



Clearbrook Waterworks District

Water
Quality
Report

2014

**Gold Medal Winner of the 2008 and 2009 and 2014 Award
for Best Tasting Tap Water in the World**



CLEARBROOK WATERWORKS DISTRICT

2014 Water Quality Report

**Clearbrook Waterworks District
2564 Clearbrook Road
Abbotsford, BC V2T 2Y5**

FEBRUARY 2015

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Foreword

Clearbrook Waterworks District (CWD) is pleased to present the 2014 Annual Water Quality Report, prepared in collaboration with Kalwij Water Dynamics Inc., and with contributions from Ryan Federau, CWD's own Water Quality Technician. We work closely with our hydrogeologist, Dr. Ineke Kalwij (P.Eng) of Kalwij Water Dynamics, to ensure the health and sustainability of our system and our groundwater resource.

This report is verification of the ongoing commitment by the CWD Board of Trustees and staff to deliver the highest quality water. An accomplishment also punctuated by the awarding of the District's third gold medal for being the Best Municipal Water (Berkley Springs International Water Tasting, held every year in Berkley Springs, West Virginia).

CWD system operators are highly trained and skilled and certified through the Environmental Operator's Certification Program. CWD complies with all provincial and federal regulations relating to the supply and delivery of potable water, while promoting responsible stewardship of the aquifer. We remain committed to the protection of public health, ensuring an uninterrupted supply of the World's Best Drinking Water.

CWD employs a holistic approach to water quality, employing proactive maintenance schedules, which include full system flushing, comprehensive system monitoring, weekly water quality sampling, and the adoption of emerging technologies where possible, through system renewal and upgrading.

Respectfully submitted,

Jason Hildebrandt
Administrator

Introduction

The 2014 Water Quality Report provides information about the water system, our quality assurance practices, and the quality of our drinking water. CWD's water system supplies, distributes and stores potable water to about 15,000 water users in the district.

2014 was also a year of achievements:

- ✓ In early 2014, the new pump station at the Reservoir was officially placed in operation. This pump station was part of the Reservoir Improvement Project and entails the construction of a new pump station, equipped with new transfer and booster pumps, a fire pump, and related infrastructure. The Improvement Project also includes pipe replacement at the reservoir site, and enhancements to the Supervisory Control and Data Acquisition (SCADA) system (engineering consulting services for this project were provided by Opus DaytonKnight Consultants Ltd.);
- ✓ On August 6, 2014 we celebrated, with our community, the Gold Medal for Best Municipal Water in conjunction with a ribbon-cutting ceremony to officially commission the new pump station at the reservoir site;
- ✓ A test well was successfully drilled and constructed at CWD Janzen Yard (Janzen Well Field); the test well has provided valuable information about the site hydrogeology and groundwater development potential;
- ✓ Under CWD's Well Replacement Program, a third Replacement Well (RW 1-87/14) has been successfully constructed, tested and commissioned. RW 1-87/14 replaces (old) Well 1-87 at Autumn Well Field. On October 22, 2014, Fraser Health permitted CWD to operate RW 1-87/14 as part of their existing potable water system. Since November 21, 2014, RW 1-87/14 has been operating automatically and in rotation with RW 3-93/11 and RW 7-00/13 (Fyfe Well & Water Services provided the well drilling and construction services for the test well and production well, and completed the pump installation for RW 1-87/14; Kalwij Water Dynamics provided the project management and hydrogeological services for both projects;

- ✓ The construction of new water main infrastructure at Autumn Well Field has been completed (by CWD field staff), and is required to connect RW 1-87/14 to the water distribution system. This new infrastructure also includes the construction of a new water manifold in the pump house (installed by Absolute Industrial Mechanical Ltd.); and
- ✓ Under the Pipe Replacement Program, sections of the water main near the reservoir site and Parkview Street have been replaced and upgraded by CWD staff.

CWD Water System

The supply and distribution system (water system) of Clearbrook Waterworks District (CWD) solely relies on groundwater. CWD is the exclusive drinking water provider to the residents within CWD boundaries (formerly Clearbrook village), serving a population of approximately 15,000 through 32 kilometres (km) of water main (pipe network), with three production wells supplying the system, and 6,820 cubic metres (m³) of combined reservoir storage.

The water supply is primarily used for drinking water but is also used to meet fire flow water requirements. There are over 190 fire hydrants connected to the water system, installed and maintained by CWD.

Through SCADA, we have real-time access via Remote Terminal Units to pertinent aspects of the water system. This includes the monitoring of flow information (wells, to and from the reservoir), reservoir levels, water system pressure (pump stations), and water temperature (groundwater and reservoirs). SCADA continuously acquires data stored in a database. Such data is used by our hydrogeologist for further processing and analysis, which is essential to the periodic review of our supply and distribution system.

Our Aquifer

CWD's production wells extract water from the Abbotsford-Sumas Aquifer. The aquifer covers an area of approximately 161 km²; it is a trans-boundary aquifer which extends from the Fraser Valley into Whatcom County of Washington State, USA. It is an unconsolidated aquifer composed of sands and gravels (glacial outwash deposits). Although the aquifer is largely unconfined, some parts of the aquifer are confined. CWD production wells screen the aquifer at a location characterized by an overlaying confining layer. This confining layer of low permeability consists of silt and clay (also termed an *aquitard*); the presence of such *aquitard* is advantageous from an aquifer protection point of view as they are conducive in protecting the aquifer from potential (anthropogenic-induced) contamination.

The aquifer is considered a highly productive aquifer. The City of Abbotsford, Clearbrook Waterworks District, and Fraser Valley Trout Hatchery are the major (single) groundwater users (of the Canadian portion of the aquifer). As per BC Aquifer Classification System the Abbotsford-Sumas Aquifer is classified as a heavily developed and highly vulnerable aquifer. CWD has a wellhead and aquifer protection program in place to safeguard our groundwater resource. To create awareness about our aquifer, CWD has installed Groundwater Protection Area sign boards in throughout the District (**Figure 1**).



FIGURE 1. GROUNDWATER PROTECTION AREA SIGN BOARD

Groundwater Extraction

In 2014, RW 3-93/11 and RW 7-00/13 acted as primary production wells for CWD (working in rotation). Under the Well Replacement Program, RW 3-93/11 replaced Well 3-93 in 2011, and RW 7-00/13 replaced Well 7-00 in 2013. Well 3-93 was permanently decommissioned in 2013, and Well 7-00 has been retrofitted to act as a monitoring well. Well 1-87 was a backup well until the well was taken permanently off-line on September 26, 2014. RW 1-87/14 replaces Well 1-87. Since November 21, 2014, RW 1-87/14 has been operating in rotation with RW 3-93/11 and RW 7-00/13.

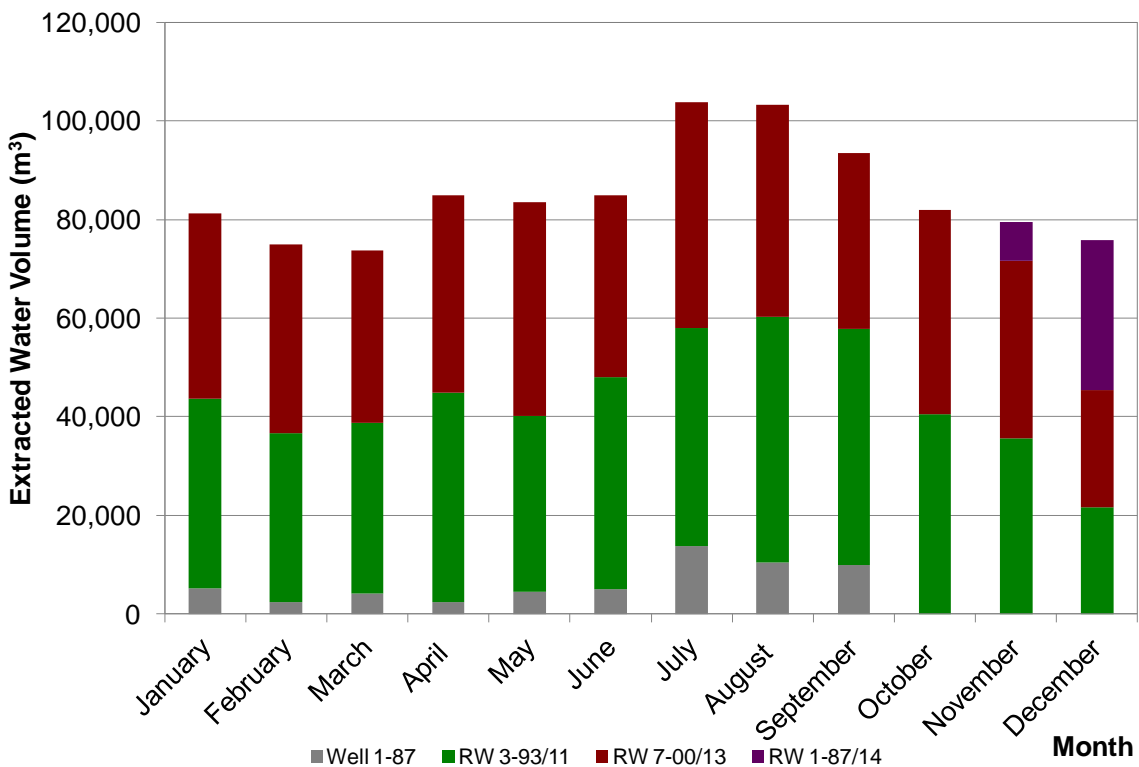


FIGURE 2: MONTHLY GROUNDWATER EXTRACTION VOLUME

Figure 2 shows the monthly groundwater extraction. For each month the figure shows the volumetric contribution of each well. In summary (for 2014):

- 1) The total volume of combined groundwater extraction is 1,042,374 m³ (1.04 million m³);
- 2) The combined average daily extraction volume is 2,856 m³ or 2.9 million litres;
- 3) July thru September were the months with the highest extraction volumes; accounting for 29.0% (combined) of the total yearly extraction volume; and
- 4) The average extraction rates for the primary production wells, RW 3-93/11, RW 7-00/13, and RW 1-87/14 are 48.5 l/s, 48.3 l/s, and 48.1 l/s, respectively.

