Lake notification is set up for Sensitive facilities and customers. Cynobacteria bloom - Emergency Response Plans includes contact of sensitive facilities and customers.	GVW	19.1 Complete + annual update

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Citation

Regional District of North Okanagan – Greater Vernon Water (2017, January). North Kalamalka Lake Intake Assessment Response Plan. Prepared by John Bartell, Water Source Protection Coordinator; and Renee Clark, Water Quality Manager.

APPENDIX 1: STAC Participants, Meeting Agendas and Minutes

REGIONAL DISTRICT OF NORTH OKANAGAN

NORTH KALAMALKA LAKE
WATER SOURCE INTAKE PROTECTION PLANNING
TECHNICAL ADVISORY COMMITTEE

Wednesday, June 19, 2013 - 8:30 am – 3:30 pm

LOCATION: COUNCIL CHAMBERS,
DISTRICT OF COLDSTREAM MUNICIPAL HALL
9901 KALAMALKA LAKE ROAD

AGENDA

A. 8:30am - 9:00am

Welcome and Introductions

- Renee / John will provide opening comments and a brief overview of the meetings purpose and goals

Round Table Introductions

- Opportunity for participants to introduce themselves and identify their role within their organization

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B. 9:00am - 10:00am

Presentation

Renee / John - Kal Lake Source Assessment and Recommendations

- Kalamalka Lake Watershed Assessment
- Overview of the recommendations for Source Assessment
- Review identified risks to drinking water source
- Identified barriers and opportunities to manage and limit hazard exposure
- Review proposed Intake Protection Zone (IPZ)
- SHIM Mapping Study and Report Recommendations (Michelle Austin, DoC)

COFFEE BREAK – 10:00am – 10:30am (Refreshments provided)

C. 10:30-12:00

Roundtable Discussion and Analysis of Source Protection Recommendations

Facilitated Session to Review

- RDNO Planning Process, Response Alternatives
- Understanding Roles and Responsibilities with Protecting Water Quality
- Define of Key Stakeholders that can aid in implementing recommendations
- Communication Structure – Planning, Emergency Response
- Setting future goals and priorities
- Identification of key individuals and introduce Terms of Reference to develop Stakeholder Technical Advisory Committee (STAC) for North Kalamalka Water Source Protection Planning

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LUNCH - 12:00pm - 1:00pm (Lunch provided)

D. 1:00pm - 3:00pm

Facilitated Discussion - Identification of Action Items Required to Address Source Protection Recommendations

Goal – Development of Basic Action Plan and Identification of Opportunities
Identify and review major and minor action items and other initiatives to address key recommendations

- Set Priorities
- Estimate Timeline
- Identify Responsibilities
- Estimate Cost and Review Budget Implications
- Identify Opportunities for Streamlining Process
- Other related items for discussion (open to all meeting participants)

E. 3:00pm – 3:30pm – Other Items - Final Discussions & Wrap Up

- Facilitator to provide overview of meeting, and identify accomplishments
- Set meeting date for STAC - fall 2013

F. 3:30pm - ADJOURNMENT

REGIONAL DISTRICT OF NORTH OKANAGAN

Minutes of the meeting for **NORTH KALAMALKA LAKE WATER SOURCE INTAKE PROTECTION PLANNING COMMITTEE** held in the Council Chambers at the District of Coldstream on Wednesday, June 19, 2013 at 8:30 a.m. – 3:30 p.m.

Attendees:	Brooke Marshall	City of Vernon (CoV)
	Erik Lachmuth	Ministry of Environment (MoE)
	Gordon Moseley	Interior Health (IH)
	Greg Tegart	Ministry of Agriculture (MoA)
	Kandis Lipsett	Ministry of Environment (MoE)
	Maria Besso	Society for the Protection of Kalamalka Lake (SPRKL)
	Michelle Austin	District of Coldstream (DoC)
	Mike Baker	District of Coldstream (DoC)
	Mike Reiley	District of Coldstream (DoC)
	Mike Reiner	Ministry of Environment (MoE)
	Mike Sokal	Ministry of Environment (MoE)
	Patti Meger	District of Lake Country (DLC)
	Sonya Campbell	Ministry of Forests, Lands and Natural Resource Operations MFLNRO)
	Kathy Porter	**Facilitator**, Summit Environmental Consultants Ltd.
Staff:	Renee Clark	Water Quality Manager, RDNO
	John Bartell	Engineering Technologist, Water, RDNO
	Kelly Kirkland	Sr. Clerk Engineering, RDNO (taking minutes)

The meeting was called to order at 8:45 a.m. These notes represent a brief summary of the issues discussed at the meeting and may not include remarks from all participants.

