Drinking Water Quality – 2016 Annual Report

JUNE 2017 | ENGINEERING, PARKS AND ENVIRONMENT

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1.0 Summary

The City of North Vancouver's Drinking Water Quality Annual Report provides annual operating information about our drinking water and supports the City's application for the water distribution system annual Operating Permit. The Medical Health Officer issues the permit as required by the Drinking Water Protection Act.

In conjunction with the Greater Vancouver Water District (Metro Vancouver), the City continues to deliver safe, high-quality water to its residents. The City's ten-year capital plan for the water utility continues to provide for the ongoing replacement of aging or problematic water infrastructure and to provide funding for the maintenance programs related to water quality.

The Regional Drinking Water Management Plan (DWMP), prepared by Metro Vancouver in 2011, provides direction for a sustainable water supply and includes commitments at both the municipal and regional level. The 2011 DWMP is an update of the 2007 plan and reflects fundamental improvements in water quality treatment at the Seymour Filtration Plant and a larger focus on sustainability of the resource.

The primary goals of the Plan remain unchanged and are as follows:

Goal 1: Provide Clean, Safe Drinking Water

Goal 2: Ensure the Sustainable Use of Water Resources

Goal 3: Ensure the Efficient Supply of Water

2.0 Source Water

Metro Vancouver has three watersheds that provide our drinking water: Capilano and Seymour Watersheds on the North Shore and Coquitlam Watershed in Coquitlam. Drinking water is supplied to 2.4 million residents from these sources. Both the Capilano and Seymour water sources are filtered and disinfected at the Seymour Falls Water Filtration Plant prior to distribution.

The watersheds are protected from urban development, closed to public access, and managed as natural assets of the highest importance to the region we live in. Protecting the source of our drinking water protects other natural assets.

Metro Vancouver is responsible for monitoring and testing water for microbiological, chemical, and physical quality. Metro Vancouver maintains a laboratory for the program, testing all source water as well as samples collected by member municipalities from their distribution systems. An Annual quality control report provides a comprehensive report on water quality information for the entire Metro Vancouver service area. Extensive information on water in general is provided on the Metro Vancouver web site (www.metrovancouver.org).

The City of North Vancouver is located between the Capilano and Seymour source water reservoirs; consequently, it receives water from both sources. Predominately, water from the Seymour Watershed has been delivered to areas north of Keith Road from the Metro Vancouver source on Lynn Valley Road (CNV Pressure Zone 2). Source water to the western portion of this area is temporarily stored in the Metro Vancouver Greenwood Reservoir. The area south of Keith Road (CNV Pressure Zone 3) is primarily fed by the Metro Vancouver Capilano Main No. 7. Additionally, isolated portions of the City in the Tempe Heights and Queensbury School area (CNV Pressure Zone 1) are serviced from water from the District of North Vancouver water mains to provide efficient distribution of water without additional pumping infrastructure. Conversely, isolated portions of the District are serviced by the City of North Vancouver water utility for the same reason.

Prior to 2016, the Seymour and the Capilano water source had been entirely independent. However, in the first half of 2015, Metro Vancouver completed commissioning of the Capilano-Seymour water tunnels, which now provide filtration of the Capilano Reservoir source water prior to distribution. This is a fundamental change to water quality management in the City, as the Capilano source water was often prone to turbidity events and widely varying chlorine concentrations.

3.0 Distribution System

3.1 General

The City of North Vancouver's water distribution system serves an estimated population of 54,300, along with an institutional, commercial, and industrial base that accounts for approximately 68% and 32% of the yearly water consumption respectively. There are 127 kilometres of pipe divided into four pressure zones with nine pressure reducing stations and over 7,100 service connections. Approximately 53% of the water main system is cast iron, 37% is ductile iron, 9% is PVC, and 1% is steel. The oldest pipes in the system were installed in 1911. Appendix A is a map showing the sampling station locations, the pressure reducing stations which correlate with the GVWD water sources to the City, and the various pressure zones.

3.2 Testing

The City's water quality sampling program is based on accepted protocols developed in consultation with the Medical Health Officer (MHO). The program provides microbiological, chemical, and physical testing to evaluate water quality. There are 20 sampling stations located throughout the City to give a broad cross-section of the water quality in the distribution system. Samples are taken from half the stations each week, such that each station is tested on a bi-weekly basis. The City continues to monitor with a continuous inline chlorine analyzer in the Westmoreland PRV chamber to provide real-time free chlorine, pH, and temperature data for source water supplied by Metro Vancouver.

The *Guidelines for Canadian Drinking Water Quality* classifies water quality parameters into the following groups:

- microbiological
- chemical and physical; and
- radiological.

Parameters have been included in the guidelines due to a Health-Based concern, an Aesthetic Objective, or for Operational reasons. For the health-based parameters, a maximum acceptable concentration is provided under the guidelines, aesthetic objectives and operational guidelines also have suggested limits or ranges. In some cases, a parameter may have a health-based maximum limit, and a more stringent aesthetic objective.

Maximum acceptable concentration limits have been established for certain substances known or suspected to cause adverse effects on health. The Health Canada standards have been developed to safeguard health on the basis of lifelong consumption and the use of the water for all usual domestic purposes, including personal hygiene.

The bi-weekly samples from all 20 stations are tested for the following health-based parameters:

- microbiological evidence (E.coli, HPC, coliform); and

- turbidity.

Three sampling stations are tested for the health-based parameters Haloacetic Acids (HAA) and Trihalomethanes (THMs), on a less frequent basis:

- No. 807 – 1900 Hamilton;
- No. 808 – 980 West 1st Street; and
- No. 812 – 539 East 20th Street.

Metals analysis is also provided at three additional stations and are tested at a lower frequency:

- No. 801 – 550 West 28th Street;
- No. 803 – 264-268 East 9th Street; and
- No. 804 – 848 East 6th Street.

Most metals are health-based parameters, but not all. A list of aesthetic-based parameters is provided in the following section

The bi-weekly samples from all 20 stations are tested for the following aesthetic parameters:

- Temperature; and
- chlorine residual.

Additional chemical and physical based water quality parameters that are not health-based include:

• ammonia	• iron	• sulphate
• calcium	• magnesium	• sulphide
• chlorine	• odour	• taste
• colour	• pH	• temperature
• copper	• silver	• total dissolved solids
• hardness	• sodium	• zinc

3.3 Water Quality Sampling Results

DISCUSSION ON HEALTH-BASED PARAMETERS

In 2016 none of the health-based parameters tested exceeded the maximum acceptable limits under the Guidelines.

Micro-Biological Parameters

Microbiological results for the 2016 testing year were that all E.coli and coliform tested below the guidelines. This is indicative of positive system-wide disinfection despite some lower chlorine residual concentrations.

Chemical and Physical Parameters

Specifically, the seven individual sets of results collected throughout the year both HAA and THM concentrations remained consistently low at about one-fourth of the maximum acceptable limit.

Vinyl chloride testing is conducted at one station in Tempe Heights, where the water system is constructed entirely from PVC pipe, and measurable concentrations were not detected in 2016. Metro Vancouver provides the testing and data summary services and alerts the City to any water quality problems.

Turbidity is generally caused by rainfall events affecting the watersheds and is beyond the control of the City; it is less common now due to universal filtration of both North Shore sources (since April 2015). Water main cleaning, water main breaks, and high velocity flows due to firefighting are the other primary sources of turbidity in the City and they are primarily managed annually through water main flushing programs, as well as being addressed on a longer-term basis through water main replacement.

The City also includes turbidity testing for each sample in the field as part of the sampling program. This ensures an immediate response to turbidity problems if necessary, rather than a delay caused by waiting for GVWD lab results.