Water Quality Assurance

Approach

Providing safe, reliable and clean water to our rate payers remains CWD's key responsibility. We take pride in providing drinking water of the highest quality at a reasonable cost, thereby meeting water demand, complying with provincial regulations, and working responsibly to protect our aquifer. The Drinking Water Protection Act (DWPA), created by BC Ministry of Health, sets acceptable limits for compounds in drinking water that may pose a health risk. This act is enforced by all Drinking Water Health Officers in BC.

As a water purveyor we are required to have our water analyzed to confirm the absence of microbiological parameters by an accredited laboratory. This entails the weekly monitoring of our water supply and distribution system: CWD has over 26 sampling stations throughout the District which, and on a rotating basis, are sampled and analyzed for *Total Coliforms* and *Escherichia Coliform*. Furthermore, water samples are collected from the wells and reservoirs, and analyzed on the required microbiological parameters. A copy of the results of the microbiological water quality samples submitted to the Fraser Health Authority for 2014 are included in **Appendix A**.

Furthermore, once a year (in December) water samples are collected from each of the production wells and are submitted to an accredited laboratory for potability analysis (next section). Twice a year Biological Activity Reaction Tests are completed for water samples collected from the well and aquifer formation (next section).

Water Quality Technician's Report 2014

Year 2014 was another busy year for water quality monitoring and reporting; it included several projects and programs. The reservoir pump station was brought online, which was preceded by several more water main tie-ins, hydrant replacements/installations, and air valve installations. Water quality monitoring forms an integral part to these activities.

Prior to full commissioning of the new pump station, our reservoir site flushing program was continued in order to preserve water quality in the upper pressure zone of our water system. Reservoir A has been disconnected from the system, and the upper pressure zone is now supplied directly by Reservoirs B and C.

In February, we entered again the Berkeley Springs International Water Tasting contest, and we achieved first place in the Municipal Tap Water category. This is our third gold medal, and we are consistently among the top contenders in the municipal tap water category.

Hydrant flushing from the 2013 fall flush carried over into January of 2014, and was completed by month's end. The spring flush for 2014 was started in April, and the fall flush started in October.

BART testing was performed in April and November; compared to previous year, the results are similar. RW 1-87/14 shows high aggressivity for iron related bacteria (in the well), and this may relate to the fact that it has been recently constructed. It will be interesting to see the progression of the BART testing for this well in 2015.

In 2014, a replacement new production well (RW 1-87/14) has been placed on line. The tie-in of this well to the distribution system required the construction of new pipe infrastructure.

Furthermore, a new, larger segment of water main on Parkview Street was installed (part of the Pipe Replacement Program), in order to facilitate increased flow through the water main. A series of water quality testing was completed to ensure water potability.

Four water line leaks were discovered and repaired by CWD staff in 2014. Furthermore, several contractor water main tie-ins were overseen by CWD staff to ensure proper disinfection and installation procedures.

Year 2015 is shaping up to be another interesting year, with the addition of real time pH and water conductivity monitoring at our well sites, as well as the installation of portable emergency disinfection units to enable us to better react to possible adverse water quality conditions.

Ryan Federau

Water Quality Technician

Clearbrook Waterworks District

Water Quality Review

Potability Analysis Results

Raw water samples were collected from **RW 3-93/11**, **RW 7-00/13**, and **RW 1-87/14** on December 15, 2014. The water samples were analyzed by Exova Group Ltd. (Exova), an accredited laboratory located in Surrey BC, on: (1) *physical properties*; (2) *water chemistry*; and (3) *microbiological parameters*. Water sampling for Well 1-87 has been discontinued since this well was taken permanently off-line on September 26, 2014.

Tables 1 - 4 summarize the water quality analysis data (physical parameters, metals, miscellaneous parameters, and microbiological parameters, respectively). Results are evaluated with the most recent edition of the *Guidelines for Canadian Drinking Water Quality* (Health Canada 2014). **Appendix B** includes a copy of the water quality reports prepared by Exova.

In summary, results of the water analysis suggest that the water quality meets the requirements stated in the most recent edition of the *Guidelines for Canadian Drinking Water Quality*.

TABLE 1 PHYSICAL PARAMETERS

Parameter	RW 3-93/11	RW 7-00/13	RW 1-87/14	Canadian Drinking Water Guidelines	Units	Guideline comment
pH (at 25°C)	6.96	6.85	7.31	6.5 - 8.5	---	within AO
Total dissolved solids (TDS)	165	144	145	500	mg/l	below AO
Electric conductivity	263	224	225	<i>no guideline set</i>	µS/cm at 25 °C	-
Turbidity	0.02	0.02	0.15	<i>no guideline set</i>	NTU	-
Colour	23	14	20	<i>no guideline set</i>	Colour units	-
Hardness (CaCO ₃)	100	86	89	<i>no guideline set</i>	mg/l	-

AO = Aesthetic Objective.

Physical Properties

pH

The pH (“potential of hydrogen”) is a measure for hydrogen-ion concentration in water, and tells something about the acid-base equilibrium. A pH measurement less than 7.0 means that the water is acidic; a value equal to 7.0 means that the water is neutral, and a value more than 7.0 means that water is basic (alkaline). The Aesthetic Objective (AO) guideline for pH is between 6.5 and 8.5.

The pH values (**Table 1**) for RW 3-93/11, RW 7-00/13, and RW 1-87/14 are **6.96**, **6.85**, and **7.31** respectively, suggesting that the water is within the *basic* range for RW 1-87/14 and within the *acidic* range for RW 3-93/11 and RW 7-00/13. The sampled water meets the AO guideline criterion.

The values suggest that there is no risk of corrosion or encrustation. A pH value between 6.8 and 7.3 is an ideal condition with respect to inhibition of corrosion and incrustation (Health Canada 1979a).

Total Dissolved Solids

Total Dissolved Solids (TDS) is the total amount of materials dissolved (mineral constituents) in water, computed from conductivity and turbidity. High levels of TDS can cause hardness, unpalatability, mineral deposition and corrosion. At low levels, however, TDS contributes to the palatability of water (Health Canada 1978). TDS and Electrical Conductivity (EC) are closely related. (The more salts dissolved in the water, the higher the value of the electric conductivity.)

TDS values (**Table 1**) for RW 3-93/11, RW 7-00/13, and RW 1-87/14 are **165**, **144**, and **145 milligrams per litre (mg/l)** respectively, and are below the Maximum Allowable Concentration (MAC) limit of 500 mg/l.

Turbidity

Turbidity is a measure of the relative clarity of water, and turbidity in water is caused by suspended and colloidal matter (fine sand, clay, silt, organic and inorganic matter, and microscopic organisms). Turbidity is also a useful indicator of groundwater quality changes. Turbidity values can be impacted by groundwater recharge events as recharging displaces

sediments, especially if groundwater is under direct influence of surface water (CWD's groundwater sources are not under direct influence of surface water).

Health Canada has set water treatment limits regarding turbidity (not applicable to CWD's water system). For systems that use groundwater that is not under the direct influence of surface water, which are considered less vulnerable to faecal contamination, turbidity should generally be below 1.0 NTU (Health Canada 2013a). Furthermore, in order to minimize particulate loading and effectively operate the distribution system, it is also good practice to ensure that water entering the distribution system has turbidity levels below 1.0 NTU (Health Canada 2013a).

The Turbidity value (**Table 1**) is **0.02 NTU** for RW 3-93/11 and RW 7-00/13, which equals the nominal detection limit (NDL) for turbidity. The turbidity value for RW 1-87/14 is **0.15 NTU**.