Introductions

The meeting began with the introduction of participants. Individual interests are summarized below:

Fish passages / culverts	MOA (Livestock)
SPRKL (Riparian areas, wetlands, source of volunteers, funding available for sampling	Repository for data, drinking water safety, septic systems (failed septic systems records, etc
Best Management Practices for ranch, cattle ranges, mapping creeks and monitoring creeks and tributaries, gathering data i.e. Noble Canyon and its user recreation groups	OCP and planning issues, water licences for wells, BC Water Research Data
Aquifers affecting the north end of Kal Lake, spring/fall sampling on Coldstream Creek (bacteria), water quality objectives	Mitigation projects on Kal Creek to balance and monitor for Vernon Creek and ground water influence
Projects which may impact District of Lake Country project	Railway spills, resources, fuels, properties of transportation) – Counterpart research in CN and utilizing resources, costly booms, identifying water intakes and spawning grounds
SHIM project is a good resource	Land use is timely, servicing bylaws, etc.)
Lavington wetlands to improve Coldstream Creek, years	Organic recycling, agricultural waste control

of reports and studies, Shuswap Lake Integrated Planning Process SLIPP committee formed a good resource for looking at recreational use on Shuswap and Okanagan Lakes	Regulations – two years away

Kal Lake Source Assessment Report
Presented by R. Clark and J. Bartell

Report prepared by H. Larratt.
Key issues:

- Kalamalka Lake Watershed Assessment
- Overview of the recommendations for Source Protection
- A review of identified risks to drinking water source
- Identified barriers and opportunities to manage and limit hazard exposure
- A review of the proposed Intake Protection Zone (IPZ)
- SHIM Mapping Study and Report Recommendations (which M. Austin of the DoC spoke briefly on)
- The Greater Vernon Watershed (GVW) was formed by merging three municipal water utilities in 2003T, and now services over 50,000 domestic and agricultural customers under the RDNO Permit to Operate.

Kal Lake Source Assessment Report Discussion:

- The need to acquire available studies and understand land use and governance
- Kirkland Drive was noted as an area of concern – need to establish a sampling site
- Sensitive Habitat Inventory Mapping (SHIM) project was a partnership with the RDNO and utilized a grant from the Okanagan Basin Water Board (OBWB) in 2009
- SHIM standard mapping of creeks identifies spawning, channelized areas, retaining walls, obstructions, points of interest, etc.
- Out of the SHIM Report, three key issues were identified:
    1. GIS was used to keep an accurate record of baseline data
    2. Estimation of average setbacks was determined
    3. Excessive erosion was identified at 22 key sites identified (including 11 as priorities for restoration)
- Funding for various projects such as a storm water grant from the MoTI for the DoC may be available.
- DoC has recently constructed a bio-swale
- The Farmland Riparian Integrated Stewardship Program (FRISP) has been looking at ways to work together with the Coldstream Ranch.

Source Protection Planning Discussion:

- Challenges, communication
- Roles, responsibilities and jurisdictions
- Drinking Water Act, other Acts and Regulations
- Strong relationships, negotiations, fostering leadership and promoting local champions
- Land use decisions that augment source protection initiatives
- Leadership and local champions
- Building public and political support
- Communication
- Increasing the use of education and outreach initiatives

- A GVW requirement to focus on the 12 recommendations in the report
- Water sources in this area, conservation of water through metered domestic and irrigated water and metered Industrial, Commercial, Institutional (ICI) properties.

