MEMORANDUM

Date: April 24, 2017

To: Cindy Meays
   Deputy Director
   Environmental Protection Division
   Ministry of Environment

From: Nicole Pyett, M.Sc., P.Geo.
   Regional Hydrogeologist
   Ministry of Forests, Lands and Natural Resource Operations

RE: Memorandum regarding the April 11, 2017 site inspection in Hullcar, BC

Background

An untreated water sample collected from the Steele Springs Waterworks community water supply system (Steele Springs) on March 20, 2017 by the Ministry of Environment was found to contain an E. Coli count of 49 CFU/100mL. This prompted the Hullcar Inter-Ministry Working Group to request Ministry of Forests, Lands and Natural Resource Operations (FLNRO) Regional Hydrogeologist, Nicole Pyett, FLNRO Groundwater Protection Officer, John Pogson, and Ministry of Environment (ENV) Environmental Protection Officer, Devan Oldfield, to attend the Hullcar area. The purpose of the visit was to assess the nearby land surface, inspect existing wells, and observe the Steele Springs water system to establish any factors that may contributing to the elevated E. coli levels.

N. Pyett, J. Pogson, and D. Oldfield attended the site on April 11, 2017 and were accompanied by FLNRO Natural Resource Officers: Don Lemp, Tammy Jones, Dan Krywonos, and Samuel Isaak; to increase team capacity and provide an opportunity for groundwater cross-training.
Project Scope

The scope of this site visit was limited to:

1. A visual inspection of the Steele Springs water intake line and collection point;
2. A ground surface inspection focused along the ridge of the re-entrant (draw) containing the Steele Springs collection point; and,
3. Inspections of known wells within 0.5 km of the Steele Springs intake.

A site map is provided as Figure 1 below.

Observations

1. A visual inspection of the Steele Springs intake line and collection point

Steele Springs board members Brian Upper and Murray Todd received provincial government staff at the Steele Springs pump house along Schubert Road. D. Oldfield collected a water quality sample consistent with the previously employed sampling methodology for a standardized list of water parameters. N. Pyett and J. Pogson were guided by M. Todd from the pump house, upgradient along the supply line, to the point of collection. N. Pyett and J. Pogson inspected the supply line for any potential points of entry for contaminants (Figure 2). The supply line is comprised of segmented PVC piping, with friction fitted joints, placed along the bed of the re-entrant. The supply line was in direct contact with surface water and sediments in many areas. One joint appeared to have space for water entry as the friction fitting was cross-loaded to allow the pipe to fit the desired route up the re-entrant (Figure 3). Several joints were buried below the surface and were therefore not available for visual inspection (Figure 4).

Approximately two thirds of the way up the re-entrant from the pump house to the intake point, provincial staff observed two overflow ports that were open to the air (Figure 5). Water was flowing rapidly from the downgradient port but was only dripping from the upgradient port. While these ports are open, it does not appear as though the water level has been high enough within the re-entrant to allow surface water to flow back into the supply line. Two intentional cross connections built into the system between the main supply line and secondary piping were observed to be closed at the time of inspection (Figure 6).
The system intake was described by B. Upper as a screened pipe buried into 1.5 m (5 feet) of sediment, consistently experiencing positive pressure flow conditions. The intake pipe is located within a shallow concrete building with footings approximately 0.6 m (2 feet) below the ground surface (Figure 7). The intake was observed to be located in the lowest point of the re-entrant allowing surface water to potentially pool against the protective building or the intake to receive upgradient shallow flow (Figure 8). Surface soils were wet upgradient of the intake, possibly from surface flows occurring during recent rains.

2. A ground surface inspection focused along the ridge of the re-entrant (draw) containing the Steele Springs collection point

There were no large holes, channels, or excavations on the ground surface near the Steele Springs intake. Coarse sediments (primarily sands) were visible at the ground surface. There was manure observed on the ground surface within an approximately 0.5 km upslope from the collection point. The age of the manure is unknown.

3. Inspections of nearby wells

Wells within an approximately 0.5 km horizontal distance upgradient from the Steele Springs intake were identified using the water wells layer within provincial mapping software, iMapBC. This setback was selected to focus available provincial staff capacity in the vicinity of the water sample collection point reporting observed E. Coli contamination.