Hardness

This parameter is an indicator for the degree of softness or hardness of water. Soft water can have a corrosive effect, whereas hard water may result in scale deposits (incrustation in e.g., the water distribution system). MAC has not been established, but generally water with hardness greater than 200 mg/l is considered poor, and in excess of 500 mg/l is unacceptable for most domestic purposes. Hardness (**Table 1**) is evaluated based on the concentration of calcium carbonate (CaCO_3) because calcium (Ca^{2+}) and carbonate (CO_3^{2-}) are the dominant ions in most hard waters.

CaCO_3 values for RW 3-93/11, RW 7-00/13, and RW 1-87/14 are **100, 86, and 89 mg/l** respectively, and are categorized as moderately hard (60-120 mg/l). Hardness levels between 80 and 100 mg/L (as CaCO_3) are generally considered to provide an acceptable balance between corrosion and incrustation (Health Canada 1979b).

Metals

Manganese

Manganese is a metallic element either naturally occurring through weathering of minerals and rocks, or due to human influences entering the groundwater through leaching or effluent.

TABLE 2 TOTAL METALS

Metal extractable	Symbol	RW 3-93/11	RW 7-00/13	RW 1-87/14	Canadian Drinking Water Guidelines	Units	Guideline comment
Aluminium	Al	<0.005	<0.005	<0.005	0.1	mg/l	below OG
Antimony	Sb	<0.0002	<0.0002	<0.0002	0.006	mg/l	below MAC
Arsenic	As	0.0004	0.0003	0.0010	0.01	mg/l	below MAC
Barium	Ba	0.007	0.006	0.018	1	mg/l	below MAC
Boron	Ba	0.017	0.011	0.020	5	mg/l	below MAC
Cadmium	Cd	<0.00007	<0.00007	<0.00007	0.005	mg/l	below MAC
Chromium	Cr	<0.0005	0.0005	<0.0005	0.05	mg/l	below MAC
Copper	Cu	0.001	0.003	<0.001	1	mg/l	below AO
Lead	Pb	0.0003	0.0002	<0.0001	0.01	mg/l	below MAC
Selenium	Se	<0.0006	<0.0006	0.001	0.01	mg/l	below MAC
Uranium	U	<0.0005	<0.0005	<0.0005	0.02	mg/l	below MAC
Vanadium	V	0.0008	0.0008	0.0006	<i>no guideline set</i>	mg/l	-
Zinc	Zn	0.011	0.013	<0.001	5	mg/l	below AO
Calcium	Ca	28.5	24.6	24.6	<i>no guideline set</i>	mg/l	-
Iron	Fe	<0.005	<0.005	0.006	0.3	mg/l	below AO
Magnesium	Mg	7.1	6.08	6.69	<i>no guideline set</i>	mg/l	-
Manganese	Mn	<0.001	0.001	0.014	0.05	mg/l	below AO
Potassium	K	1.6	1.3	2.1	<i>no guideline set</i>	mg/l	-
Silicon	Si	9.11	9.57	8.26	<i>no guideline set</i>	mg/l	-
Sodium	Na	10.4	7.2	9.0	200	mg/l	below AO
Sulphur	S	-	-	-	<i>no guideline set</i>	mg/l	-

MAC = Maximum Allowable Concentration; OG = Operational Guideline; AO = Aesthetic Objective.

The AO guideline is 0.05 mg/l. Concentrations exceeding 0.15 mg/l can stain plumbing fixtures and laundry. It can also produce undesirable tastes in beverages. Even at concentrations below 0.05 mg/l, manganese may form coatings on water distribution pipes that may slough off as black precipitates (Health Canada 1987). Presence of manganese in water may lead to microbial growth in and around the well casing and water distribution system.

The manganese concentration (**Table 2**) for RW 3-93/11 was found to be below NDL of **0.001 mg/l**. The manganese concentration for RW 7-00/13 and RW 1-87/14 are **0.001 mg/l** and **0.014 mg/l**, respectively (which is below the AO guideline criterion).

Iron

Like manganese, iron is a metallic element either naturally occurring through weathering of minerals and rocks, or due to human influences entering the groundwater through leaching or effluent. The AO guideline is 0.3 mg/l. Similar to manganese, concentrations exceeding 0.3 mg/l can cause staining (plumbing fixtures and laundry) and can produce undesirable tastes in beverages. Precipitation of iron is visible as reddish-brown color to water and well components. As with manganese, the presence of iron may lead to the growth of unwanted bacteria (that form slime coating) in the water infrastructure.

Iron concentrations (**Table 3**) for RW 3-93/11 and RW 7-00/13 are below the NDL (i.e., < **0.005 mg/l**), meeting the AO guideline criterion. The iron concentration for RW 1-87/14 is 0.006 mg/l, which is below the AO guideline criterion.

Arsenic

Arsenic is a natural element that is widely distributed throughout the Earth's crust, often found naturally in groundwater, through erosion and weathering of soils, minerals, and ores (Health Canada 2006). Arsenic is classified as a human carcinogen. The MAC guideline for Arsenic is 0.01 mg/l.

Arsenic concentrations (**Table 3** for RW 3-93/11 and RW 7-00/13 are **0.0004 mg/l** and **0.0003 mg/l**, respectively, meeting the MAC guideline criterion. The arsenic concentration for RW 1-87/14 is **0.001 mg/l**, which is below the MAC guideline criterion.

**TABLE 3 MISCELLANEOUS PARAMETERS: INORGANICS,
ANIONS AND NITROGENS**

Parameter	Symbol / Chemical Formula	RW 3-93/11	RW 7-00/13	RW 1-87/14	Canadian Drinking Water Guidelines	Units	Guideline comment
Inorganics							
Alkalinity (total)	CaCO ₃	60	47	69	<i>no guideline set</i>	mg/l	-
Fluoride	F ⁻	0.03	0.02	0.03	1.5	mg/l	below MAC
Anions							
Dissolved sulphate	SO ₄ ²⁻	20.9	15.7	23.8	500	mg/l	below AO
Dissolved chloride	Cl ⁻	28.2	24.9	10.9	250	mg/l	below AO
Nitrogens (N)							
Nitrate - N	NO ₃ ⁻	1.7	2.32	0.92	10.0	mg/l	below MAC
Nitrite - N	NO ₂ ⁻	<0.01	<0.01	<0.01	1.0	mg/l	below MAC

MAC = Maximum Allowable Concentration; AO = Aesthetic Objective.

TABLE 4 MICROBIOLOGICAL PARAMETERS

Parameter	RW 3-93/11	RW 7-00/13	RW 1-87/14	Canadian Drinking Water Guidelines	Units	Guideline comment
Total coliform bacteria	< 1.0	< 1.0	< 1.0	0 CFU / 100 ml	CFU / ml	below MAC
Escherichia coliform bacteria subgroup (E. Coli)	< 1.0	< 1.0	< 1.0	0 CFU / 100 ml	CFU / ml	below MAC
Heterotrophic Count - Aerobic	2	45	< 2	<i>no guideline set</i>	CFU / ml	-

MAC = Maximum Allowable Concentration.

Miscellaneous Parameters

Nitrogen

Nitrate (NO_3^-) and nitrite (NO_2^-), both products of the oxidation of nitrogen by microorganisms in plant, soil and water, are naturally occurring ions that are ever-present in the environment. Nitrates are used widely as inorganic fertilizers. **MAC** levels for nitrate and nitrite are 10 mg/l and 1 mg/l respectively.

Nitrate nitrogen concentrations (**Table 3**) are **1.7, 2.32, and 0.92 mg/l** for RW 3-93/11, RW 7-00/13, and RW 1-87/14, respectively (and thus below **MAC** guideline criterion). Water sample results for all three wells indicate that nitrite nitrogen concentrations are **below NDL** of 0.01 mg/l.

Fluoride

Fluoride is a chemical that naturally occurs in ground water from leaching of fluoride-containing rock formations, breakdown of soils, and deposition of atmospheric volcanic particulates. Fluoride is also introduced to the water system through agricultural practices, chemical manufacturing plants, and septic and sewage systems. Health Canada has established a **MAC** of 1.5 mg/l for fluoride.

Water samples results (**Table 3**) show fluoride concentrations of **0.03, 0.02, and 0.03 mg/l** for RW 3-93/11, RW 7-00/13, and RW 1-87/14 respectively, values of which are below the established **MAC**.

Microbiology

Total Coliforms

Total coliforms are bacteria species (organisms) that are found naturally in water, soil, vegetation, and human and animal faeces. Because total coliforms are widespread in the environment, they can be used as one of the many operational tools to determine the efficacy of a drinking water treatment system (Health Canada 2013b). Coliforms are an indicator of the sanitary condition of the groundwater. If any colonies are detected, corrective measures must be implemented.

The Health Canada guideline limit for Total Coliforms is 0 MPN (Most Probable Number) per 100 millilitres (ml); i.e., none detectable per 100 ml. Water sample results (**Table 4**) for all three

wells show total coliforms concentration values < 1 MPN/100 ml (i.e., below NDL), thereby meeting Health Canada guideline criterion for total coliforms of **0 per 100 ml**.