Stakeholder Technical Advisory Committee:
Identification of key individuals to develop (STAC) for North Kalamalka Water Source Protection Planning

- Agricultural Land Commission (ALC regulations)
- OBWB – Development of water management plan
- Trail riding recreation groups as yet to be identified
- First Nations / Okanagan Indian Band (land use)
- Southern Interior Drinking Water Team (SIDWT)
- Transport Canada (Kevin Woods)
- Fire Departments (Wildfires, retardants (awareness) storm drains, retardants, downstream run off of contaminated debris)
- Salmon River roundtable group
- City of Kelowna
- SHIM
- SLIPP
- Okanagan Irrigation Management (OKIM)
- RDNO Regional Growth Strategy Committee
- RDNO Agricultural Advisory Committee
- Environmental Farm Planner (Mr. Campbell) study of focussing on riparian streams
- Ducks Unlimited
- Propriety (contact: Pete Wise, Wildlife Officer)

Governance Recommendations and Challenges:

- Licenses of occupation
- Protect intake
- Transport Canada – activities on the lake
- Front counter – first point of action
- Docks around licensed by MFLNRO / DFO referrals out to other ministries
- Where does DoC fit in? Zoning authority extends out into the lake so that DoC can regulate activities on the lake but cannot regulate the water nor interfere with navigation.
- DoC's W1 zoning in bylaw – private prop owners who want a dock associated with residential use. W2 zone is a higher level use for commercial upland land owners, more activities, rental of boats, and marinas. Grey areas are regulatory authorities. Noise issues (i.e. party boats stereo system by bylaw), DoC cannot regulate boat operation with respect to boats with no mufflers
- Jurisdictional issues around buoys (sample: Shuswap Lake). No funding resources to enforce or funding to manage. K. Lipsett will meet with marina managers to provide awareness and recommendations, etc. RDNO to develop policy or regulatory role for future proposed marinas and docks on Kal Lake

.

Priority issues for the development of a North Kalamalka Water Source Protection Plan:
Priority Issues
Of the 19 recommendations in the Assessment, 12 were selected by participants for further discussion in small working groups. Summaries are attached in Appendix "A".

Following the small working group discussions, each group presented a brief summary. Comments from the plenary discussion are included in Appendix "B"

Collaborative Governance Keys to Success:
Presented by Kathleen Porter

- International interest
- Collaborative governance
- Public process vocal
- Stakeholder private sector
- POLIS project OBWB has worked with them www.polisproject.org
- Facilitator Lead
- Inter-jurisdictional
- Community partnerships
- Pooled funding
- Defined decision process and authority
- Open communication

Follow up steps:

- Issue focused working groups
- Coldstream planning opportunities – OCP
- Terms of Reference approval and community liaison
- Send out formal invite to next session
- Pick one priority project at a time
- Determine who the participants/groups will be (OCP from all jurisdictions COV in-house)
- North Okanagan livestock groups - not just cattle associations (BC Cattlemen's Association, Vernon Riding Association, Dairy Association, etc.)
- Who is necessary? Not to duplicate tasks
- Timeline for summary report finalization in 6-8 weeks
- Concept plan organizational chart
- Agenda for workshop
- Focus and invite stakeholders
- Others come back – develop work plan and priorities
- Database organization
- Communication sharing and contacts
- Working groups and reporting back

Action items:
K. Porter to review Summary with J. Bartell
J. Bartell, R. Clark and K. Porter to review and plan next steps.

Other Items – Final Discussions & Wrap Up

- Facilitator to review Summary Notes prepared by staff.
- Set meeting date for Stakeholder Technical Advisory Committee for fall 2013

ADJOURNMENT

There being no further business, the meeting was adjourned at 3:20 p.m.

Certified Correct:

R. Clark, Water Quality Manager

Prepared by:

K. Kirkland, Sr. Clerk Engineering

RDNO - NORTH KALAMALKA LAKE WATER SOURCE INTAKE PROTECTION PLANNING COMMITTEE

June 19, 2013 at 8:30 a.m. – 3:30 p.m.

Appendix "A"

Priority items identified by meeting participants

Item 1 License of Occupation

- Could be used to protect Intake
- Front Counter BC may provide information on application process
- FLNRO – Has jurisdiction of docks, and removal of non-approved docks
- DFO (Navigable Water Act)
- Where docs DoC fit – Land use, zoning authority, has jurisdiction over lake surface, but not over vessel navigation or operation (ie. loud mufflers)
- Commercial use

Item 2 Funding

- Head lease – license of occupation
- Boating may be a potential source of funding
- Most properties around lake are connected to Sewer
- Some septic exists on properties along Coldstream Creek
- The DoC has jurisdiction in regards to storm water collection
- Infrastructure improvements