Well registration with the BC Ministry of Environment has historically been voluntary within British Columbia. In addition to nine registered wells, one unregistered well was identified within the area of interest. Other wells may exist but were not observed during the April 11, 2017 field visit.

Four of the registered wells had previously been inspected by provincial groundwater staff and were found to be compliance with Part 3, Division 3 of the Water Sustainability Act (WSA) and the Groundwater Protection Regulation (GWPR). The five additional wells plus one unregistered well were inspected to ensure they were not creating points of entry for contaminants to move from the ground surface into the surficial aquifer. Provincial staff also visualized eight other light blue or orange coloured pipe stickups at
beyond the inspection radius at distances of approximately 0.5 – 1.0 km to the Steele Springs intake (Figure 9). They are likely part of an irrigation water distribution system and were not open to surface at the time of the site visit.

Well inspection results:

The unregistered well (Well inspection 1 below) was found to be likely out of compliance with the Groundwater Protection Regulation but was deemed not likely a significant potential cause of surface contamination to the aquifer due to the nature of the construction of the well pit and the lack of pooling water around the wellhead.

Four of the registered wells (Well inspections 2 – 5 below) were found to be constructed and maintained in a sanitary manner, and were deemed not likely a cause of surface contamination introduction into the aquifer.

The fifth registered well (Well inspection 6 below) was found to be constructed in a sanitary manner but was located in a close proximity to a horse enclosure. The well construction and grading around the wellhead indicates this well is not a significant potential hazard to surficial aquifer water quality.

Well inspection summaries and supporting figures are found below. The original well inspection forms are included in this memorandum as Appendix A.

Well Inspection 1 (Figure 10)

No Well Tag Number or Well Identification Plate

Observations:

- Approximately six inch well located in a well pit with a pressure tank and distribution line;
- Dripping observed from distribution line;
- Coarse sand floor with no standing water;
- Stick up on well pit preventing direct surface flows into well pit;
- No visible well plate; and,
- Unknown if the well is currently in use.

Follow-up:

J. Pogson to contact well owner to establish well status and have well brought into compliance with Part 3, Division 3 of the WSA and the GWPR.

**Well Inspection 2 (Figure 11)**

Well I.D. Plate No. 25853

Observations:

- Outside irrigation well;
- Appropriate grading around wellhead;
- Appears sanitary; and,
- Back check value on distribution line.

Follow-up:

J. Pogson to establish ownership and provide well inspection documentation to the well owner.

**Well Inspection 3 (Figure 12)**

Well I.D. Plate No. 25852

Observations:

- Outside irrigation well;
- Appropriate grading around wellhead;
- Appears sanitary; and,
- Back check value on distribution line.

Follow-up:
J. Pogson to provide well inspection documentation to the well owner.

Well Inspection 4

**Well Tag Number 31548**

Observations:
- 4.5 inch domestic well in a locked, concrete floored well house;
- No foreign matter found in the well house; and,
- Good drainage around the well house.

Follow-up:

J. Pogson to provide well inspection documentation to the well owner.

Well Inspection 5 (Figure 13)

**No Well Identification Plate**

Observations:
- Outside irrigation well;
- Appropriate grading around wellhead;
- Appears sanitary; and,
- Pressure value on well read “0” at time of visit.

Follow-up:

J. Pogson to provide a Well Identification Plate and well inspection documentation to the well owner.

Well Inspection 6 (Figure 14)

Domestic well
No Well Identification Plate
Observations:
- Outside with appropriate stickup and grading at ground surface;
- Within two metres of a fenced horse pen; and,
- No manure observed immediately adjacent to the well.

Follow-up:

J. Pogson to provide a Well Identification Plate and well inspection documentation to the well owner as well as recommend further separation between the wellhead and the horse enclosure.

Discussion

There were no notable changes (i.e. natural or man-made holes, surface channeling from ground surface manipulation or concentrated storm runoff, recent building/paving/ground surface adjustments, etc.) observed along the ground surface upgradient of the Steele Springs intake that would indicate a recent change in conditions was responsible for the high E.Coli count observed in the Steele Springs system.