Escherichia Coliform (E.coli)

E.coli is member (subgroup) of the total coliforms group but is found exclusively in faeces of humans and animals. Its presence in water indicates not only recent faecal contamination of the water but also the possible presence of intestinal disease-causing bacteria, viruses, and protozoa; The ability to detect faecal contamination in drinking water is a necessity, as pathogenic microorganisms from human and animal faeces in drinking water pose the greatest danger to public health (Health Canada 2013c). The detection of E.coli should lead to an immediate issuing of a boil water advisory, notifying the responsible authorities, investigating the cause of the contamination, and implementing corrective actions.

The guideline limit for E.coli is 0 MPN per 100 ml (i.e., no E.coli colonies must be detected). Water samples results (**Table 4**) for all three wells show E.coli concentration values below NDL of 1 MPN/100 ml, thus meeting Health Canada guideline criterion for E.coli of **0 per 100 ml**. (Absence of this bacteria does not necessarily indicate that intestinal viruses and protozoa are also absent.)

Biological Activity Reaction Test (BART)

The biological activity reaction test (BART) is a method to analyze several bacterial communities that can cause problems for water quality (e.g. turbidity), aesthetics (e.g. odour, discoloration, cloudiness) and water infrastructure (e.g. corrosion). The following bacterial communities were analyzed:

1. **Iron Related Bacteria (IRB)**: cause taste and odour problems and “red water”. This leads to staining of plumbing fittings and laundry; IRB can provide a place in wells for other bacteria to live, can increase corrosion, and can cause encrustation of well screens and pumps;
2. **Sulphate Reducing Bacteria (SRB)**: a group of anaerobic bacteria that generate hydrogen sulphide (H₂S) and cause a number of significant problems in water, ranging from “rotten egg” odours to the blackening of equipment, slime formations, and the initiation of corrosive processes;

3. **Slime Forming Bacteria (SLYM)**: create slimes, turbidity, foul tastes and odours; and
4. **Heterotrophic Aerobic Bacteria (HAB)**: one form is aerobes, which removes organics quickly, and one form is fermentors (anaerobic) that make acids (very low pH).

Data collection protocol

BART samples were collected in April and November of 2014 for Well 1-87 (in April only), RW 3-93/11, RW 7-00/13, and RW 1-87/14 (in November only).

A sufficient downtime was practiced prior to taking the water samples. Water samples for BART were collected at the start-up of the pump operation ($t = 0$), after 20 minutes of pumping ($t = 20$) and after 2 hours of pumping ($t = 120$). Samples collected at these times represent various distances from the well (i.e., in the well casing, outside the well screen, and in the aquifer formation for $t = 0$, $t = 20$, and $t = 120$, respectively).

Water samples were collected from each well for preparing the IRB, SRB, SLYM and HAB testers. Water samples were collected for each sample retrieval time; yielding 12 samples (vials) per well. These vials were observed and analyzed during the course of 9 days following the start of the BART. For more information about BART and the interpretation of the results, the reader is referred to DBI (2004). BART-Soft v6 (developed and distributed by DBI) is applied to obtain qualitative and quantitative results.

TABLE 5 BART RESULTS

Well	Tester	Test session 2014-1 (April 7 & 8, 2014)			Test session 2014-1 (November 25 & 26)		
		Sample retrieval time			Sample retrieval time		
		t = 0	t = 20 min	t = 120 min	t = 0	t = 20 min	t = 120 min
1-87	IRB	Day 6 (FO) 550 (M)	no reaction	no reaction	Well operation discontinued as per September 26, 2014		
	SRB	no reaction	no reaction	no reaction			
	SLYM	no reaction	no reaction	no reaction			
	HAB	Day 6 (DO) 446 (L)	no reaction	no reaction			
	Downtime	24 hours					
RW 3-93/11	IRB	Day 8 (BR) 34 (M)	no reaction	no reaction	no reaction	no reaction	no reaction
	SRB	no reaction	no reaction	no reaction	no reaction	no reaction	no reaction
	SLYM	no reaction	no reaction	no reaction	no reaction	no reaction	no reaction
	HAB	no reaction	no reaction	no reaction	no reaction	no reaction	no reaction
	Downtime	24 hours			24 hours		
RW 7-00/13	IRB	Day 6 (FO) 550 (M)	no reaction	Day 7 (FO) 1,370 (M)	Day 7 (BR) 137 (M)	no reaction	no reaction
	SRB	no reaction	no reaction	no reaction	no reaction	no reaction	no reaction
	SLYM	no reaction	no reaction	no reaction	no reaction	no reaction	no reaction
	HAB	Day 6 (DO) 1,590 (L)	Day 5 (DO) 1,590 (L)	no reaction	no reaction	no reaction	no reaction
	Downtime	24 hours			24 hours		

TABLE 5 BART RESULTS, CONT'T...

Well	Tester	Test session 2014-1 (April 7 & 8, 2014)			Test session 2014-1 (November 25 & 26)		
		Sample retrieval time			Sample retrieval time		
		t = 0	t = 20 min	t = 120 min	t = 0	t = 20 min	t = 120 min
RW 1-87/14	IRB	-	-	-	Day 5 (FO) 2,200 (H)	Day 6 (FO) 550 (M)	Day 6 (FO) 550 (M)
	SRB	-	-	-	no reaction	no reaction	no reaction
	SLYM	-	-	-	no reaction	no reaction	no reaction
	HAB	-	-	-	Day 4 (DO) 7,440 (M)	Day 6 (DO) 446 (L)	Day 4 (DO) 7,440 (M)
	Downtime	-			24 hours		

Key:

- IRB Iron Related Bacteria
- SRB Sulphate Reducing Bacteria
- SLYM Slime Forming Bacteria
- HAB Heterotrophic Aerobic Bacteria
- BR Brown ring around the ball: very aerobic IRB
- FO Ring of foam bubbles around the ball: anaerobic IRB communities
- DO Bleaching spreads downwards faster than it ascends in the tester; anaerobic heterotrophic functions dominate
- H High aggressivity
- M Medium aggressivity
- L Low aggressivity
- 1,590 colony forming units per millilitre (cfu /ml) or predicted active cells per mL, (pac/mL)

BART Results

Table 5 summarizes the results. The table shows on which day a reaction occurs, and the type of reaction. The number of days from taking the sample to the occurrence of a reaction (i.e. positive reaction) is called “time lag”. In general, the shorter the time lag, the greater the aggressivity of the bacterial population, and the more likely the need to address the need for treatment (i.e., well maintenance / rehabilitation).

Results indicate that:

With respect to **IRB**:

- ✓ Well 1-87, RW 3-93/13, and RW 7-00/13 showed **medium bacterial activities** (aggressivity) in the well casing (**t = 0**), observed for the BART completed in April; only

RW 7-00/13 showed **medium IRB aggressivity** in the well casing, observed for the BART completed in November;

- ✓ Only RW 7-00/13 showed **medium bacterial aggressivity** in the aquifer formation (**t = 120**), and which was observed for the BART completed in April; and
- ✓ RW 1-87/14 showed **high aggressivity** in the well casing (**t = 0**), and **medium aggressivity** just outside the well screen (**t = 20**) and in the aquifer formation (**t = 120**), observed for the BART completed in November (high aggressivity may related to the fact that this well has been recently constructed).

With respect to **HAB**:

- ✓ **Low bacterial aggressivity** was detected in the well (**t = 0**) for Well 1-87 and RW 7-00/13, observed for the BART completed in April;
- ✓ **Low bacterial aggressivity** was found just outside the well screen (**t = 20**) for RW 7-00/13, observed for the BART completed in April; and
- ✓ **Medium bacterial aggressivity** was detected for RW 1-87/14 in the well (**t = 0**) and in the aquifer formation (**t = 120**); **low bacterial aggressivity** was detected just outside the well screen (**t = 20**) for this well, observed for the BART completed in November.

With respect to **SRB**:

None of the wells showed bacterial activities pertaining to **SRB**, based on the BART completed in April and November, 2014.

With respect to SLYM:

None of the wells showed bacterial activities pertaining to **SLYM**, based on the BART completed in April and November, 2014.

In summary, BART results suggest that no actions are required at this point, but vigilance through an ongoing testing program should be practiced.

Further Information

Metals in Drinking water – “Flush” Message!

(From Fraser Health, dated February, 2014)

- ✓ Anytime the water in a particular faucet has not been used for six hours or longer, “flush” your cold-water pipes by running the water until you notice a change in temperature. (This could take as little as five to thirty seconds if there has been recent heavy water use such as showering or toilet flushing. Otherwise, it could take two minutes or longer.) The more time water has been sitting in your home’s pipes, the more lead it may contain.
- ✓ Use only water from the cold-tap for drinking, cooking, and especially making baby formula.
- ✓ Hot water is likely to contain higher levels of lead.
- ✓ The two actions recommended above are very important to the health of your family. They will probably be effective in reducing lead levels because most of the lead in household water usually comes from the plumbing in your house, not from the local water supply.
- ✓ Conserving water is still important. Rather than just running the water down the drain you could use the water for things such as watering your plants.