Item 3 Intake Protection Zone

- All properties within proposed Intake Protection Zone should be connected to sewer.
- All storm water outfalls should be inspected for
- Proposed Deleting: Retrofitted to meet water quality objectives? – Standards
- Bylaws should be looked at to ensure contaminates do not enter into storm drain.
- Calgary is a good example of use of Municipal Bylaws
- Education is important
- May find information within historic records – Hydro carbons / railway or historic bulk fuel areas.
- Fueling – use of bilge tanks, jerry cans (storage, or pumping stations) should be considered
- Invasive species
- Who - Lake Watch group / Navigable Transport Canada / RCMP, Homeowner Group / Boat Launches < Parks & Recreation
- Boat launch study (capacity North end of lake to launch boats
- DoC has little ability to manage capacity

Item 4 Houseboat Management / Recreation options

- Moorage buoys – Federal
- No funding – no enforcement
- Marina's docks – Local Government

Item 5 Spill Management Emergency Response & Communications

- Respondents should know who to contact, whose jurisdiction, and what is the communication plan
- Grey and black water
- Marinas (fuel)
- Obtain contact names and numbers (i.e. Provincial Emergency Response, Regional Transportation Management Centre, Coastguard for diverting traffic, flooding, fire, avalanche and spills)
- If emergency on the Lake, who would be Emergency Response contacts, Municipality, DoC Bylaw Enforcement, RCMP, Fire Hall (who is storing spill kits)?
- Succession

Item 6 Carrying Capacity

What: What is the carrying capacity of Kal Lake? Value system; How to protect lake
What: Drinking Water
Who: IHA, Municipality and RDNO
What: Riparian areas
Who: Stewardship groups
What: Recreational users
Who: Public (boaters, swimmers, fishermen, etc.)
What: Agriculture industry (quality, quantity and impact)
Who: Ranches, Dairy Associations re: irrigation,
What: What is the Carrying capacity on Coldstream Creek
What: Capacity in watershed re: number of range cattle on land. Need plan for disposal of waste or nutrients. Be able to dispose of waste product. And used as a nutrient.

Item 7 Agriculture

Who: MFLNRO, water act, licensing and tendering of livestock, harvesting and roads
Who: Municipality for RAR process, land use, zoning, water and irrigation issues Recreation Groups.
Who: MoA, land owners, fisheries act, strengthening farming act, RAR and ALC Act, GVW licensing (allocation) and Master Water Plan, Quantity, Quality and Cost of Water. Spreading of Manure, IHA and DFO
Who: MoE – Waste Management

RDNO - NORTH KALAMALKA LAKE WATER SOURCE INTAKE PROTECTION PLANNING COMMITTEE

June 19, 2013 at 8:30 a.m. – 3:30 p.m.

Appendix "B"

Comments made by Committee in regards to 12 out of the 19 Recommendations included in the Kal Lake Source Assessment Report (Report) completed by H. Larratt.

1. **INTAKE PROTECTION ZONE**
   PRIORITY rating **High**

2. **GIS MAPPING of KALAMALKA LAKE**
   PRIORITY rating **Med /Low**

   - RDNO GIS (water quality studies) - one location of data
   - OKIM has inventoried agricultural uses (crop types, etc.)
   - RDNO Planning group
   - Whose connected (septic)
   - Kelowna soil & maps

3. **CLEAN UP PREPAREDNESS**
   PRIORITY rating **High**

   - Establish protocols
   - Preventing clean up contamination

4. **INFORMATION EXCHANGE**
   PRIORITY rating **High /Moderate-Ongoing**

   - Faster warning of turbidity spikes, contamination events and algae blooms
   - Obtain contacts

5. **STORM WATER OUTFALL IMPROVEMENTS**
   PRIORITY rating **High**

   - Prevent contamination
   - OCP planning
   - Bylaws
   - Retrofit expensive
   - RDNO has identified top 5 areas
   - Identify problems and share with stakeholders

6. Discussion with RAILWAY on Potentially Hazardous Goods

PRIORITY rating **High**

- Communications
- Identify contaminants
- Scheduling

7. PUBLIC EDUCATION

PRIORITY rating **High**

- Engage the public (lakeside and creek side property owners)
- Storm water
- Signage
- Media release
- Identify Communication Plan required
- Schools
- GVW - Conservation, quality
- Key message for this year (communication plan)
- One valley one water
- Symbol or logos

8. PROTECT KAL FORESHORE

PRIORITY rating **Covered by other priorities**

- Increase source protection
- Incorporated in previous topics

9. DISCOURAGE WATERFOWL BEACHES / LANDFILLS

PRIORITY rating **Low**

- Preventing gulls and other waterfowl in the IPZ
- Jurisdictional issue
- Parks & Recreation addling program
- Landfill influence

10. WATERSHED CONTROL PROGRAM

PRIORITY rating **High**

- Significant improve water quality
- MOE – no tools
- Use SHIM?
- Sharing problems in watershed
- OBWB doesn't have legislation to make changes
- OBWB Water plan and under what authority?