Wells inspected during the site visit did not appear to create unsanitary conditions to support entry of contaminants into the surficial aquifer.

The Steele Springs intake itself is located in the bottom of a re-entrant (draw), reportedly drawing water from a depth of 1.5 m (five feet) below the ground surface. There is a potential for this intake to be receiving percolating surface water as well as water from the surficial aquifer. There are also locations along the supply line (e.g. open over-flows and pipe joints) that may allow surface contaminants to enter the system.

It should be noted that manure was observed on the ground surface within a 0.5 km linear distance of the Steele Springs water intake. The age of the manure is unknown. Given available information, provincial staff find it likely that the elevated E. coli counts could be directly from the surficial aquifer or from the interception of percolating surface water by the intake point.
**Next steps**

Groundwater staff will follow up on any compliance or reporting requirements associated with the well inspections.

This memorandum will be distributed to members of the Hullcar Inter-Ministry Working Group for their consideration and applicability to the management of this file in their subject matter areas.

**Closure**

Please send any questions or comments regarding the contents of this report to Nicole.Pyett@gov.bc.ca.

Kind regards,

Nicole Pyett, M.Sc., P.Geo.
Regional Hydrogeologist, Groundwater Science, South Area
Ministry of Forests, Lands and Natural Resource Operations
Figure 1: Site map
Figure 2: Supply line from the Steele Springs intake to the pump house. The photo direction is up the re-entrant (draw) to the North-West. Photo taken on April 11, 2017.
Figure 3: Supply line above the bed of the re-entrant (draw). Spaces in jointing may allow surface contaminants to enter the supply line in some circumstances. Photo taken on April 11, 2017.
Figure 4: Jointed supply line positioned into the hillside on approach to the Steele Springs collection point. Photo taken on April 11, 2017.
Figure 5: Supply line from the Steele Springs intake to the pump house (blue) and a secondary line (overflow?). The downgradient overflow port (open to air) installed into the supply line is indicated with an arrow. The photo direction is up the re-entrant (draw) to the North-West. Photo taken on April 11, 2017.
Figure 6: Connection between the supply line from the Steele Springs intake to the pump house (blue) and a secondary line (overflow?). The cross connection was shut at the time of the photo taken on April 11, 2017.
Figure 7: The Steele Springs collection point. Board member Brian Upper indicated the screen intake and the building footings are approximately five feet and two feet into the sediments, respectively. Photo taken on April 11, 2017.
Figure 8: The upgradient side of the protective building over the intake point. The ground surface was observed to be damp during the April 11, 2017 site visit.
Figure 9: Irrigation system (?) infrastructure beyond area of interest. Photo taken on April 11, 2017.
Figure 10: Well inspection 1. Photo taken on April 11, 2017.
Figure 11: Well inspection 2. Photo taken on April 11, 2017.
Figure 12: Well inspection 3. Photo taken on April 11, 2017.
Figure 13: Well inspection 5. Photo taken on April 11, 2017.
Figure 14: Well inspection 6. Photo taken on April 11, 2017.
Appendix A: Well inspection reports
**MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS**

**Inspection Date (YYYY/MM/DD) / Time (hh:mm):** 2017/04/11

**Inspector:** NICO FEHR / TAMMY DUNES

**Site or water system name:** PRIVATE WELL

**Well owner:**

**Phone No.:**

**Mailing address:** ARMSTRONG, BC

**Site contact:**

**Phone No.:**

**Site coordinates (NAD 83, Zone & UTM or Lat/Long ddd.ddddd):** 11U 242693E 5597775N

**Location address:** A6 ABOVE - SECONDARY HOUSE

**Legal property description (e.g. PID, lot):** 40 025 315 007

**Well location description:** JUST SOUTH OF FENCE LINE AROUND 50' PROPERTY YARD. PIT COVERED WITH FRAMED METAL ROOFING.

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**PHOTOGRAPHS TAKEN:** Yes □ No

**ISSUES IDENTIFIED FOR FOLLOW UP BASED ON WATER SUSTAINABILITY ACT & GROUNDWATER PROTECTION REGULATION REQUIREMENTS:**

**Well inspection Form V 3.1 June 2016**
COMMENTS & RECOMMENDED ACTIONS: WELL WAS LOCATED IN AN APPROXIMATELY SIX FOOT DEEP WELL PIT. INSPECTION WAS VISUALLY COMPLETED FROM SURFACE. WELL IS NOT REGISTERED & MAY NOT CURRENTLY BE IN USE. WELL PIPING APPEARED TO BE LEAKING. COULD NOT VISUALIZE CAP. FLOOR OF WELL PIT IS COARSE SEDIMENTS & POOLING WATER.