In 2016, only six samples exceeded the recommended turbidity level of 1.0 NTU, for a total of 1.15% of the 520 samples, which is considered very low given the large percentage of cast iron water mains in the utility. These exceedances occurred at four stations throughout the City and could have been the result of any number of the above-mentioned operational conditions.

Appendix B provides a description of the sampling parameters, the allowable limits, and a detailed summary of the 2016 test results.

DISCUSSION ON NON HEALTH-BASED PARAMETERS

Chlorine residual, while not a health-based parameter, is a requirement for all distribution systems as chlorine is the barrier for micro-biological regrowth following initial filtration and disinfection. It is a requirement to maintain a chlorine residual of 0.2 mg/L for distribution systems.

Chlorine residual sampling results showed a system average at 0.63 mg/l, which is well above the 0.2 mg/l minimum standard. Of the 20 sampling stations, three locations exhibited chlorine concentrations below the 0.2 mg/l criteria for a total of 6 instances out of 520 samples (1.15 %).

Stations that had low chlorine concentration include:

- Station No. 801 – 568 West 28th Street 1 low concentration sample
- Station No. 807 – 1904 Hamilton: 3 low concentration samples
- Station No. 812 – 539 East 20th Street: 2 low concentration samples

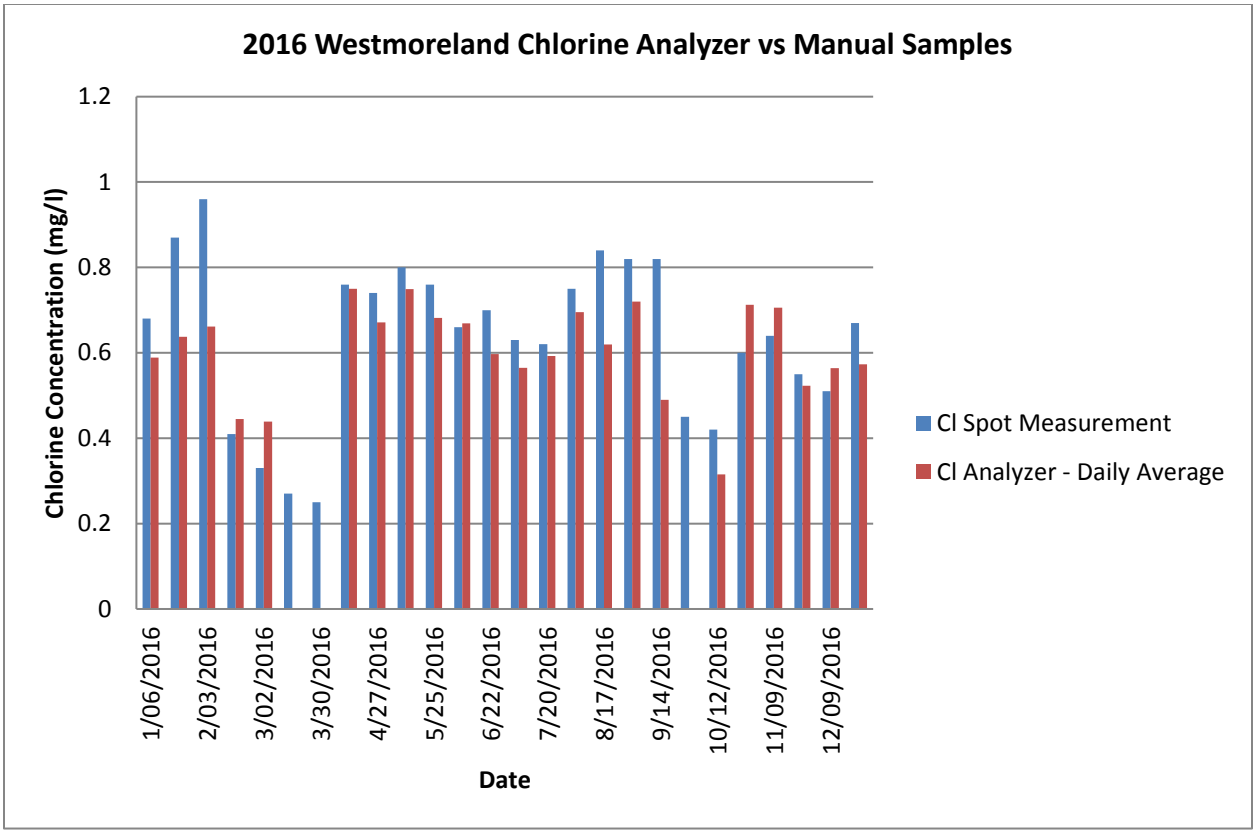
This is an improvement from 2015, where a total of seven sample locations fell below the 0.2 mg/l threshold. Specifically in 2015, Station 807 and 812 had a total of 9 and 7 samples below guideline concentrations respectively. These improvements at these Stations are largely due to some operational changes made to increase water demands slightly in these areas at controlled locations.

1900 Hamilton Avenue is located in a quiet residential area north of Marine Drive and west of Fell Avenue. Water in this area is drawn from the Westmoreland Metro Vancouver source, but due to older cast iron water mains and lower residential demands, it is likely that the chlorine concentrations were reduced more quickly than water was being consumed. The City continued to flush the water mains in this area and has also installed a continuous water flushing system that has resulted in a marked improvement in the areas water quality.

539 East 20th Street is located in the Queensbury School neighbourhood, which is an area that receives water from the District of North Vancouver via the 29th and Regent source. Given that this water is received from the District, it is expected to have a longer residence time in the distribution system, which would lead to the lower chlorine concentrations. In 2016, the average chlorine residual was 0.35mg/l with 1 recorded failure the lowest being 0.05mg/l.

A review of the chlorine analyzer at the Westmoreland source was conducted for 2016 and it was found that while the instrument generally agreed with the manual samples, the values from the analyzer generally drifts either higher or lower than the manual measurements (based on the temporally varying average daily chlorine concentrate as compared the single manual measurement). The equipment is maintenance-intensive and results can be affected in periods when the unit is not maintained as frequently as required. There were two periods in 2016 where the Cl analyzer was not operational.

The following chart shows 23 manual measurements made in 2016 and the corresponding daily average chlorine concentration. The majority of the values agree well, but it appears that the analyzer tends to drift and report higher Cl concentrations over time in between maintenance activities.



The City has set alarms for the chlorine analyzer since the period of no data to trigger early and more frequent maintenance. Since that time, there have been very few alarms.

The chlorine analyzer at Westmoreland has been shown to provide reliable data if regular maintenance and calibration of the sensor are completed; however, the data has not been shown to provide a large value in terms of operations and the delivery of high-quality drinking water. Should another sensor be added to the system, the location and operational needs should be well justified given that the sensors require an ongoing maintenance commitment. Relocation of the current sensor may be more beneficial than the addition of a second unit.

Water temperature during the summer months at times exceeds the recommended value of 15 degrees Celsius in the City distribution system. While higher temperatures are not aesthetically pleasing and may influence bacterial regrowth, City Water Utility Operations cannot influence water temperature to a large degree.

In 2016, water temperature exceeded the recommended value a total of 86 times out of 520 samples, or a total of 16.5% of the time. The peak station was Station No. 812 – 539 West 20th Street, which exceeded temperature values as much as 36% of the time (9 of 26 samples). The lowest instances of temperature samples testing above recommended values were 8% (2 of 26 samples) and occurred at Station No. 817 – 2200 Block St. Andrew's Avenue and Station No. 818 – 755 Grand Boulevard.

The primary non health-based metals that are often detected in drinking water include: Iron, Copper, and Zinc. In the City's water system all concentrations measured are below the aesthetic objectives, with Iron being the most prevalent metal detected in the three sample sets.

3.4 Risks

Risks to distribution water quality include the following issues related to disinfection and maintenance-related activities. The City's Water Utility procedures have been developed to minimize and mitigate these foreseen risks.