11. <u>PROHIBIT MULTI-SLIP MARINAS WITHIN IPZ</u>

PRIORITY Rating **High** (from an issue, but not high rating from an implementation perspective)

- Increase source protection
- Spill protection
- Boat storage
- Education of the development community
- Bylaw / planning / environmental
- Location in one area (viewscapes, fisheries, etc.)

12. <u>ANNUAL OVERVIEW OF CHANGES TO NORTH ARM, KAL LAKE</u>

PRIORITY Rating **Moderate**

- Knowledge of changes to aid planning
- Processing applications and compliance
- Illegal locks / mooring buoys

REGIONAL DISTRICT OF NORTH OKANAGAN

NORTH KALAMALKA LAKE
WATER SOURCE INTAKE PROTECTION PLANNING
TECHNICAL ADVISORY COMMITTEE

Thursday, September 4th: 9:00 am – 3:30 pm

LOCATION: COUNCIL CHAMBERS,
DISTRICT OF COLDSTREAM MUNICIPAL HALL
9901 KALAMALKA LAKE ROAD

AGENDA

A. Welcome and Introductions
9:00am - 9:10am

Renee – Chair, Opening comments
John – Coordinator, Brief overview of the meetings objectives and goals

Round Table Introductions

Opportunity for participants to introduce themselves and identify their role within their organization

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B. Presentation - Water Quality Coldstream Creek and Kalamalka Lake
9:15am – 9:45am

- Health Risk Monitoring Outcomes
- Water Quality Monitoring of Kalamalka Lake and Coldstream Creek
- Bacterial Source Tracking Study Results
- Filtration Exclusion

C. Kal Lake Source Assessment and Recommendations
9:50am – 10:15am

- Introduction of Draft Source Assessment Response Plan

Coffee Break – 10:15am – 10:30am (Refreshments provided)

D. Analysis of Response Plan Action Items
10:30-12:00

SMART PRINCIPLE - *Specific, Measurable, Achievable, Realistic, Time bound*

- **Committee**: to provide comments either verbal (captured by scribe) or written on comment forms provided.

Lunch - 12:00pm – 12:45 pm (Lunch provided)

E. 12:45 pm – 2:30 pm

- Continuation of the Source Assessment Response Plan action items, and assigned responsibility timeline and cost

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F. Other Items - Final Discussions & Wrap Up
3:00pm – 3:30pm

- Coordinator to provide overview of meeting and identify proposed changes to draft plan
- Set meeting date for TAC – Spring 2015

G. Adjournment
3:30pm

REGIONAL DISTRICT OF NORTH OKANAGAN

NOTES of the **NORTH KALAMALKA LAKE WATER SOURCE INTAKE PROTECTION PLANNING TECHNICAL ADVISORY COMMITTEE** of the **REGIONAL DISTRICT OF NORTH OKANAGAN** held in the Council Chambers, District of Coldstream office on Thursday, September 4, 2014.

Members:	T. Koch	SPrKL
	T. Osborn	Coldstream Ranch
	G. Tegart	Ministry of Agriculture
	B. Recksiedler	Ministry of Agriculture
	B. Kirkland	Kalamalka Fly Fishers Club
	P. Meger	District of Lake Country
	R. Miles	City of Vernon
	M. Reiley	District of Coldstream
	M. Baker	District of Coldstream
	J. Lasuik	Ministry of Environment
	D. Oswell	Friends of Kalamalka Park
	J. Glaspie	Officer of Recreation, FLNRO
	S. Campbell	FLNRO
	G. Moseley	Interior Health
Staff:	R. Clark	Water Quality Manager
	J. Bartell	Engineering Technologist
	J. Miles	Water Sustainability Coordinator

CALL MEETING TO ORDER

The meeting was called to order at 9:04 a.m. by R. Clark.

Welcome and Introductions

Round Table Introductions - opportunity for participants to introduce themselves and identify their role within their Organization.

Opening comments – R. Clark

Brief overview of the meetings objectives and goals.