Preventing Water-Borne Infections for People with Weakened Immune Systems

<http://www.healthlinkbc.ca/healthfiles/hfile56.stm>

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Health Canada. 2013c. Guidelines for Canadian Drinking Water Quality. Guideline Technical Document: Esherichia coli. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment, Ottawa, Ontario. URL: <http://www.hc-sc.gc.ca>. March 2012.

Health Canada. 2014. Guidelines for Canadian Drinking Water Quality. Summary table.
Drinking Water Guidelines. *Prepared by the* Federal-Provincial-Territorial Committee on
Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment.
Available at <http://www.hc-sc.gc.ca> (*most recent update of on-line version: October 2014*).

Appendices

Appendix A

Fraser Health 2014 Sampling Range Report



fraserhealth

February 6, 2015

Dear: Water System Operator

Re: Annual Reporting Requirements for Permitted Water Systems

Please find enclosed a copy of the 2014 Range Report for your water system. This report contains a summary of the bacteriological water quality results for the samples submitted through the Fraser Health Authority from your water system within the 2014 calendar year.

Section 15(b) of the Drinking Water Protection Act requires that a water supplier makes monitoring results public on an annual basis **within 6 months of the end of the calendar year** (Sec. 11 *Drinking Water Protection Regulations*).

The following items are to be included as part of the annual report.

- General Contact Information
- Summary of Bacteriological Water Quality Results (enclosed with this letter)
- Results from your most recent chemical analysis report
- Improvement Actions & Plans

To assist you, a new standardized template has been developed to help guide you through the completion of your annual report. Fraser Health encourages you to use the template provided, as this document contains all the essential components expected in an annual report.

Depending on the population served & the number of connections, a water supplier may choose to use one or more of the following methods for making information available to the public.

- Post a copy of the report on the Water Suppliers Website (where available)
- Place an ad in the local newspaper advertising the report and the methods by which a copy of the report can be obtained or viewed.
- Mail a copy of the report to every household & premise served by the water system
- Attach a notice to the utility bill advertising the report and the methods by which a copy of the report can be obtained or viewed.
- Post a copy of the report or notice advertising the report on a community bulletin board (applicable for small water systems)

Please ensure the Annual Report is completed and made available to all users by **June 30, 2015**. Should you have any questions please contact me at 604-870-7920.

Sincerely,

Barbara Haworth, B.Sc., B.Tech., C.P.H.I.(C)
Drinking Water Program
Fraser Health Authority
604-870-7920

Sample Range Report

Fraser Health Authority

Facility Name: Clearbrook Waterworks District

Date Range: Jan 1 2014 to Dec 31 2014

Operator Jason Hildebrandt
2564 Clearbrook Road
Abbotsford, BC V2T 2Y5

Sampling Site	Date Collected	Total Coliform	E. Coli	Fecal Coliform
<u>2580 Langdon St -</u>				
<u>East end of</u>				
<u>driveway, 2580</u>				
<u>Langdon St - East</u>				
<u>end of driveway</u>				
	1/20/2014	L1	L1	
	2/17/2014	L1	L1	
	3/24/2014	L1	L1	
	4/14/2014	L1	L1	
	5/26/2014	77	L1	
	6/23/2014	L1	L1	
	7/21/2014	L1	L1	
	8/25/2014	L1	L1	
	9/29/2014	L1	L1	
	10/27/2014	L1	L1	
	11/24/2014	<u>L1</u>	<u>L1</u>	
	Total Positive:	1	0	0
<u>2889 Upland Cres.</u>				
<u>2889 Upland Cres</u>				
	1/6/2014	L1	L1	
	2/11/2014	L1	L1	
	3/24/2014	L1	L1	
	5/12/2014	L1	L1	
	6/23/2014	L1	L1	
	8/5/2014	L1	L1	
	9/16/2014	L1	L1	
	10/27/2014	L1	L1	
	12/8/2014	L1	L1	
	12/22/2014	<u>L1</u>	<u>L1</u>	
	Total Positive:	0	0	0
<u>2564 Clearbrook Rd.</u>				
<u>(Office), 2564</u>				
<u>Clearbrook Road</u>				
	1/27/2014	L1	L1	
	2/24/2014	L1	L1	
	3/31/2014	L1	L1	
	5/5/2014	L1	L1	

6/2/2014	L1	L1	
7/2/2014	L1	L1	
8/5/2014	L1	L1	
9/2/2014	L1	L1	
9/29/2014	L1	L1	
11/3/2014	L1	L1	
12/1/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

2743 Moorland St.
2743 Moorland St

1/27/2014	L1	L1	
3/3/2014	L1	L1	
4/29/2014	L1	L1	
6/2/2014	L1	L1	
7/14/2014	L1	L1	
8/25/2014	L1	L1	
10/6/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

AUDIT - 32171
South Fraser , 32171
South Fraser

3/24/2014	L1	L1	
5/27/2014	L1	L1	
9/22/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

32171 South Fraser
Way (Petro Canada).
32171 South Fraser
Way (Petro Canada)

2/3/2014	L1	L1	
3/3/2014	L1	L1	
3/31/2014	L1	L1	
4/29/2014	L1	L1	
5/26/2014	L1	L1	
7/2/2014	L1	L1	
7/28/2014	L1	L1	
8/25/2014	L1	L1	
9/22/2014	L1	L1	
10/20/2014	L1	L1	
11/24/2014	L1	L1	
12/29/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

31419 Springhill
Court, 31419
Springhill Court

1/6/2014	L1	L1	
2/17/2014	L1	L1	

3/31/2014	L1	L1	
5/20/2014	L1	L1	
7/2/2014	L1	L1	
8/11/2014	L1	L1	
9/22/2014	L1	L1	
11/3/2014	L1	L1	
12/15/2014	1	L1	
12/29/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	1	0	0

3089 Claudia Court
3089 Claudia Court

1/20/2014	L1	L1	
3/3/2014	L1	L1	
4/7/2014	L1	L1	
5/5/2014	L1	L1	
6/2/2014	L1	L1	
7/2/2014	L1	L1	
7/28/2014	L1	L1	
9/2/2014	L1	L1	
9/29/2014	L1	L1	
10/20/2014	L1	L1	
11/24/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

AUDIT - 2459 Center
Street (at United
Rentals), 2459
Center Street

10/27/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

AUDIT - 32073 Mt.
Waddington Avenue,
32073 Mt.
Waddington Avenue

3/24/2014	L1	L1	
5/27/2014	L1	L1	
9/22/2014	L1	L1	
11/26/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

31898 Royal
Crescent, 31898
Royal Crescent

1/27/2014	L1	L1	
2/24/2014	L1	L1	
3/17/2014	L1	L1	
4/22/2014	L1	L1	
5/12/2014	L1	L1	
6/9/2014	L1	L1	

7/7/2014	A		
7/14/2014	L1	L1	
8/11/2014	L1	L1	
9/22/2014	L1	L1	
10/14/2014	L1	L1	
11/17/2014	L1	L1	
12/15/2014	L1	L1	
12/29/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

2749 Braeside
Street, 2749
Braeside Street

2/3/2014	L1	L1	
3/17/2014	L1	L1	
4/22/2014	L1	L1	
5/5/2014	L1	L1	
6/16/2014	L1	L1	
7/28/2014	L1	L1	
9/8/2014	L1	L1	
10/20/2014	L1	L1	
12/1/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

32073 Mt
Waddington Ave.
32073 Mt
Waddington Ave

1/13/2014	L1	L1	
2/11/2014	L1	L1	
3/10/2014	L1	L1	
4/14/2014	L1	L1	
5/12/2014	L1	L1	
6/23/2014	L1	L1	
7/28/2014	L1	L1	
8/25/2014	L1	L1	
9/22/2014	L1	L1	
10/20/2014	L1	L1	
12/29/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

2903 Palm Crescent,
2903 Palm Crescent

1/13/2014	L1	L1	
2/17/2014	L1	L1	
3/17/2014	L1	L1	
4/22/2014	L1	L1	
5/20/2014	L1	L1	
6/16/2014	L1	L1	
7/7/2014	A		
7/14/2014	L1	L1	
8/5/2014	L1	L1	

9/8/2014	L1	L1	
10/6/2014	L1	L1	
11/3/2014	L1	L1	
12/1/2014	L1	L1	
12/8/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

32350 Diamond
Cres, 32350
Diamond Cres

1/6/2014	L1	L1	
2/3/2014	L1	L1	
3/10/2014	L1	L1	
4/7/2014	L1	L1	
5/5/2014	L1	L1	
6/9/2014	L1	L1	
7/21/2014	L1	L1	
8/18/2014	L1	L1	
9/16/2014	L1	L1	
11/12/2014	L1	L1	
12/15/2014	L1	L1	
12/22/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