Increased chlorine residuals can increase the levels of Haloacetic Acid (HAA) and Trihalomethanes (THMs). Longer-than-average exposure to THMs is an indicator of by-product-related cancer risk.

Chlorine residuals below 0.2 mg/l can potentially allow pathogenic organisms to multiply.

Insufficient levels of maintenance and care can put the water system at risk. Water main cleaning is an essential component of the care that is required to maintain high-quality drinking water. Planned replacement of aging pipes reduces the risk of water main breaks and the associated risk of contamination.

3.5 Issues

In 2016 all source water for the entire year has been treated at the Seymour Falls treatment plant, which has likely led to be consistent chlorine residuals. Temperature continues to be a challenge, as average water temperatures in August, September, and October tend to exceed the guideline threshold.

Based on the 20 sample stations, there are two clear areas to focus additional efforts to improve operational improvements to improve chlorine concentrations and temperature: Station No. 807 – 1900 Hamilton Avenue, and Station No. 812 – 539 East 20th Street.

3.6 Water System Operation and Maintenance

The goal for water system flushing is to clean all mains on a 365-day cycle and the following table depicts the generalized water system cleaning schedule. Some areas are cleaned twice per cycle based on observations and operational decisions. The zones are mapped in Appendix A.

City of North Vancouver Water Main Cleaning Plan	
Water Pressure Zones	**Frequency**
Zone 1/5 - 785	Annually
Zone 2 - 632	Annually
Zone 3 - 601	Annually and some areas twice per year
Zone 4 - 385	Annually
Turbid Water Reports	As required

Combining the cleaning program with the valve actuation program has the added benefit of ensuring all valves in the system are open and maintaining flows in the designed fashion.

In 2016, a total of four water projects were constructed with a total length of 1089m of new water main.

2016 Water Main Construction	2017 Water Main Construction
A. 400-500 East 8th Street (R) – 401m	A. 100 Block East Keith to 6th (R)
B. 200 East 10th Street (R) – 280m	B. 4th Street-Heywood to Kennard (R)
C. Brooksbank: North of Cotton Dr. (R) – 230m	C. 29th Regent to 793 East 29th Street (R)
D. Mahon Park: 16th Street to North (N) – 178m	D. St. George's: East 13th to East 15th (R)
E.	E. East 3rd: St. David's to Queensbury (R)
F.	F. Moody: East 2nd to East 4th (R)

R – Replacement water main construction
N – New water main construction

All the new and replacement water main construction improves flow capability and pipe quality, both of which have a positive influence on water quality and overall system resiliency.

4.0 Significant Incidents

There were no incidents in the City's water distribution system that significantly compromised water quality in 2016. Of note, the City of North Vancouver's Engineering Department updated its Emergency Plan, which includes identification of critical elements in the water system infrastructure as well as key water quality topics.

A comprehensive water communication protocol for source water turbidity events was established through a task force of Metro Vancouver member municipalities and the Vancouver Coastal and Fraser Health Authorities and endorsed in March 2008. The protocol is now included in the Appendix D Response Plan.

5.0 Operator Qualifications

The table below highlights the qualifications and experience of City of North Vancouver staff directly involved in the operation of the water system.

Employee	Position	Courses	Qualifications	Work Experience
R. Greenlees	Section Manager Utilities	Water Distribution I&II Other trades related education		37 years
D. Price	Utility Tradesman	Tradesman Plumber	EOCP Water Distribution II	29 years
M. Trinkl	Supervisor Operations		EOCP Water Distribution II	27 years
D. Sherwood	Assistant Supervisor		EOCP Water Distribution II	17 Years
W. Mason	Utility Tradesman	Tradesman Plumber Cross Connection Control	EOCP Water Distribution III	16 years
Leon Beaupre	Irrigation System Worker	Cross Connection Control	Irrigation Industry assoc. of B.C. level 1+2	4 years
T. Stefas	Pipefitter		EOCP Water Distribution I	10 years
T. Van Nes	Pipefitter	Cross Connection Control	EOCP Water Distribution I	4 years
J. Siemens	Plumbing and Gas Inspector	Cross Connection Control Tradesman Plumber Hydronic Technician		13 years
Bryce Pollock	Plumbing and Gas Inspector	Cross Connection Control Tradesman Plumber Hydronic Technician		10 years

The City recognizes the value that operator education and training provides. Staff members participate annually in a variety of workshops, product orientations, and technical courses. The City's water system is a Class III distribution system, which includes staff with Level III certification. The City staff complement is knowledgeable, experienced, and eminently competent to operate the City's water distribution system.

6.0 Security Measures

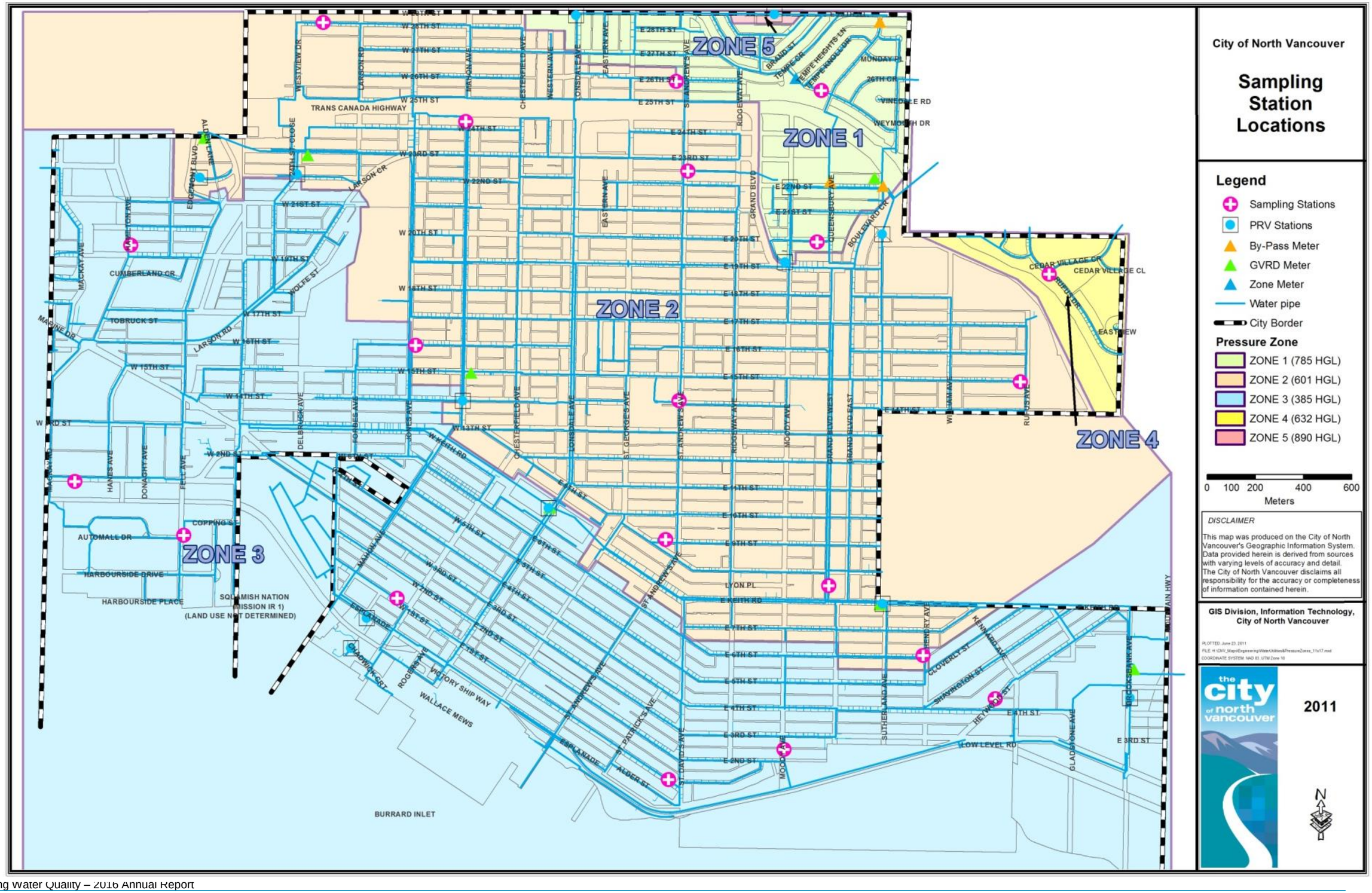
Security measures for water systems typically concentrate on the protection of water sources and reservoirs. The City's system relies upon the GVWD for water supply and storage and therefore has not employed any extraordinary measures. Supply points (GVWD meter stations and PRVs) could be the most vulnerable components of our system, but in reality are no more vulnerable than fire hydrants and individual service connections. City staff will continue to keep apprised of security issues and will implement operational changes as required.