Presentation - Water Quality Coldstream Creek and Kalamalka Lake – R. Clark

- Source Protection Challenges
- Health Risk Monitoring Outcomes
- Water Quality Monitoring of Kalamalka Lake and Coldstream Creek
- Bacterial Source Tracking Study Results
- Filtration Exclusion

Presentation Questions/Comments:

- Key human-related issues – horse related E. coli, Stormwater at outfalls 13/14/18 near Kal Beach and from lands below Okanagan College (residential, highway); pollution in Coldstream Creek (high nitrate/phosphorus levels, E. coli near Kirkland and Howe especially during snowmelt period)
- Critical WQ seasons – Feb. /March and Sept./Oct.
- Is 35m intake feasible? R. Clark indicated yes but IPZ would need to be re-evaluated.
- How is marling measured to provide indicator of whether UV treatment will be impacted by turbidity increase? UV transmissivity is measured to indicate treatment success.
- Instead of intake extension, has moving the pump house further south on lakeshore been examined to remove urban influence? Need cost evaluation to compare land purchase and construction of new pump house versus extending intake pipe. Or possibility to have 2 intakes alternating operations, 20m intake could be turned off for periods of high turbidity.
- Filtration process - and by extension, costs - dependant on initial water quality/treatment prior to water being filtered.
- Monitoring – is GVW confident in data quality? GVW would like more support from MoE, especially in investigation into what causes pollution spikes. E.G. investigate improved manure management, not spreading on frozen ground or during quick melt periods. School Road to Howe Drive has 60-70% of cultivated areas (on south facing slopes-fast melt in afternoon) so may need more sampling sites in that area. Need to investigate retention sites to slow melt, assess impact of retention sites on watershed hydrology downstream.
- Is filtration at mouth of creek a possible solution to improving lake water quality? Challenging to treat all outflows into lake. Need to deal with in-stream water quality.

Kal Lake Source Assessment and Recommendations – J. Bartell

- Introduction of Draft Source Assessment Response Plan

Analysis of Response Plan Action Items

SMART PRINCIPLE - *Specific, Measurable, Achievable, Realistic, Time bound*

- **Committee**: to provide comments either verbal (captured by scribe) or written on comment forms provided. Committee members are welcome to include comments from other people in their organization on Action Items and to recommend other Action Items specific to their organization. Please submit by **October 3, 2014**.

- Continuation of the Source Assessment Response Plan action items, and assigned responsibility timeline and cost – see Excel matrix file.

Final Discussions & Wrap Up

- Coordinator to provide overview of meeting and identify proposed changes to draft Plan

- Set meeting date for TAC – **early March 2015**

ADJOURNMENT

There being no further business the meeting was adjourned at 3:25 p.m.

CERTIFIED CORRECT

Jennifer Miles
Water Sustainability Coordinator

Renee Clark
Water Quality Manager

APPENDIX 2: STAC Terms of Reference

REGIONAL DISTRICT OF NORTH OKANAGAN

Terms of Reference
Kal Lake/ Coldstream Creek Watershed Protection
And Assessment Response Planning Committees

Background

As stated by the Okanagan Basin Water Board "Clean Water is the most precious natural asset in the Okanagan and is essential to the beauty of our landscapes, healthy economy and the well being of our citizens".

On November 29, 2011 Greater Vernon Water (GVW) provided Interior Health (IH) with the Source Water Assessment for the North Kalamalka Lake Intake (the Assessment) in response to the terms and conditions in the Drinking Water Quality Improvement Program Conditions on Permit. To complete this Condition on Permit – GVW must provide an Assessment Response Plan. This implementation stage will be the key to a successful Source Water Protection Plan (Plan)

The Plan is intended to be a framework and guide designed to achieve a desired watershed condition through the cooperation of key stakeholders, community groups and community members. The only way the plan will work is if all the stakeholders and the public see themselves as partners with a common goal. Stakeholder meetings are to be collaborative planning rather than conflict resolution**,** will increase knowledge of all stakeholders and find creative yet sound ways to move forward with the recommendations in the Assessment.

Scope

The planning process will assist in meeting the Condition on Permit which is to provide an Assessment Response Plan for the Kalamalka Lake Intake. It will also provide a means to accomplish recommendations from other technical documents and studies and a forum to deal with issues that arise.