JOHN FORSON (GWO) TO FOLLOW UP RE: IN USE? IN COMPLIANCE? TO SUBMIT A COPY OF THE WELL INSPECTION REPORT TO THE WELL OWNER.

FLNRO Regional Office contact info:
[Signature]

Inspector Signature

Government of British Columbia Water Website: www.gov.bc.ca/water

Diagram/Site pictures:
MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS

Inspection Date (YYYY/MM/DD) / Time (hh:mm) : 2017/04/11

Site or water system name: PRIVATE WELL

Well owner: [Redacted]

Mailing address: [Redacted]

Site contact: [Redacted]

Site coordinates (NAD 83, Zone & UTM or Lat/Long ddd.ddddd): 114 342679E 5597701N

Location address: AS ABOVE

Legal property description (e.g. PID, lot): PID 025 31D 667

Well location description: S.W. CORNER OF 197.0 M UTILITY OF DRIVEWAY

Well Tag Number 1

Well ID Plate No. 25853

ID plate location [Redacted]

Construction date

Construction method

Class of well

Subclass of well

Driller name

Driller company

Driller registered [Redacted]

Driller class [Redacted]

Pump installer name

Pump installer company

Pump installer registered [Redacted]

Well Tag Number 1

Active [Redacted]

Well head location Outside

Well pit drained [Redacted]

Estimated distance to nearest water well [Redacted] m

Secure well cap/cover Yes

Type of cap [Redacted]

Well depth (below ground surface) [Redacted] m [Redacted] ft

Well diameter [Redacted] cm [Redacted] inches

Casing stick-up [Redacted] cm [Redacted] inches

Pumping rate (if known) [Redacted] USgpm 1gpm L/s L/min m³/d

Surface seal Yes

Well maintenance

Flowing well Yes

Photographs taken: Yes No

Issues identified for follow up based on Water Sustainability Act & Groundwater Protection Regulation requirements: [Redacted]

Well inspection Form V 3.1 June 2016
COMMENTS & RECOMMENDED ACTIONS: unnumbered list Cap.
BACK CHECK VALVE IN PLACE.

FLNRO Regional Office contact info:

Inspector Signature

Government of British Columbia Water Website: www.gov.bc.ca/water

Diagram/Site pictures:

Original to File / Copy to – circle all that apply:
Copy Hand Delivered to Well Owner / Site Contact / Contractor / Environmental Health Officer: YES NO
Copy Mailed/Emailed to Well Owner / Site Contact / Contractor / Environmental Health Officer: YES NO

Well Inspection Form V 3.1 June 2016
**MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS**

**Inspection Date (YYYY/MM/DD) / Time (hh:mm):** 2017/02/11 12:00  
**Inspector:** DEVAN D'.FIELD / NICOLE Z. F.ER

**Site or water system name:** PRIVATE WELL

**Well owner:** [Redacted]  
**Phone No.:** [Redacted]

**Mailing address:** [Redacted]  
**Phone No.:** [Redacted]

**Site contact:** [Redacted]  
**Phone No.:** [Redacted]

**Site coordinates (NAD 83, Zone & UTM or Lat/Long ddd.ddddd):** 11W 34 2430 E 55 7771 N

**Location address:** [Redacted]

**Legal property description (e.g. PID, lot):** 075 318 730

**Well location description:** SOUTH END OF PROPERTY ALONG SCHUBET ROAD.

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¹Attach well construction record (if available) ²If work supervised by a registered person, provide name of supervisor

**PHOTOGRAPHS TAKEN:** □ YES □ NO

**ISSUES IDENTIFIED FOR FOLLOW UP BASED ON WATER SUSTAINABILITY ACT & GROUNDWATER PROTECTION REGULATION REQUIREMENTS:**  
□ YES □ NO