7.0 Notification And Emergency Response Plan

The City's Notification and Emergency Response Plan is included in Appendix D. The City of North Vancouver's Engineering, Parks and Environment Emergency Response Plan is up to date and tested annually to ensure new staff are aware of expectations in the event of an emergency.

8.0 Appendices

Appendix A: CNV Water Zones and Sampling Station Locations



City of North Vancouver

Sampling Station Locations

Legend

- Sampling Stations
- PRV Stations
- By-Pass Meter
- GVRD Meter
- Zone Meter
- Water pipe
- City Border

Pressure Zone

- ZONE 1 (785 HGL)
- ZONE 2 (601 HGL)
- ZONE 3 (385 HGL)
- ZONE 4 (632 HGL)
- ZONE 5 (890 HGL)

0 100 200 400 600
Meters

DISCLAIMER

This map was produced on the City of North Vancouver's Geographic Information System. Data provided herein is derived from sources with varying levels of accuracy and detail. The City of North Vancouver disclaims all responsibility for the accuracy or completeness of information contained herein.

GIS Division, Information Technology, City of North Vancouver

PLOTTED: June 23, 2011
FILE: H:\CNV_Mapid\Engineering\Water\Utilities\PressureZones_11x17.mxd
COORDINATE SYSTEM: NAD 83, UTM Zone 10

the city of north vancouver

2011

N

The following chart shows the sampling station locations with a designation for the type of flow being evaluated.

City of North Vancouver - Water Sampling Locations

																				Source Samples			
Number	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	S	S	S	S
Zone	601	601	601	601	601	601	385	385	385	385	385	785	632	785	385	601	601	601	601	385	601	385	785	785
Address	568 West 28th	1546 Jones	200 Block East 8th	848 East 6th	895 East 15th	259 East 26th	1900 Block Hamilton	980 West 1st	202 - 236 West 1st	472 - 474 East 1st	1050 Heywood	539 West 20th	1903 Rufus	2640 Tempe Knoll	42 Fell	231 East 15th	2200 Block St. Andrew's	755 Grand Blvd.	304 West 24th	209 Moody	20th & Sutherland	Westmoreland	29th & Regent	29th & Lonsdale
Flow	B	A	B	C	B	B	B	B	A	B	B	C	B	C	B	A	A	A	B	B	S	S	S	S

Flow Description for Sampling Locations
S = Source water (14% of samples)
A = High to Medium flow - transmission mains (24% of samples)
B = Meduim to Low flow - distribution mains (48% of samples)
C = Very little flow - dead ends, unlooped lines, poor circulation (14% of samples)

Sampling Station Work Program

In general the City distribution system is in sound condition and has a good water quality record. The water is supplied by the GVRD from the Capilano and Seymour watersheds through eight connections with meters. The system is not complex, comprising of 133,000 metres of water main in a basic grid format.

Sampling is done on Wednesdays. Each station is sampled on a bi-weekly basis and the GVRD provides the testing and data summary services.

Appendix B: Water Sampling Parameters and 2016 Sampling Results

The following provides a simple description of the sampling parameters:

Sample Parameter	Sample Description	Guideline Limit
CL2Free mg/L	Free Chlorine in milligrams per litre	Min 0.2

The chlorine residual within the water distribution system is the indicator for the effectiveness of the disinfection process. The source water at Capilano and Seymour is treated to 1.5 mg/L and the goal is to maintain 0.2 to 0.4 mg/L at the extremities of the distribution system.

E.coli MF/100mLs	E.coli coliforms – Membrane Filtered per 100 millilitres	0

The microbiological quality of water is measured by sampling the number of coliform organisms. E.coli coliforms are considered key indicators and could indicate sewage contamination. None of the coliform organisms detected should be E.coli coliforms.

In rare circumstances, the E.coli coliform test and the total coliform test will read MPN/100mLs. This indicates the sample was too turbid for the normal Membrane Filtration test and required an alternative method. MPN is an abbreviation of “Most Probable Number”.

HPC CFU/mLs	Heterotrophic Plate Count – Colony Forming Units per milliliters	Max 500

Measuring the heterotrophic plate count (HPC) is an analytic method that is a useful operational tool for monitoring general bacteriological water quality throughout the treatment process and in the distribution system. HPC results are not an indicator of water safety and, as such, should not be used as an indicator of potential adverse human health effects. Each drinking water system will have a baseline range of HPC bacteria levels depending on the site-specific characteristics. Unexpected increases in the HPC baseline range could indicate a change in the treatment process, a disruption or contamination in the distribution system, or a change in the general bacteriological quality of the water.

Increases in HPC bacteria concentrations can be sudden or can gradually increase over time. Although some variation in HPC levels is normal and can occur seasonally, these increases can indicate a change in raw water quality, problems with drinking water treatment, or problems in the distribution system or plumbing and should be investigated.

Consistently low levels of HPC bacteria in the finished drinking water are an indicator that the treatment system is functioning properly. In the distribution system, HPC results outside of the normal range can provide some indication of stagnation, tuberculation, low or no residual disinfectant, and availability of nutrients for bacterial regrowth

Tcoli MF/100mLs	Total coliforms – Membrane Filtered per 100 millilitres	Max 10

The microbiological quality of water is measured by sampling the number of coliform organisms. No sample should contain more than 10 total coliforms per 100 millilitres, and 90% or more of the samples taken in a 30-day period must have zero coliform organisms. As well, no consecutive samples from the same site should show the presence of coliform organisms.

Temp ^{o}C	Temperature – Degrees Celsius	Max 15

Temperature is measured in degrees Celsius at the time a sample is taken. Higher temperatures in the distribution system may contribute to bacterial regrowth.

Turbidity NTU	Turbidity – Nephelometric Turbidity Unit	Max 1

Turbidity describes the amount of disturbed sediment in water. The presence of turbidity can have significant effects on both the microbiological quality of water and on the detection of bacteria and viruses. More important, however, is that the sediment interferes with the disinfection process. Turbidity's interference with chlorination can range from negligible to severe.

Water Sampling Results

The following tables summarize the chlorine residual and turbidity for the source water stations in 2016. The 29th and Lonsdale and 29th and Regent sites are from the District of North Vancouver distribution system and not direct from GVWD mains. Sutherland and Westmoreland are direct from GVWD mains.

2016 Metro Vancouver Source **Water**

601						
20th/Sutherland					# Outside	% Outside
	count	high	low	average	Guidelines	Guidelines
Free-CL2	25	0.98	0.53	0.80	0	0%
Turbidity	25	0.64	0.07	0.25	0	0%

385						
Westmoreland					# Outside	% Outside
	count	high	low	average	Guidelines	Guidelines
Free-CL2	26	0.96	0.25	0.64	0	0%
Turbidity	26	1.28	0.19	0.56	1	4%

782						
29TH/Regent					# Outside	% Outside
	count	high	low	average	Guidelines	Guidelines
Free-CL2	26	0.78	0.41	0.62	0	0%
Turbidity	26	0.85	0.17	0.38	0	0%

782						
29th/Lonsdale					# Outside	% Outside
	count	high	low	average	Guidelines	Guidelines
Free-CL2	26	0.74	0.04	0.57	1	4%
Turbidity	26	6.19	0.18	0.57	1	4%

The tables on the next two pages summarize the sampling results for each of the 20 stations.