This planning initiative for Coldstream Creek will cross a number of jurisdictions from the headwaters located at Silver Star Mountain (Electoral Area C) , Province of BC Crown Land, District of Coldstream, Regional District of North and Central Okanagan and District of Lake Country. The water quality impacts water licensing held by the Regional District of North Okanagan and its customers in the City of Vernon, District of Coldstream, portions of Electoral Areas B and C and bulk supply areas in Spallumcheen and Electoral Area D. Therefore, the Greater Vernon Water Advisory Committee would be given the role of review before the Plan it is forwarded to the Regional Board for approval.

In order to establish and identify the issues, potential objectives and strategies for the Kal Lake / Coldstream Creek of the Coldstream Creek an initial focus group meeting

should be held with Ministries and municipalities as a fact finding exercise. It will provide the opportunity to examine past projects, studies and research, of the watershed and develop a gap analysis (What is known and what is unknown) to make good decisions. It is proposed that this focus group be held in October or November of 2012.

The next step will be to form a Stakeholder Technical Advisory Committee whose role will be to guide development of the plan and advise and provide recommendations to the Greater Vernon Advisory Committee.

1. Composition of Stakeholder Technical Advisory Committee (STAC)

The STAC for this plan should include representation from all stakeholder agencies that will be responsible for implementation of the plan. It shall be composed of representatives from Provincial and Federal Ministries including Ministry of Transportation, Ministry of Environment - Conservation and Enforcement and Water Stewardship, Ministry of Agriculture, Ministry of Forest Lands and Natural Resource Operations – range, roads, forestry and recreation, the Coldstream Ranch, Railway (Knighthawk Rail), Interior Health - Drinking Water Officer, City of Vernon staff, District of Coldstream management and or staff (Engineering and Planning) and Regional District management and staff. There will be three public representatives' upon invitation or application - water stewardship groups, community groups, chamber of commerce and or interested citizens.

Information from meetings will be provided to members of the STAC even if the member is not able to attend. The committee may be expanded as needed to suit the implementation matter at hand.

2. Role of the Stakeholder Technical Advisory Committee (STAC)

1.1 The role of the TAC is to provide the Regional District of North Okanagan/ Greater Vernon Water and staff with comments and recommendations on objectives, strategies, policies, and land use legislation that may be considered to protect water quantity and quality and the implementation of the protection plan. The STAC will also work collaboratively with the Water Quality manager and staff on:

1.1.1 Provide advice (i.e. bulletins, posters, signage, website links and presentations) aimed at raising awareness of source water protection and the effects of land use on water quality and quantity.

1.1.2 Acting as a resource for RDNO/GVW management and staff for integrated resource management as well as a liaison to the ministry, licensee, public or private industry or activity they represent.

1.1.3 Identifying opportunities that may be available through other agencies or programs to implement strategies to protect source water and water quality/ quantity.

1.1.4 Identifying threats that may delay or impair the implementation of the protection plan.

1.1.5 Developing collaborative solutions that follow SMART (Specific, Measurable, Achievable, Realistic, Time- Bound) principles.

3. Chairperson of Committee

3.1 The Chairperson shall be Regional District of North Okanagan staff or management.

4. Meetings of the Committee

4.1 The Committee will meet two (2) times per year. The first meeting held in February is review previous years reports, to develop actions for the coming year and to capture some of the grant applications, etc (Members to provide information/report to chairperson in December). Second meeting in later September, early October will provide feedback from actions and projects.

5. Order of Business

5.1 The order of business will be indicated in the meeting agendas.

5.2 Agendas will be prepared by the Chairperson and provided to the group fourteen (14) days in advance of the next meeting date.

6. Record of Meetings

6.1 Regional District staff will be responsible for preparation of the records of all Committee meetings.

6.2 Records and all related documents shall be available thirty (30) days following the meeting.

7. Conduct of Members at Meetings

7.1 Committee members are expected to be respectful of one another and to offer input and suggestions that are relevant, constructive and productive.

7.1.1 Members should be committed to providing advice focused on developing recommendations.

7.1.2 Members will respect the ideas, concerns and opinions of others.

7.1.3 Everyone will have an opportunity to speak, but only one person shall speak at a time. There will be a timekeeper to ensure all persons concerns are heard within allotted time.

8. Reporting

8.1 Annual reports should be available to the Stakeholder Technical Advisory Committee thirty (30) days prior to the first meeting of the year as per criteria as outlined by RDNO.