Well Inspection Form V 3.1 June 2016
FLNRO Regional Office contact info:

Inspector Signature

Government of British Columbia Water Website: www.gov.bc.ca/water

Diagram/Site pictures:
MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS

Inspection Date (YYYY/MM/DD) / Time (hh:mm): 2017-04-11 Inspector: DAN KEYDON

Site or water system name: PRIVATE WELL

Well owner: ___________________________ Phone No.: ___________________________

Mailing address: ___________________________

Site contact: AS ABOVE Phone No.: ___________________________

Site coordinates (NAD 83, Zone & UTM or Lat/Long ddd.ddddd): 11U 342 458E 559 7747N

Location address: ___________________________

Legal property description (e.g. PID, lot): PID 011 3140 054

Well location description: NORTH WEST SIDE OF PROPERTY ALONG SKYBUSTER RD.

Well Tag Number
Well ID Plate No. ___________________________

ID plate location: □ Attached to casing □ Other ___________________________

Construction date ___________________________

Construction method ___________________________

Class of well ___________________________

Subclass of well ___________________________

Driller name ___________________________

Driller company ___________________________

Driller registered: □ Yes □ No □ Supervised

Driller class: □ Water well □ Geothermal/Geothermal/Environmental

Pump installer name ___________________________

Pump installer company ___________________________

Pump installer registered: □ Yes □ No □ Supervised

Well Tag Number: ___________________________

Well status: □ Active □ Deactivated □ Decommissioned

Well head location: □ Outside □ Pump house □ Pit □ Other See comments

Well pit drained: □ Yes □ No See comments

Estimated distance to nearest water well: 15 m

Secure well cap/cover: □ Yes □ No See comments

Type of cap: □ Sanitary seal □ Bolted (pitless adapter style) □ Other (e.g. hand pump) See comments

Well depth (below ground surface): __________ m __________ ft □ Unknown

Well diameter: __________ cm __________ inches

Casing stick-up: __________ cm __________ inches

Pumping rate (if known): __________ USgpm __________ L/s __________ L/min __________ m³/d

Other: (circle correct units)

Surface seal: □ Yes □ No □ Unknown See comments

Clear access to well: □ Yes □ No See comments

No foreign matter stored within 3 m

Grading promotes drainage away from wellhead

Flowing well: □ Yes □ No See comments

PHOTOGRAPHS TAKEN: □ YES □ NO

ISSUES IDENTIFIED FOR FOLLOW UP BASED ON WATER SUSTAINABILITY ACT & GROUNDWATER PROTECTION REGULATION REQUIREMENTS:

□ YES □ NO

Well Inspection Form V 3.1 June 2016
FLNRO Regional Office contact info:

Inspector Signature

Government of British Columbia Water Website: www.gov.bc.ca/water

Diagram/Site pictures:

Original to File / Copy to – circle all that apply:
Copy Hand Delivered to Well Owner / Site Contact / Contractor / Environmental Health Officer: YES  NO
Copy Mailed/Email to Well Owner / Site Contact / Contractor / Environmental Health Officer: YES  NO

Well Inspection Form V 3.1 June 2016
**MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS**

**Inspection Date (YYYY/MM/DD) / Time (hh:mm):** 2017/04/11 - 12:07  
**Inspector:** Pogston / Jones

**Well owner:**  
**Mailing address:**  
**Site contact:**  
**Site coordinates (NAD 83, Zone & UTM or Lat/Long ddd.ddddd):** 50.51030 x -119.21880

**Location address:**  

**Legal property description (e.g. PID, lot):**

**Well location description:** Beige/red trim - 12 x 12 barn style - Right side of driveway

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**Well depth (below ground surface):** _________ m  
**Well diameter:** _________ cm  
**Casing stick-up:** _________ cm  
**Pumping rate (if known):** Unknown  
**Surface seal:** Yes

**Well status:** Active  
**Deactivated:** No  
**Decommissioned:** No  
**Not in Use:** See comments

**Well head location:** Outside  
**Pump house:** Yes  
**Well pit:** No  
**See comments:**

**Estimated distance to nearest water well:** 50 m  
**Secure well cap/cover:** Yes  
**Sanitary seal:** Rubber gasket  
**Bolted (pitless adapter style):** No  
**Other (e.g. hand pump):** See comments