Table 1: 2016: Zone 601

801
601
568 West 28th

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.61	0.17	0.43	1	4%
EColi	26	0.00	0.00	0.00	0	0%
HPC	24	2.00	0.00	0.25	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.20	6.00	12.24	7	27%
Turbidity	25	0.55	0.14	0.27	0	0%

802
601
1546 Jones

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.73	0.34	0.57	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.24	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.00	5.40	11.70	5	19%
Turbidity	26	0.28	0.11	0.18	0	0%

803
601
200 Block East 8th

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.71	0.38	0.54	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.16	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.90	5.10	11.76	6	23%
Turbidity	26	1.40	0.12	0.35	1	4%

804
601
848 East 6th

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.81	0.41	0.65	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	4.00	0.00	0.72	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	20.00	6.50	12.88	8	31%
Turbidity	26	2.00	0.09	0.23	1	4%

805
601
895 East 15th

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.80	0.40	0.61	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.24	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.00	5.80	11.74	4	15%
Turbidity	26	1.50	0.11	0.29	1	4%

806
601
259 East 26th

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.86	0.40	0.61	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.24	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	17.20	4.70	10.76	3	12%
Turbidity	26	0.62	0.10	0.19	0	0%

816
601
231 East 15th-LGH

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	1.05	0.51	0.79	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.16	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	17.90	3.50	10.18	3	12%
Turbidity	26	0.45	0.08	0.15	0	0%

817
601
2200 Block St. Andrew's

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.92	0.53	0.72	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.24	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	16.50	3.70	9.48	2	8%
Turbidity	26	0.26	0.08	0.14	0	0%

818
601
755 Grand Blvd

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.94	0.61	0.76	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	4.00	0.00	0.32	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	17.00	4.30	9.97	2	8%
Turbidity	26	0.66	0.09	0.18	0	0%

819
601
304 West 24th

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.91	0.48	0.73	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	8.00	0.00	0.32	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	17.90	4.60	10.67	3	12%
Turbidity	26	0.20	0.09	0.13	0	0%

Table 2: 2016: Zones 385, 632, 785

807
385
1900 Block Hamilton

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.83	0.13	0.45	3	12%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	10.00	0.00	0.72	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	16.50	6.00	11.81	3	12%
Turbidity	26	1.20	0.13	0.41	1	4%

808
385
980 West 1st

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.92	0.44	0.72	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	4.00	0.00	0.32	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.10	6.00	12.17	5	19%
Turbidity	26	0.28	0.09	0.15	0	0%

809
385
202-236 West 1st

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.86	0.56	0.72	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	4.00	0.00	0.72	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	17.50	6.00	11.32	3	12%
Turbidity	26	1.00	0.09	0.22	0	0%

810
385
472-474 East 1st

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.90	0.30	0.63	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.24	0	0%
Coliform	26	2.00	0.00	0.08	0	0%
Temp	26	18.50	6.00	12.06	5	19%
Turbidity	26	0.47	0.10	0.19	0	0%

811
385
1050 Heywood

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.83	0.44	0.65	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	180.00	0.00	7.60	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	17.50	6.90	11.76	6	23%
Turbidity	26	0.23	0.10	0.15	0	0%

812
785
539 East 20th

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.53	0.05	0.35	2	8%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	2.00	0.00	0.16	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	19.80	7.00	12.93	9	35%
Turbidity	26	1.40	0.11	0.29	2	8%

813
632
1903 Rufus

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.90	0.53	0.76	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	8.00	0.00	0.56	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	17.00	5.90	11.18	4	15%
Turbidity	26	0.27	0.07	0.13	0	0%

814
785
2640 Tempe Knoll

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.60	0.25	0.44	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	4.00	0.00	0.32	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.90	6.00	12.40	7	27%
Turbidity	26	1.00	0.14	0.29	0	0%

815
385
42 Fell (Pump Station)

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	0.89	0.59	0.76	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	6.00	0.00	0.56	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.20	5.80	11.52	4	15%
Turbidity	26	0.21	0.09	0.14	0	0%

820
385
209 Moody

	count	high	low	average	# outside guidelines	% outside guidelines
Free-CL2	26	1.01	0.41	0.70	0	0%
EColi	26	0.00	0.00	0.00	0	0%
HPC	25	4.00	0.00	0.40	0	0%
Coliform	26	0.00	0.00	0.00	0	0%
Temp	26	18.00	5.00	10.63	4	15%
Turbidity	26	0.99	0.08	0.18	0	0%

The following analytical results are from the City's distribution system and include: disinfection by-products (DBPs) (Haloacetic Acids and Trihalomethanes), metals, and vinyl chloride. DBP is a term used to describe a group of organic and inorganic compounds formed during water disinfection. This monitoring is required under the Water Quality Monitoring and Reporting Plan for the GVRD and Member Municipalities.

The table below shows the current guidelines.

Parameter	**Health-Based Guideline**	**Aesthetic Objective**
Total Trihalomethanes	100 µg/L (ppb) or 0.1 mg/L (ppm)	
Total Haloacetic Acids (5)	80 µg/L (ppb) or 0.080 mg/L (ppm)	
Copper		≤1000 µg/L (ppb) or ≤ 1.0 mg/L
Iron		≤ 300 µg/L (ppb) or ≤0.3 mg/L
Lead	10 µg/L (ppb) or 0.01 mg/L	
Zinc		≤ 5000 µg/L (ppb) or ≤ 5.0 mg/L
Vinyl Chloride	2 µg/L (ppb) or 0.002 mg/L	

The table on the next page contains the data from the analysis carried out each quarter for the individual compounds in each group of disinfection by-products. The standard for these compounds is based on the total amount of the group detected; therefore, the total for each group has been calculated for each site. The table also contains the quarterly running average results for total Trihalomethanes and total Haloacetic Acids for individual sites. Both results are within Canadian guideline limits.

Semi-annual vinyl chloride analysis is done where PVC pipe is used in the distribution system. Analysis was provided in the 2nd and 4th quarters for Station 814 in the Tempe Heights area. Both samples were within Canadian guideline limits.

Quarterly Disinfection By-Products Results – 2016

Source	Period 2016	Total THMs Ppb (100 mg/L max acceptable)	Total HAAs Acids ppb (80 mg/L max acceptable)	Quarterly Average THMs ppb	Quarterly Average HAAs ppb	Chloride Vinyl ug/L (2mg/L max acceptable)
807	1st Qtr	**26.6**	**23.2**	**27**	**19**	
	2nd Qtr	**22.2**	**17.4**	26	**19**	
	3rd Qtr	**22**	**15.2**	**24**	**20**	
	4th Qtr	**32**	**29**	**26**	**21**	
808	1st Qtr	**27.5**	**23.4**	**25**	**24**	
	2nd Qtr	**22**	**14.9**	**26**	**22**	
	3rd Qtr	**24**	**18.9**	**24**	**21**	
	4th Qtr	**25**	**24.6**	**25**	**20**	
812	1st Qtr	**25.7**	**24.3**	**29**	**21**	
	2nd Qtr	**25.3**	**20.7**	**29**	**21**	
	3rd Qtr	**33**	**14.3**	**28**	**20**	
	4th Qtr	**31**	**25.3**	**29**	**21**	
814	2nd Qtr					<0.0010
814	4th Qtr					<0.0010

The maximum acceptable concentration (MAC) in the Canadian guidelines for TTHMs is a location yearly running average of 100 ug/L based on quarterly samples.

Metals analysis is done semi-annually. Copper, iron, lead, and zinc are the parameters required under the Water Quality Monitoring and Reporting Plan, but since the method of analysis produces other metals results as well, they were also included. All the results were within the guidelines.

Metals Sampling Results – 2016

	Guideline Criteria	**Station 801** 550 West 28th Street		**Station 803** 264-268 East 9th Street		**Station 804** 848 East 6th Street	
Date Collected	MAC	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half
Antimony Total ug/L	6.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic Total ug/L	10.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Barium Total ug/L	1000	2.5	2.9	2.3	2.9	2.3	2.9
Boron Total ug/L	5000	<10	<10	<10	<10	<10	<10
Cadmium Total ug/L	5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium Total ug/L	50	0.26	0.23	0.22	0.12	0.25	0.23
Lead Total ug/L	10	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Mercury Total ug/L	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium Total ug/L	50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
AESTHETIC OBJECITIVES							
Aluminum Total ug/L	100	21	33	23	38	27	37
Calcium Total ug/L	n/a	2980	2900	2950	2880	2940	2890
Cobalt Total ug/L	n/a	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper Total ug/L		6.8	9.9	6.1	7.3	11.9	6.7
Iron Total ug/L	300	159	148	47	138	15	30
Magnesium Total ug/L	n/a	153	149	154	151	152	149
Manganese Total ug/L	50	3.1	3.3	3.7	5.5	8.1	1.9
Molybdenum Total ug/L	n/a	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel Total ug/L	n/a	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Potassium ug/L	n/a	143	180	147	184	142	182
Silver Total ug/L	n/a	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium Total ug/L	200,000	1310	1550	1310	1580	1290	1570
Zinc Total ug/L	5,000	<3	<3	<3	<3	<3	<3

Appendix C: Water Sample Trends

Appendix C was an addition to the Water Quality Report in 2003 and provides a historical look at sampling results for 6 regularly sampled parameters. The appendix provides information for the six most recent years.

The tables below and chart on the following page are based on the results from all sampling stations taken for the water distribution system as a whole and do not separate the four different pressure zones within the City's system. The acceptable limits for each category are listed in between the tables for comparison to the averages.

The charts specifically indicate the number of samples (product of number of stations and periods of measurement) that exceeded the health-based or aesthetic objectives as described in Section 3 of the report.

System Wide Summary Total Number of Exceedances – 6 Year Look

Year 2011	Count	# Outside Guidelines	% Outside Guidelines	Averages	Max Guidelines
Free-CL2	520	32	6.15%	0.59	<.2
EColi	520	0	0.00%	0.00	>0
HPC	508	0	0.00%	2.39	>500
Coliform	520	0	0.00%	0.00	>10
Temp	520	24	4.62%	8.79	>15
Turbidity	520	10	1.92%	0.24	>1

Year 2012	Count	# Outside Guidelines	% Outside Guidelines	Averages
Free-CL2	520	54	10.38%	0.60
EColi	520	0	0.00%	0.00
HPC	509	3	0.59%	12.10
Coliform	520	0	0.00%	0.00
Temp	520	30	5.77%	9.08
Turbidity	520	21	4.04%	0.47

Year 2013	Count	# Outside Guidelines	% Outside Guidelines	Averages	Max Guidelines
Free-CL2	530	65	12.26%	0.53	<.2
EColi	530	0	0.00%	0.00	>0
HPC	510	0	0.00%	7.51	>500
Coliform	530	0	0.00%	0.00	>10
Temp	530	71	13.40%	10.08	>15
Turbidity	530	23	4.34%	0.29	>1

Year 2014	Count	# Outside Guidelines	% Outside Guidelines	Averages
Free-CL2	520	62	11.92%	0.48
EColi	520	0	0.00%	0.00
HPC	500	2	0.40%	4.27
Coliform	520	0	0.00%	0.00
Temp	520	111	21.35%	10.79
Turbidity	520	13	2.50%	0.34

Year 2015	Count	# Outside Guidelines	% Outside Guidelines	Averages	Max Guidelines
Free-CL2	520	25	4.81%	0.59	<.2
EColi	520	0	0.00%	0.00	>0
HPC	499	0	0.00%	1.02	>500
Coliform	520	0	0.00%	0.01	>10
Temp	520	130	25.00%	12.00	>15
Turbidity	520	5	0.96%	0.20	>1

Year 2016	Count	# Outside Guidelines	% Outside Guidelines	Averages
Free-CL2	520	6	1.15%	0.63
EColi	520	0	0.00%	0.00
HPC	499	0	0.00%	0.72
Coliform	520	0	0.00%	0.00
Temp	520	93	17.88%	11.46
Turbidity	519	6	1.16%	0.21

Health-based parameters on the above tables include Coliform and Turbidity parameters. There have been no instances of positive coliform testing in the past 6 years and a lower number of high turbidity measurements in the in 2015 and 2016 over the previous four years.

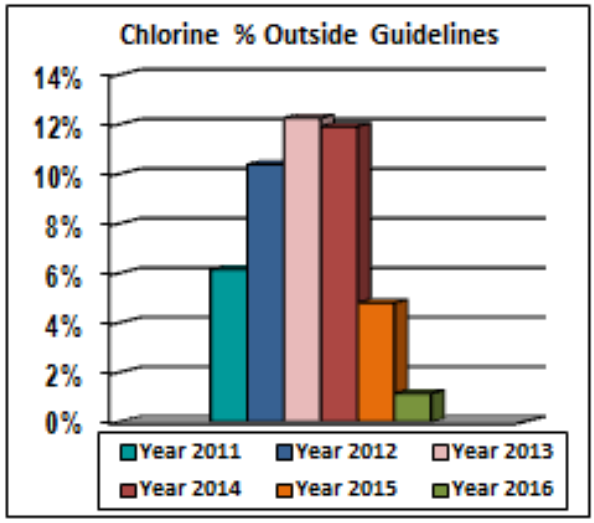
Chlorine residual (not a health-based parameter) is an indicator of providing a barrier to biological pathogen growth in the distribution system. In 2016, the lowest number of chlorine residuals falling below the 0.2 mg/L criteria was found with a total of 6 occurrences in 520 measurements.

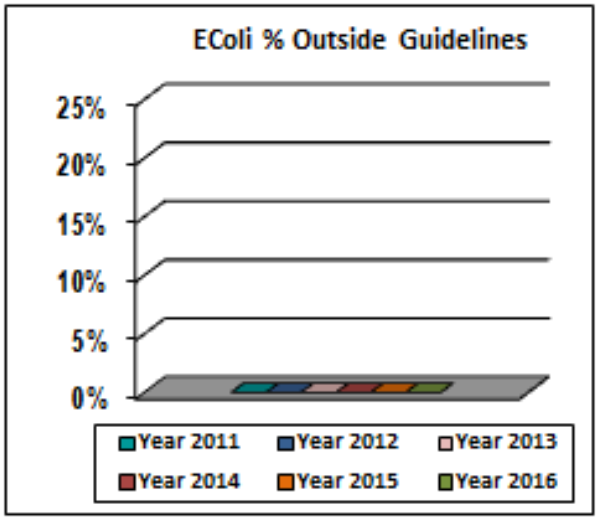
Heterotrophic Plate Count (HPC), which is a parameter that indicates the level of effectiveness of the water treatment and distribution system and is not an indicator of water safety has remained low, indicating that preventative maintenance and operational programs are effective.

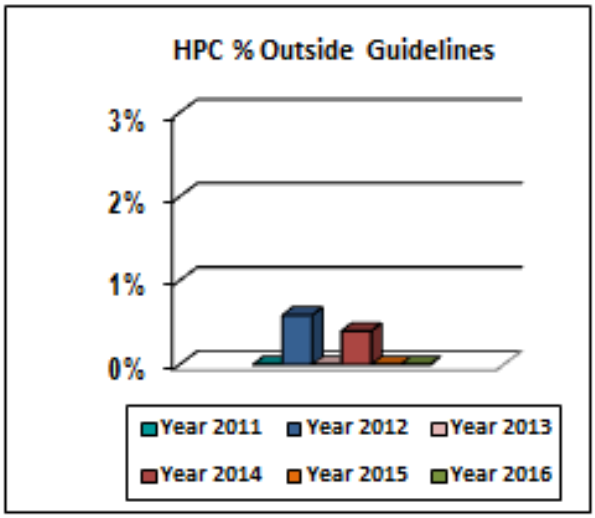
Temperature is also an aesthetic parameter that can vary broadly and is largely based on climate, amount of snow pack contribution to the water source and summer-time temperatures. For the past three years, the number of temperature exceedances has been higher than the previous three years.

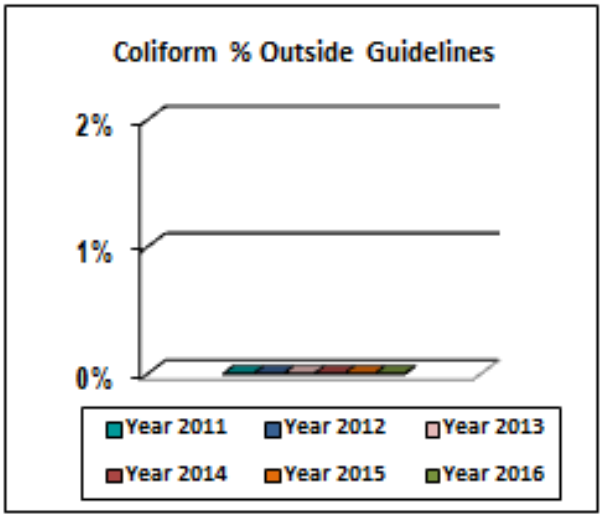
It should be recognized the sampling parameter averages are sometimes skewed by high values for a low number of samples outside of the guidelines.

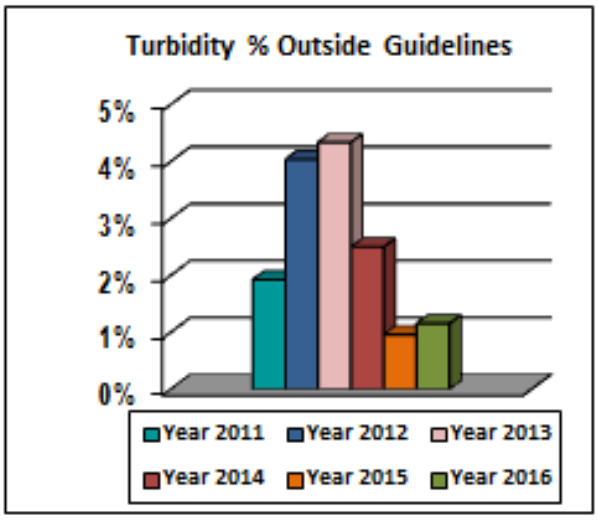
Charts: Comparison of the Annual Percentage of Samples Outside of the Guidelines for CNV Water System

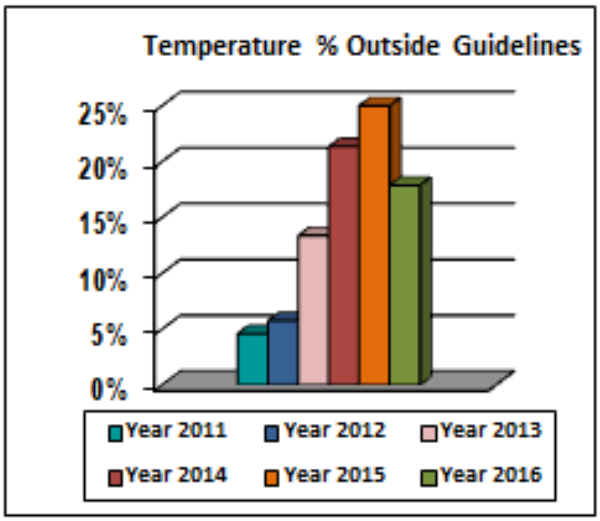












Appendix D: Notification and Emergency Response Plan

1. Notification Requirements: for situations that may affect water potability.

Situation	Notifying Agency	Agency Notified	Time Frame For Notification
E. coli Positive Sample	GVWD	CNV and VCH	Immediate
Total Coliforms over 10/100mLs and no chlorine residual	GVWD	CNV	Immediate
Chemical Contamination	GVWD	CNV and VCH	Immediate
Chemical Contamination - Municipality	CNV	VCH GVWD and DNV	Immediate
Turbidity > 5 NTU	CNV/GVWD	CNV and VCH	Immediate
GVWD Disinfection Failure	GVWD	CNV and VCH	Immediate in any situation where water quality regulations may not be met.
Loss of Pressure Due to High Demand	CNV	GVWD Operations and VCH	Immediate
Main Break With Suspected Contamination	CNV	VCH	Immediate
Main Break With Potential Environmental Damage	CNV	MOE	Immediate

2. Response Plans:

[a] E.coli Positive Samples

If any interim samples have been taken from the site they will be examined by the lab. Interim samples are samples that may have been taken from the site in the period between when the E.coli positive sample was taken and when it was determined to be positive.

The chlorine residual noted on the sampler's field sheet will be reviewed by the lab and compared to previous readings to determine if there was a localized loss of disinfectant residual.

The Section Manager – Utilities (or designate) and the VCH will be notified immediately by the GVWD laboratory.

Arrangements will be made for the immediate collection of a repeat sample and, where possible, the collection of samples from upstream and downstream of the E.coli-positive sample location.

VCH will be contacted and the need for a “boil water” notice will be evaluated.

If a boil water notice is warranted, the public notification process as outlined in the Water Quality Monitoring and Reporting Plan for the GVWD and Member Municipalities will be followed. The boil water notice will be under the direction of Vancouver Coastal Health.

The lab will initiate the procedures necessary for the identification of E.coli with standard biochemical tests.

The lab will contact the CNV with consecutive negative sample results and the results of the species identification tests. The CNV will contact VCH to evaluate these results and to determine whether the advisory can be lifted.

[b] Chemical Contamination

In the event of chemical contamination in the water distribution system, VCH will be immediately notified. Immediate steps will be taken to isolate the contaminated area and the level of contamination will be determined through water sampling and testing. The chemical will be identified and any public health risk factors associated with the chemical presence will be determined. A public advisory will be carried out under the guidance of VCH.

[c] Turbidity Events

Turbidity in the water distribution system is monitored on a regular basis through the water sampling program. Water sampling results yielding readings > 1 NTU are scrutinized, along with corresponding free chlorine. Any sections of the water system generating high turbidity results will be field checked and flushed if necessary.

For turbidity sample results > 5 NTU, VCH will be immediately notified and an evaluation will be made for any necessary actions. The Source Water Turbidity Event procedures are noted below.

[d] GVWD Disinfection Failure

Upon notification by GVWD that an interruption in disinfection has occurred, the City will immediately commence more frequent monitoring of free chlorine residual levels at strategic locations. The monitoring frequency will be at the advice of the GVWD and VCH, and will continue until disinfection is resumed.

[e] Loss of Pressure

In the event of extreme pressure loss, the City will isolate the section or facility from the distribution system and supplement pressure to the affected area. The City will immediately consult with GVWD and VCH regarding further actions. All water quality complaints from the public will be immediately and thoroughly investigated for potential contamination.

[f] Water Main Break

For water main breaks where chemical or microbiological contamination of the system is suspected, the City will isolate the contaminated section from the rest of the distribution system. The City will immediately consult with VCH regarding further actions. All water quality complaints from the public will be immediately and thoroughly investigated for potential contamination.

Water samples will be taken from the vicinity of all water main breaks and tested for bacteria if contamination is suspected. The procedures outlined above in [b] will be implemented if necessary.

Emergency Management British Columbia will also be notified if a water main break results in potential harm to fish habitat (chlorine or siltation).

3. Follow Up

Following a return to normal after any of the above situations, an assessment will be made for the need to notify the affected public.

4. Response Protocol addition for part [c] Turbidity Events

The procedures below are from the Source Water Turbidity Communications Task Force and were endorsed by the REAC Water Subcommittee at its meeting on March 12th, 2008 and by the Medical Health Officers from the Vancouver Coastal and Fraser Health Authorities at a meeting on April 7th, 2008.

Metro Vancouver Communications Responsibilities

Requirement	Status	Comments
Notify Vancouver Coastal Health (VCH) as required under the Drinking Water Protection Act and provide timely updates to VCH and Fraser Health (FH) as required.	No change from current practice.	Vancouver Coastal Health is the Regulator of the Greater Vancouver Water District under the Drinking Water Protection Act.
Notify member municipalities and provide timely updates. Concurrent or advance notification is required when public messages are involved. , Notify municipal Water Quality Contacts (or alternate as required) by phone (24/7) for extraordinary turbidity events.	There is an established practice to notify both operations and water quality contacts of municipalities.	The intent is to use telephone, email, pager or other means of communication as required until it is confirmed that the notification of an extraordinary event has been received by each municipality.
Maintain up-to-date phone and e-mail contact lists.	Updated on regular basis.	
For water quality issues related to the regional (GVWD) water system, take the lead in the development of public messages in advance by working with the Vancouver Coastal Health Authority (GVWD Regulator) and the Fraser Health Authority.		General guidelines for public messages for source water turbidity events are shown on page 4.
For water quality issues related to the regional (GVWD) water system, notify the general public by using appropriate means.	No change from current practice.	Metro Vancouver is responsible for broad public communications. Communications to specific groups is the responsibility of the municipalities and Health Authorities.

Requirement	Status	Comments
For extraordinary turbidity events, organize conference calls and invite municipalities to participate along with health authorities.	As required.	Highly effective way of coordinating response.
For extraordinary turbidity events, notify the BC Nurse Line.	New	Improved communication.
Answer calls from the public and refer calls to health authorities and specific municipalities as required.	No change from current practice.	
At the end of the event, provide information to the Health Authorities and affected municipalities that the situation has improved to the point where normal operations can be resumed.	New	

Communications Responsibilities of Health Authorities

Requirement	Status	Comments
Regulatory issues.	Underway.	Working to ensure clarity and consistency of terminology.
Assist water suppliers with drafting answers to health-related questions from the public and with identifying communications responsibilities for specific groups.	New.	Will facilitate consistent and appropriate communication and messaging.
Refer regional water system operational questions to Metro Vancouver.	No change.	
Refer local water system questions to the appropriate municipality.	No change.	
Improve communication protocols between Vancouver Coastal and Fraser Health authorities.	Underway.	For example, VCH and FH will harmonize their Question and Answer sheets for Turbidity.
As required, answer calls from the public and refer calls to Metro Vancouver and specific municipalities.	No change.	
Maintain up-to-date phone and e-mail contact lists.	Updated on a regular basis.	

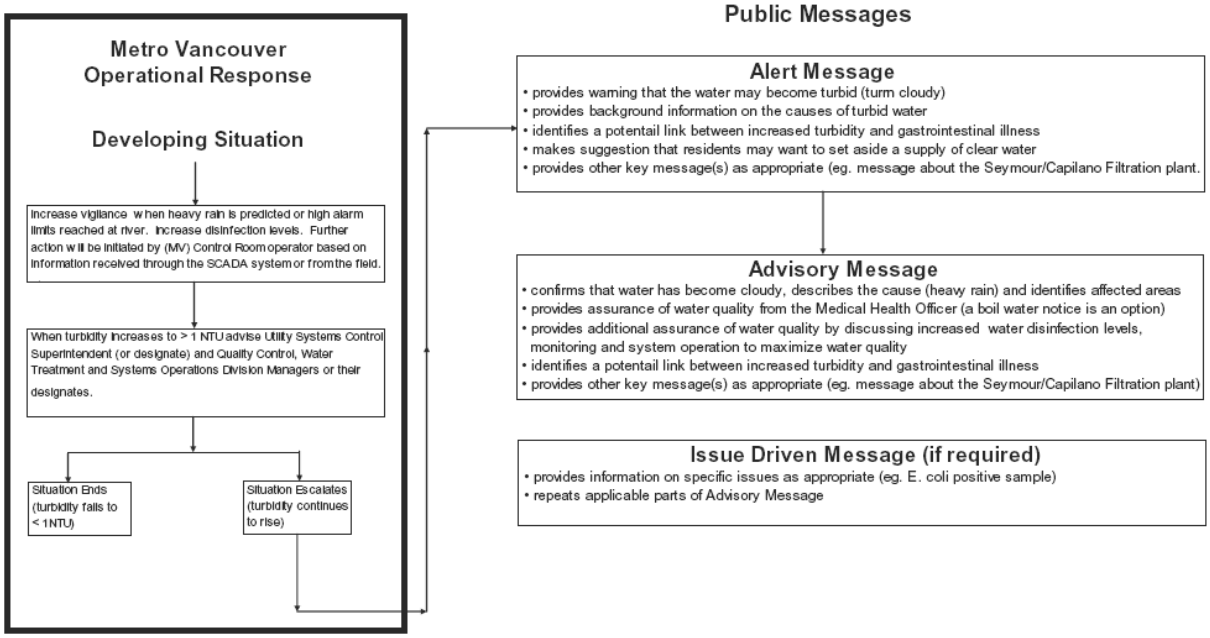
Requirement	Status	Comments
For extraordinary events, the VCH MHO will direct Metro Vancouver to organize and implement regular conference calls. VCH and FH (if applicable) and all member municipalities should be invited to participate.	New.	Highly effective way of coordinating response.
Confirm to all participants that normal operations can be resumed and special communications efforts (e.g. web site messages etc.) can be ended.	New	

Communications Responsibilities of Municipalities

Requirement	Status	Comments
Municipalities must notify the appropriate health authority drinking water program staff of an extraordinary turbidity event (unless both parties participate in a conference call – the conference call will constitute notification).	No change.	Meets regulatory requirement.
Include customer notification as part of the municipal water supply plan. Consult with the health authority about notification responsibilities for specific groups.	Some municipalities have begun this work.	Will clarify customer notification processes.
Answer local calls and enquiries and refer calls to Metro Vancouver and health authorities as required.	No change.	
Maintain up-to-date phone and e-mail contact lists.	Updated on a regular basis.	
Respond to local issues.	No change from current practices.	
Develop answers to anticipated questions from consumers. For matters related to health, consult the health authority before finalizing messages which involve health issues. In consultation with the health authority, develop processes for referring callers with questions about clinical symptoms to health professionals.	Municipalities in various stages of this process.	Will improve ability of municipalities to respond to questions from the public.

Requirement	Status	Comments
Ensure that local messages are consistent with Metro Vancouver messages and refer regional water system operational issues to Metro Vancouver.	Municipalities in various stages of this process.	Will improve ability of municipalities to respond to questions from the public.
Based on information received from Metro Vancouver regarding the resumption of normal operations, inform the applicable health authority that normal operations can be resumed.	New	

Guidelines For Source Water Turbidity Event Messages



SOURCE WATER TURBIDITY EVENTS

Metro Vancouver and Municipal Response Procedures