2940 Clearbrook
Rd.(Bible Col), 2940
Clearbrook Road

1/20/2014	L1	L1	
2/17/2014	L1	L1	
3/24/2014	L1	L1	
4/29/2014	L1	L1	
6/2/2014	L1	L1	
7/7/2014	A		
7/14/2014	L1	L1	
8/5/2014	L1	L1	
9/2/2014	L1	L1	
10/6/2014	L1	L1	
10/27/2014	L1	L1	
12/1/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

AUDIT - 32350
Diamond Crescent,
32350 Diamond
Crescent

3/24/2014	L1	L1	
5/27/2014	L1	L1	
9/22/2014	L1	L1	
11/26/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

2464 Sunnyside
Place, 2464
Sunnyside Place

1/13/2014	L1	L1	
2/24/2014	L1	L1	
4/7/2014	L1	L1	
5/26/2014	L1	L1	
7/7/2014	A		
7/14/2014	L1	L1	
8/18/2014	L1	L1	
9/29/2014	L1	L1	
11/12/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

Reservoir C (1985),
2886 Grandview
Cres

2/3/2014	L1	L1	
4/7/2014	L1	L1	
6/9/2014	L1	L1	
8/5/2014	L1	L1	
10/6/2014	L1	L1	
12/8/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

AUDIT - 2425
Lynden Street, 2425
Lynden Street

7/21/2014	L1	L1	
9/22/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

2664 Albert Way,
2664 Albert Way

1/20/2014	L1	L1	
3/10/2014	L1	L1	
4/14/2014	L1	L1	
6/9/2014	L1	L1	
7/21/2014	L1	L1	
9/2/2014	L1	L1	
10/14/2014	L1	L1	
11/24/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

2459 Centre Street
(at United Rentals),
2459 Centre Street
(at United Rentals)

1/13/2014	L1	L1	
2/11/2014	L1	L1	
3/10/2014	L1	L1	

4/14/2014	L1	L1	
5/12/2014	L1	L1	
6/9/2014	L1	L1	
7/14/2014	L1	L1	
8/11/2014	L1	L1	
9/8/2014	L1	L1	
10/6/2014	L1	L1	
11/12/2014	L1	L1	
12/15/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

2577 Victoria Street,
2577 Victoria St

1/27/2014	L1	L1	
2/24/2014	L1	L1	
3/24/2014	L1	L1	
4/22/2014	L1	L1	
5/20/2014	L1	L1	
6/16/2014	L1	L1	
7/21/2014	L1	L1	
8/18/2014	L1	L1	
9/16/2014	L1	L1	
10/27/2014	L1	L1	
11/17/2014	L1	L1	
12/22/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

Reservoir B (1970),
2886 Grandview
Cres

1/6/2014	L1	L1	
3/3/2014	L1	L1	
5/5/2014	L1	L1	
7/7/2014	A		
7/14/2014	L1	L1	
9/8/2014	L1	L1	
11/3/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

2425 Lynden Street,
2425 Lynden Street

1/6/2014	L1	L1	
2/11/2014	L1	L1	
3/17/2014	L1	L1	
4/7/2014	L1	L1	
5/20/2014	L1	L1	
6/16/2014	L1	L1	
7/14/2014	L1	L1	
8/11/2014	L1	L1	
9/16/2014	L1	L1	
10/14/2014	L1	L1	
11/12/2014	L1	L1	

12/8/2014	L1	L1	
12/22/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

31894 Duchess Ave.
31894 Duchess Ave

2/3/2014	L1	L1	
3/3/2014	L1	L1	
3/31/2014	L1	L1	
4/29/2014	L1	L1	
5/26/2014	L1	L1	
6/23/2014	L1	L1	
7/14/2014	L1	L1	
8/18/2014	L1	L1	
9/8/2014	L1	L1	
10/14/2014	L1	L1	
11/3/2014	L1	L1	
12/8/2014	<u>L1</u>	<u>L1</u>	
Total Positive:	0	0	0

Result Values: E - estimated L - less than G - greater than

Samples that contain total coliform:	2		0.84% of total
Samples that contain e. coli:	0		0.00% of total
Samples that contain fecal coliform:	0		0.00% of total
Number of consecutive samples that contain total coliform:	0		
Number of samples that contain total coliform in last 30 days:	1/17		
Total number of samples:	237		

Comments:


 Environmental Health Officer
 Jan 14 2015

FOR FURTHER INFORMATION PLEASE CALL: Barb Haworth (604) 870-7900

Sample Range Report

Fraser Health Authority

Facility Name: Clearbrook Waterworks District
Date Range: Jan 1 2014 to Dec 31 2014

Operator Jason Hildebrandt
 2564 Clearbrook Road
 Abbotsford, BC V2T 2Y5

Sampling Site	Date Collected	Total Coliform	E. Coli	Fecal Coliform
<u>Well RW 7 - 00/13,</u>				
<u>Lynden St</u>				
	3/3/2014	L1	L1	
	6/9/2014	L1	L1	
	9/8/2014	L1	L1	
	11/3/2014	<u>L1</u>	<u>L1</u>	
	Total Positive:	0	0	0

Result Values: E - estimated L - less than G - greater than

Samples that contain total coliform:	0		0.00% of total
Samples that contain e. coli:	0		0.00% of total
Samples that contain fecal coliform:	0		0.00% of total
Number of consecutive samples that contain total coliform:	0		
Number of samples that contain total coliform in last 30 days:	0/0		
Total number of samples:	4		

Comments:


 Environmental Health Officer
 Jan 15 2015

FOR FURTHER INFORMATION PLEASE CALL: Barb Haworth (604) 870-7900

Sample Range Report

Fraser Health Authority

Facility Name: Clearbrook Waterworks District

Date Range: Jan 1 2014 to Dec 31 2014

Operator Jason Hildebrandt
2564 Clearbrook Road
Abbotsford, BC V2T 2Y5

Sampling Site	Date Collected	Total Coliform	E. Coli	Fecal Coliform
<u>Well # 1 - 87 (948),</u>				
<u>Autumn Ave</u>				
	1/6/2014	L1	L1	
	4/7/2014	L1	L1	
	7/7/2014	A		
	7/14/2014	<u>L1</u>	<u>L1</u>	
	Total Positive:	0	0	0

Result Values: E - estimated L - less than G - greater than

Samples that contain total coliform:	0		0.00% of total
Samples that contain e. coli:	0		0.00% of total
Samples that contain fecal coliform:	0		0.00% of total
Number of consecutive samples that contain total coliform:	0		
Number of samples that contain total coliform in last 30 days:	0/0		
Total number of samples:	4		

Comments:



Environmental Health Officer

Jan 15 2015

FOR FURTHER INFORMATION PLEASE CALL: Barb Haworth (604) 870-7900

Sample Range Report

Fraser Health Authority

Facility Name: Clearbrook Waterworks District
Date Range: Jan 1 2014 to Dec 31 2014

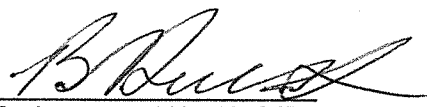
Operator Jason Hildebrandt
 2564 Clearbrook Road
 Abbotsford, BC V2T 2Y5

Sampling Site	Date Collected	Total Coliform	E. Coli	Fecal Coliform
<u>RW 3-93, Lynden St</u>				
	2/3/2014	L1	L1	
	5/5/2014	L1	L1	
	8/5/2014	L1	L1	
	10/6/2014	L1	L1	
	12/8/2014	<u>L1</u>	<u>L1</u>	
	Total Positive:	0	0	0

Result Values: E - estimated L - less than G - greater than

Samples that contain total coliform:	0		0.00% of total
Samples that contain e. coli:	0		0.00% of total
Samples that contain fecal coliform:	0		0.00% of total
Number of consecutive samples that contain total coliform:	0		
Number of samples that contain total coliform in last 30 days:	0/1		
Total number of samples:	5		

Comments:


 Environmental Health Officer
 Jan 15 2015

FOR FURTHER INFORMATION PLEASE CALL: Barb Haworth (604) 870-7900

Appendix B

Water Quality Reports by Exova

Report Transmission Cover Page

Bill To: Clearbrook Waterworks District Project:
Report To: Clearbrook Waterworks District ID:
 2564 Clearbrook Road Name:
 Abbotsford, BC, Canada Location:
 V2T 2Y5 LSD:
Attn: Ryan Federau P.O.:
Sampled By: Acct code:
Company:

Lot ID: **1044903**
Control Number: C0031600
Date Received: Dec 15, 2014
Date Reported: Dec 19, 2014
Report Number: 1976614

Contact & Affiliation	Address	Delivery Commitments
Accounts Payable Clearbrook Waterworks District	2564 Clearbrook Road Abbotsford, British Columbia V2T 2Y5 Phone: (604) 850-6621 Fax: (604) 850-7862 Email: office@clearbrookwaterworks.com	On [Lot Approval and Final Test Report Approval] send (COC, Test Report, Invoice) by Email - Merge Reports
Carol Nam Surrey QC	104, 19575 - 55 Avenue Surrey, British Columbia V3S 8P8 Phone: (604) 514-3322 Fax: (604) 514-3323 Email: carol.nam@exova.com	On [Report Approval] send (Test Report) by Email - Single Report
Ineke Kalwij Kalwij Water Dynamics Inc	P.O. Box 684 Station Main Port Coquitlam, British Columbia V3B 6H9 Phone: (604) 475-4063 Fax: (604) 475-4062 Email: ineke@kalwijwaterdynamics.com	On [Report Approval] send (COC, Test Report) by Email - Merge Reports
Ryan Federau Clearbrook Waterworks District	2564 Clearbrook Road Abbotsford, British Columbia V2T 2Y5 Phone: (604) 309-3986 Fax: (604) 850-7862 Email: ryan@clearbrookwaterworks.com	On [Lot Verification] send (COA) by Email - Single Report On [Report Approval] send (COC, Test Report) by Email - Merge Reports On [Lot Creation] send (COR) by Email - Single Report

Notes To Clients:

- Samples were decanted and preserved upon receipt.
- The analysis of water sample 1044903-1, 1044903-2, 1044903-3 is below Maximum Acceptable Concentrations for the chemical and bacteriological health related guidelines specified by the October 2014 Guidelines for Canadian Drinking Water Quality for the parameters tested.
- pH analysis was performed past the recommended holding time of 15 minutes from sample collection.
- Temperature of samples on arrival was 5.8°C.

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Analytical Report

Bill To: Clearbrook Waterworks District
 Report To: Clearbrook Waterworks District
 2564 Clearbrook Road
 Abbotsford, BC, Canada
 V2T 2Y5
 Attn: Ryan Federau
 Sampled By:
 Company:

Project:
 ID:
 Name:
 Location:
 LSD:
 P.O.:
 Acct code:

Lot ID: **1044903**
 Control Number: C0031600
 Date Received: Dec 15, 2014
 Date Reported: Dec 19, 2014
 Report Number: 1976614

Reference Number 1044903-1
Sample Date December 15, 2014
Sample Time 10:15
Sample Location
Sample Description RW 1-87/14
Sample Matrix Drinking Water

Analyte		Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
Metals Extractable						
Aluminum	Extractable	mg/L	<0.005	0.005	0.1	Below OG
Antimony	Extractable	mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Extractable	mg/L	0.0010	0.0002	0.010	Below MAC
Barium	Extractable	mg/L	0.018	0.001	1	Below MAC
Boron	Extractable	mg/L	0.020	0.005	5	Below MAC
Cadmium	Extractable	mg/L	<0.00007	0.00007	0.005	Below MAC
Chromium	Extractable	mg/L	<0.0005	0.0005	0.05	Below MAC
Copper	Extractable	mg/L	<0.001	0.001	1.0	Below AO
Lead	Extractable	mg/L	<0.0001	0.0001	0.01	Below MAC
Selenium	Extractable	mg/L	0.001	0.0006	0.05	Below MAC
Uranium	Extractable	mg/L	<0.0005	0.0005	0.02	Below MAC
Vanadium	Extractable	mg/L	0.0006	0.0001		
Zinc	Extractable	mg/L	<0.001	0.001	5.0	Below AO
Microbiological Analysis						
Total Coliforms	Enzyme Substrate Test	MPN/100 mL	<1.0	1.0	0 per 100 mL	Below MAC
Escherichia coli	Enzyme Substrate Test	MPN/100 mL	<1.0	1.0	0 per 100 mL	Below MAC
Heterotrophic Count - Aerobic	SimPlate	MPN/mL	<2	2		
Physical and Aggregate Properties						
Colour	True	Colour units	20	5		
Turbidity		NTU	0.15	0.02		
Routine Water						
pH	at 25 °C		7.31		6.5-8.5	Within AO
Electrical Conductivity		µS/cm at 25 C	225	1		
Calcium	Extractable	mg/L	24.6	0.1		
Iron	Extractable	mg/L	0.006	0.005	0.3	Below AO
Magnesium	Extractable	mg/L	6.69	0.1		
Manganese	Extractable	mg/L	0.014	0.001	0.05	Below AO
Potassium	Extractable	mg/L	2.1	0.1		
Silicon	Extractable	mg/L	8.26	0.05		
Sodium	Extractable	mg/L	9.0	0.1	200	Below AO
T-Alkalinity	as CaCO3	mg/L	69	5		
Chloride	Dissolved	mg/L	10.9	0.05	250	Below AO
Fluoride	Dissolved	mg/L	0.03	0.01	1.5	Below MAC
Nitrate - N	Dissolved	mg/L	0.92	0.01	10	Below MAC

Analytical Report

Bill To: Clearbrook Waterworks District Project:
Report To: Clearbrook Waterworks District ID:
2564 Clearbrook Road Name:
Abbotsford, BC, Canada Location:
V2T 2Y5 LSD:
Attn: Ryan Federau P.O.:
Sampled By: Acct code:
Company:

Lot ID: **1044903**
Control Number: C0031600
Date Received: Dec 15, 2014
Date Reported: Dec 19, 2014
Report Number: 1976614

Reference Number 1044903-1
Sample Date December 15, 2014
Sample Time 10:15
Sample Location
Sample Description RW 1-87/14
Sample Matrix Drinking Water

Analyte		Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
Routine Water - Continued						
Nitrite - N	Dissolved	mg/L	<0.01	0.01	1	Below MAC
Sulfate (SO4)	Dissolved	mg/L	23.8	0.5	500	Below AO
Hardness	as CaCO3	mg/L	89	1		
Total Dissolved Solids	Extractable	mg/L	145	1		

Analytical Report

Bill To: Clearbrook Waterworks District Project:
 Report To: Clearbrook Waterworks District ID:
 2564 Clearbrook Road Name:
 Abbotsford, BC, Canada Location:
 V2T 2Y5 LSD:
 Attn: Ryan Federau P.O.:
 Sampled By: Acct code:
 Company:

Lot ID: **1044903**
 Control Number: C0031600
 Date Received: Dec 15, 2014
 Date Reported: Dec 19, 2014
 Report Number: 1976614

Reference Number 1044903-2
Sample Date December 15, 2014
Sample Time 10:02
Sample Location
Sample Description RW 3-93/11
Sample Matrix Drinking Water

Analyte		Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
Metals Extractable						
Aluminum	Extractable	mg/L	<0.005	0.005	0.1	Below OG
Antimony	Extractable	mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Extractable	mg/L	0.0004	0.0002	0.010	Below MAC
Barium	Extractable	mg/L	0.007	0.001	1	Below MAC
Boron	Extractable	mg/L	0.017	0.005	5	Below MAC
Cadmium	Extractable	mg/L	<0.00007	0.00007	0.005	Below MAC
Chromium	Extractable	mg/L	<0.0005	0.0005	0.05	Below MAC
Copper	Extractable	mg/L	0.001	0.001	1.0	Below AO
Lead	Extractable	mg/L	0.0003	0.0001	0.01	Below MAC
Selenium	Extractable	mg/L	<0.0006	0.0006	0.05	Below MAC
Uranium	Extractable	mg/L	<0.0005	0.0005	0.02	Below MAC
Vanadium	Extractable	mg/L	0.0008	0.0001		
Zinc	Extractable	mg/L	0.011	0.001	5.0	Below AO
Microbiological Analysis						
Total Coliforms	Enzyme Substrate Test	MPN/100 mL	<1.0	1.0	0 per 100 mL	Below MAC
Escherichia coli	Enzyme Substrate Test	MPN/100 mL	<1.0	1.0	0 per 100 mL	Below MAC
Heterotrophic Count - Aerobic	SimPlate	MPN/mL	2	2		
Physical and Aggregate Properties						
Colour	True	Colour units	23	5		
Turbidity		NTU	0.02	0.02		
Routine Water						
pH	at 25 °C		6.96		6.5-8.5	Within AO
Electrical Conductivity		µS/cm at 25 C	263	1		
Calcium	Extractable	mg/L	28.5	0.1		
Iron	Extractable	mg/L	<0.005	0.005	0.3	Below AO
Magnesium	Extractable	mg/L	7.09	0.1		
Manganese	Extractable	mg/L	<0.001	0.001	0.05	Below AO
Potassium	Extractable	mg/L	1.6	0.1		
Silicon	Extractable	mg/L	9.11	0.05		
Sodium	Extractable	mg/L	10.4	0.1	200	Below AO
T-Alkalinity	as CaCO3	mg/L	60	5		
Chloride	Dissolved	mg/L	28.2	0.05	250	Below AO
Fluoride	Dissolved	mg/L	0.03	0.01	1.5	Below MAC
Nitrate - N	Dissolved	mg/L	1.70	0.01	10	Below MAC

Analytical Report

Bill To: Clearbrook Waterworks District Project:
Report To: Clearbrook Waterworks District ID:
2564 Clearbrook Road Name:
Abbotsford, BC, Canada Location:
V2T 2Y5 LSD:
Attn: Ryan Federau P.O.:
Sampled By: Acct code:
Company:

Lot ID: **1044903**
Control Number: C0031600
Date Received: Dec 15, 2014
Date Reported: Dec 19, 2014
Report Number: 1976614

Reference Number 1044903-2
Sample Date December 15, 2014
Sample Time 10:02
Sample Location
Sample Description RW 3-93/11
Sample Matrix Drinking Water

Analyte		Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
Routine Water - Continued						
Nitrite - N	Dissolved	mg/L	<0.01	0.01	1	Below MAC
Sulfate (SO4)	Dissolved	mg/L	20.9	0.5	500	Below AO
Hardness	as CaCO3	mg/L	100	1		
Total Dissolved Solids	Extractable	mg/L	165	1		

Analytical Report

Bill To: Clearbrook Waterworks District Project:
 Report To: Clearbrook Waterworks District ID:
 2564 Clearbrook Road Name:
 Abbotsford, BC, Canada Location:
 V2T 2Y5 LSD:
 Attn: Ryan Federau P.O.:
 Sampled By: Acct code:
 Company:

Lot ID: **1044903**
 Control Number: C0031600
 Date Received: Dec 15, 2014
 Date Reported: Dec 19, 2014
 Report Number: 1976614

Reference Number 1044903-3
Sample Date December 15, 2014
Sample Time 09:42
Sample Location
Sample Description RW 7-00/13
Sample Matrix Drinking Water

Analyte	Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
Metals Extractable					
Aluminum	Extractable mg/L	<0.005	0.005	0.1	Below OG
Antimony	Extractable mg/L	<0.0002	0.0002	0.006	Below MAC
Arsenic	Extractable mg/L	0.0003	0.0002	0.010	Below MAC
Barium	Extractable mg/L	0.006	0.001	1	Below MAC
Boron	Extractable mg/L	0.011	0.005	5	Below MAC
Cadmium	Extractable mg/L	<0.00007	0.00007	0.005	Below MAC
Chromium	Extractable mg/L	0.0005	0.0005	0.05	Below MAC
Copper	Extractable mg/L	0.003	0.001	1.0	Below AO
Lead	Extractable mg/L	0.0002	0.0001	0.01	Below MAC
Selenium	Extractable mg/L	<0.0006	0.0006	0.05	Below MAC
Uranium	Extractable mg/L	<0.0005	0.0005	0.02	Below MAC
Vanadium	Extractable mg/L	0.0008	0.0001		
Zinc	Extractable mg/L	0.013	0.001	5.0	Below AO
Microbiological Analysis					
Total Coliforms	Enzyme Substrate Test MPN/100 mL	<1.0	1.0	0 per 100 mL	Below MAC
Escherichia coli	Enzyme Substrate Test MPN/100 mL	<1.0	1.0	0 per 100 mL	Below MAC
Heterotrophic Count - Aerobic	SimPlate MPN/mL	45	2		
Physical and Aggregate Properties					
Colour	True Colour units	14	5		
Turbidity	NTU	0.02	0.02		
Routine Water					
pH	at 25 °C	6.85		6.5-8.5	Within AO
Electrical Conductivity	µS/cm at 25 C	224	1		
Calcium	Extractable mg/L	24.6	0.1		
Iron	Extractable mg/L	<0.005	0.005	0.3	Below AO
Magnesium	Extractable mg/L	6.08	0.1		
Manganese	Extractable mg/L	0.001	0.001	0.05	Below AO
Potassium	Extractable mg/L	1.3	0.1		
Silicon	Extractable mg/L	9.57	0.05		
Sodium	Extractable mg/L	7.2	0.1	200	Below AO
T-Alkalinity	as CaCO3 mg/L	47	5		
Chloride	Dissolved mg/L	24.9	0.05	250	Below AO
Fluoride	Dissolved mg/L	0.02	0.01	1.5	Below MAC
Nitrate - N	Dissolved mg/L	2.32	0.01	10	Below MAC

Analytical Report

Bill To: Clearbrook Waterworks District Project:
Report To: Clearbrook Waterworks District ID:
2564 Clearbrook Road Name:
Abbotsford, BC, Canada Location:
V2T 2Y5 LSD:
Attn: Ryan Federau P.O.:
Sampled By: Acct code:
Company:

Lot ID: **1044903**
Control Number: C0031600
Date Received: Dec 15, 2014
Date Reported: Dec 19, 2014
Report Number: 1976614

Reference Number 1044903-3
Sample Date December 15, 2014
Sample Time 09:42
Sample Location
Sample Description RW 7-00/13
Sample Matrix Drinking Water

Analyte		Units	Result	Nominal Detection Limit	Guideline Limit	Guideline Comments
Routine Water - Continued						
Nitrite - N	Dissolved	mg/L	<0.01	0.01	1	Below MAC
Sulfate (SO4)	Dissolved	mg/L	15.7	0.5	500	Below AO
Hardness	as CaCO3	mg/L	86	1		
Total Dissolved Solids	Extractable	mg/L	144	1		

Approved by: 
Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).

Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Methodology and Notes

Bill To: Clearbrook Waterworks District Project:
 Report To: Clearbrook Waterworks District ID:
 2564 Clearbrook Road Name:
 Abbotsford, BC, Canada Location:
 V2T 2Y5 LSD:
 Attn: Ryan Federau P.O.:
 Sampled By: Acct code:
 Company:

Lot ID: **1044903**
 Control Number: C0031600
 Date Received: Dec 15, 2014
 Date Reported: Dec 19, 2014
 Report Number: 1976614

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (Surrey)	APHA	* Alkalinity - Titration Method, 2320 B	15-Dec-14	Exova Surrey
Alk, pH, EC, Turb in water (Surrey)	APHA	* Conductivity, 2510 B	15-Dec-14	Exova Surrey
Alk, pH, EC, Turb in water (Surrey)	APHA	* pH - Electrometric Method, 4500-H+ B	15-Dec-14	Exova Surrey
Anions by IEC in water (Surrey)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	16-Dec-14	Exova Surrey
Heterotrophic (Standard) Plate Count (Aerobic SP) - Surrey	US EPA	Enzyme Substrate Method, 9215 E	15-Dec-14	Exova Surrey
Metals SemiTrace (Extractable) in water (Surrey)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	15-Dec-14	Exova Surrey
Total and E-Coli - Colilert - DW (Surrey)	APHA	Enzyme Substrate Test, APHA 9223 B	15-Dec-14	Exova Surrey
Trace Metals (extractable) in Water (Surrey)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	15-Dec-14	Exova Surrey
True Color in water (Surrey)	APHA	* Spectrophotometric - Single Wavelength Method, 2120 C	17-Dec-14	Exova Surrey
Turbidity - Water (Surrey)	APHA	* Turbidity - Nephelometric Method, 2130 B	17-Dec-14	Exova Surrey

* Reference Method Modified

References

APHA Standard Methods for the Examination of Water and Wastewater
 US EPA US Environmental Protection Agency Test Methods

Guidelines

Guideline Description Health Canada GCDWQ
 Guideline Source Guidelines for Canadian Drinking Water Quality, Health Canada, October 2014
 Guideline Comments MAC = Maximum Acceptable Concentration
 AO = Aesthetic Objective
 OG = Operational Guideline for Water Treatment Plants
 Refer to Health Canada GCDWQ for complete guidelines and additional drinking water information at www.hc-sc.gc.ca

Comments:

- Samples were decanted and preserved upon receipt.
- The analysis of water sample 1044903-1, 1044903-2, 1044903-3 is below Maximum Acceptable Concentrations for the chemical and bacteriological health related guidelines specified by the October 2014 Guidelines for Canadian Drinking Water Quality for the parameters tested.
- pH analysis was performed past the recommended holding time of 15 minutes from sample collection.
- Temperature of samples on arrival was 5.8°C.

Methodology and Notes

Bill To: Clearbrook Waterworks District Project:
Report To: Clearbrook Waterworks District ID:
 2564 Clearbrook Road Name:
 Abbotsford, BC, Canada Location:
 V2T 2Y5 LSD:
 Attn: Ryan Federau P.O.:
Sampled By: Acct code:
Company:

Lot ID: **1044903**
Control Number: C0031600
Date Received: Dec 15, 2014
Date Reported: Dec 19, 2014
Report Number: 1976614

The comparison of test results to guideline limits is provided for information purposes only. This is not to be taken as a statement of conformance / nonconformance to any guideline, regulation or limit. The data user is responsible for all conclusions drawn with respect to the data and is advised to consult official regulatory references when evaluating compliance.

Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

End of Document