**Well pit drained:** Yes  
**Other:** No  
**See comments:**

**Type of cap:** Sanitary seal  
**Other:** Rubber gasket  
**Bolted (pitless adapter style):** No  
**Other (e.g. hand pump):** See comments

**Well maintenance:**

**Pump installer name:** ?  
**Pump installer company:** ?  
**Pump installer registered:** Yes  
**Supervised:** Yes  
**Flowing well:** Yes  
**No foreign matter stored within 3 m:** Yes  
**Grading promotes drainage away from wellhead:** Yes  
**Clear access to well:** No  
**Concrete floor:** Yes  
**Can't see concrete floor:** No  
**Unknown:** Yes  
**See comments:**

**Issues identified for follow up based on Water Sustainability Act & Groundwater Protection Regulation requirements:**

**Photographs taken:**

**Attach well construction record (if available):**

**If work supervised by a registered person, provide name of supervisor:**

**Yes**  
**No**

Well Inspection Form V 3.1 June 2016
COMMENTS & RECOMMENDED ACTIONS: - Owner moved here 6 years ago. Well here.
- Well house is typically locked. Call first before inspection.
- Well pit drained - dry inside.
- Slight ground pump house flat; appears good draining on outside around pump house.

FLNRO Regional Office contact info:

Inspector Signature

Government of British Columbia Water Website: www.gov.bc.ca/water

Diagram/Site pictures:
MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS

Inspection Date (YYYY/MM/DD) / Time (hh:mm): April 11 2019  Inspector: D. Kywwoz

Site or water system name: PRIVATE WELL

Well owner: PMI on LRTA  Phone No.: 

Mailing address: 

Site contact:  Phone No.: 

Site coordinates (NAD 83, Zone & UTM or Lat/Long ddd.ddddd): 

Location address: 

Legal property description (e.g. PID, lot): 403 986 497 7

Well location description: RIGHT SIDE OF DRIVEWAY NEAR TIN HOUSE

Well Tag Number\(^1\) 禮\(1\) 井\(1\)

Well ID Plate No. 

ID plate location  Attached to casing  Other

Construction date  8 years \(\) \(\)

Construction method 

Class of well 

Subclass of well 

Driller name 

Driller company 

Driller registered  Yes  No  Supervised\(^2\)

Driller class  Water well  Geoexchange  Geotechnical/Environmental

Pump installer name 

Pump installer company 

Pump installer registered  Yes  No  Supervised\(^2\)

Pump installer name 

Surface seal  Yes  No  Unknown  See comments

Clear access to well  Yes  No  Unknown  See comments

No foreign matter stored within 3 m  Yes  No  See comments

Grading promotes drainage away from wellhead  Yes  No  See comments

Well maintenance 

Flowing well  Yes  No  See comments

Estimated distance to nearest water well  m  m  NA

Secure well cap/cover  Yes  No  See comments

Type of cap  Sanitary seal  Bolted (pitless adapter style)

Well depth (below ground surface)  m  ft  Unknown

Well diameter  cm  inches  \(\) \(\)

Casing stick-up  cm  inches 

Pumping rate (if known)  USgpm  Lpm  L/s  L/min  m\(^3\)/d  Other  (circle correct units)

Wellhead location  Outside  Pump house  Well pit  Other

Well pit drained  Yes  No  See comments

Active  □  Decommissioned  □  Deactivated  □  Not in Use (see comments)

Other comments

\(^1\)Attach well construction record (if available)  \(^2\)If work supervised by a registered person, provide name of supervisor

PHOTOGRAPHS TAKEN: YES  NO

ISSUES IDENTIFIED FOR FOLLOW UP BASED ON WATER SUSTAINABILITY ACT & GROUNDWATER PROTECTION REGULATION REQUIREMENTS:

□ YES  □ NO

Well Inspection Form V 3.1 June 2016
FLNRO Regional Office contact info:

[Signature]

Inspector Signature

Government of British Columbia Water Website: www.gov.bc.ca/water

Diagram/Site pictures: