



CONTENTS

General Description	3
Source Water	3
Water Treatment	4
Water Distribution System	6
Upgrading Work in 2010	10
Upgrading Work Planned for 2011	11
Operator Training	11
Appendix A - Water Quality Sampling	
Appendix B - Source / Distribution Water Test Results	
Appendix C - Water Chemistry Test Results	
Appendix D - Emergency Response Plan	
Appendix E - Sample Boil Water Advisory	
Appendix F - VCH Permits to Operate	
Appendix G - EOCP Facility Classifications	
Appendix H- EOCP Operator Certificates	



GENERAL DESCRIPTION

The Village of Lions Bay supplies potable water to approximately 1500 residents with 500 service connections. Water is sourced from two local creeks, treated with chlorine and then distributed via eight storage tanks and thirteen kilometres of water mains to the residents. This report provides an overview of the water quality at the Village of Lions Bay during 2010.

SOURCE WATER

The community's watershed lands include Magnesia Creek drainage (421 hectares), Alberta Creek drainage (51 hectares), Harvey Creek drainage (635 hectares), and Rundle Creek drainage (20 hectares). Water is normally drawn from the intakes on Harvey Creek and Magnesia Creek. Two additional water intakes exist, one at lower Magnesia Creek, and one at Alberta Creek; however, these intakes are considered as 'reserve intakes' and were not used during 2010.

Challenges

The Village draws its water from surface sources that are subject to fluctuating turbidity levels. This fluctuation in raw water turbidity, presents a challenge to ensure that distributed water turbidity and residual chlorine levels, are not adversely affected. Water intakes are typically checked every second or third day, and several times a day when the weather dictates. Water Treatment Plants with Ultra Violet (UV) and Chlorine Disinfection are checked once daily from Monday to Friday.

Test Results

The Village tests untreated source water for turbidity once daily from Monday to Friday, and performs more extensive testing three times a year for general water chemistry, hardness, metals and contaminants including organic compounds. The results for source water during 2010 are presented and discussed below.

Turbidity

	RAW WATER 2010	
	Harvey Creek	Magnesia Creek
Count	231	216
Maximum Result (NTU)	6.99	397.0
Minimum Result (NTU)	0.10	0.10
Average (NTU)	0.47	2.42
Number of samples < 1 NTU	219	205
Number of samples > 1 NTU but < 5 NTU	10	5
Number of samples > 5 NTU	2	6
Percentage of samples < 1 NTU	94.80	94.91
Percentage of samples > 1 NTU but < 5 NTU	4.33	2.31
Percentage of samples > 5 NTU	0.87	2.78



The Canadian Drinking Water Guidelines (and the US Environmental Protection Agency) state that the turbidity of an unfiltered raw water supply should generally be around 1 NTU, and should not exceed 5 NTU. As can be seen from the above summary table, raw water turbidity during 2010 was generally acceptable for unfiltered source water, and ranged below 1.45 NTU most of the time. During 2010 Harvey raw water exceeded twice the Canadian Drinking Water Guidelines: On June 2 (6.99 NTU) and on October 26 (6.83 NTU). Magnesia raw water exceeded the Guidelines six times: On January 4 (7.44 NTU), on October 25 (397.00 NTU), on November 1st (7.33 NTU), on December 7 (14.10 NTU), on December 8 (8.65 NTU), on December 24 (11.40 NTU). These problems were solved following the procedures explained in the Appendix "D" in the section "Turbidity Events".

Due to heavy rain and high Turbidity results, on Sunday, October 24, 2010 the Village issued a Boil Water Advisory. On Monday, October 25, 2010 high Turbidity results were obtained in the Magnesia System: 19.60 NTU for PRV-5, 20.70 NTU for Magnesia Tank, 18.70 NTU for Brunswick Beach, and 397 NTU for Magnesia Raw Water. On Tuesday, October 26, 2010 the weekly Water Samples were sent to the Laboratory and the results in all of them were Negative. On Thursday, October 28, 2010 more Water Samples were sent to the Laboratory and the results were negative, too. The Boil Water Advisory was lifted on Wednesday, November 3, 2010.

Metals and General Chemistry

See results in appendix "C"

WATER TREATMENT

Treatment

Currently, no filtration is applied to the water in Lions Bay. Disinfection using an Ultra Violet (UV) system and Chlorine are the only treatment applied. The Village maintain one Water Treatment Plant for Harvey creek and another Water Treatment Plant for Magnesia creek. Turbidity and residual chlorine tests are performed at these locations and downstream of the treated water tanks. There are also two standby water treatment stations, one liquid hypochlorite injector at Brunswick Beach and another one at Alberta Creek; however, these facilities were not operated during 2010.

Challenges

In times of severe weather, the Village water system operators increase the frequency of testing and adjustment of the injector rates in order to compensate for any fluctuating chlorine demand caused by varying turbidity levels. Residual chlorine levels in treated water exiting the storage tanks are tested sometimes two to four times per day to ensure that sufficient chlorine residuals levels are maintained during raw water turbidity variations.



Test Results

The Village tests treated water exiting the storage tanks for turbidity and residual chlorine daily from Monday to Friday. These results are presented and discussed below.

Turbidity

	TREATED WATER 2010	
	HARVEY	MAGNESIA
Count	236	246
Maximum Result (NTU)	3.69	21.10
Minimum Result (NTU)	0.10	0.08
Average (NTU)	0.49	0.79
Number of samples < 1 NTU	219	217
Number of samples > 1 NTU but < 5 NTU	17	23
Number of samples > 5 NTU	0	5
Percentage of samples < 1 NTU	92.80	88.21
Percentage of samples > 1 NTU but < 5 NTU	7.20	9.35
Percentage of samples > 5 NTU	0.00	2.03

The Canadian Drinking Water Guidelines (and the US Environmental Protection Agency) state that the turbidity of an unfiltered treated water supply should generally be around 1 NTU, and should not exceed 5 NTU. As can be seen from the above summary table, treated water turbidity during 2010 was generally acceptable for unfiltered treated water, and ranged around 0.49 NTU in Harvey and 0.79 NTU in Magnesia. During 2010 Magnesia raw water exceeded the Guidelines five times: On October 25 (20.70 NTU), on October 26 (21.10 NTU), on December 8 (16.20 NTU), on December 23 (5.45 NTU), and on December 24 (8.31 NTU). These problems were solved following the procedures explained in the Appendix “D” in the section “Turbidity Events”.

Due to heavy rain and high Turbidity results, on Sunday, October 24, 2010 the Village issued a Boil Water Advisory. On Monday, October 25, 2010 high Turbidity results were obtained in the Magnesia System: 19.60 NTU for PRV-5, 20.70 NTU for Magnesia Tank, 18.70 NTU for Brunswick Beach, and 397 NTU for Magnesia Raw Water. On Tuesday, October 26, 2010 the weekly Water Samples were sent to the Laboratory and the results in all of them were Negative. On Thursday, October 28, 2010 more Water Samples were sent to the Laboratory and the results were negative, too. The Boil Water Advisory was lifted on Wednesday, November 3, 2010.



Chlorine Residual

	TREATED WATER 2010	
	HARVEY	MAGNESIA
Count	238	246
Maximum Result (PPM)	2.05	1.38
Minimum Result (PPM)	0.28	0.28
Average (PPM)	0.74	0.83
No. of Samples Outside Limits	0	0
% Samples Outside Limits	0.00	0.00

The generally agreed Minimum Acceptable Residual Chlorine level in treated drinking water is 0.2 mg/l, as recommended by Vancouver Coastal Health. The generally agreed Maximum Acceptable Residual Chlorine level in treated drinking water is 4.0 mg/l as recommended by the US Environmental Protection Agency.

As shown in the above analysis, no sample for Harvey and Magnesia had Chlorine residual less than 0.2 mg/l. This indicates that 100.00% of samples in Harvey and 100.00% of samples in Magnesia had acceptable levels of residual chlorine during 2010 (greater than 0.2 mg/l but less than 4 mg/l).

When less than 0.2 mg/l chlorine residual is noted in the Distribution System, some hydrants in the system are flushed until a minimum chlorine residual of 0.2 mg/l or more is obtained.

WATER DISTRIBUTION SYSTEM

Storage

Approximately 450,000 imperial gallons (IG) of water are consumed per day for the whole system. There are currently 8 water storage tanks throughout the system. These include: Harvey (400,000 IG), Ocean view (100,000 IG, out of service during 2010), Magnesia (100,000 IG), Upper Bayview Phase 4 (20,000 IG), Upper Bayview Phase 5 (25,000 IG), Highway (21,000 IG), South Sunset (40,000 IG, out of service during 2010), and Brunswick Beach (35,000 IG, out of service during 2010).

Distribution

The Village of Lions Bay's location on the side of a mountain requires that water pressures be controlled with thirteen (13) PRV stations: For Harvey one (1) at the Plant and six (6) for the Distribution System, and for Magnesia one (1) at the Plant and five (5) for the Distribution System.

Approximately 13 kilometres of water mains of a variety of ages and constructed from a variety of materials including asbestos cement, ductile iron, cast iron, and PVC make up the Village's distribution system.



Test Results

Samples are taken daily from Monday to Friday from five sampling sites in the middle and end of the distribution system and tested for turbidity and residual chlorine. On Mondays, samples from these sites are sent to the laboratory to be tested for Total and Fecal Coliforms, and E. Coli.

In addition, metals levels and general chemistry are tested three times a year at up to eleven locations in the distribution system. The results of these samples are presented in appendix "C".

Harvey Turbidity

	W.D.S. HARVEY 2010		
	PRV-3	CAFE	KELVIN G.
Count	245	245	244
Maximum Result (NTU)	10.10	3.12	4.18
Minimum Result (NTU)	0.11	0.09	0.09
Average (NTU)	0.55	0.34	0.30
Number of samples < 1 NTU	224	240	240
Number of samples > 1 NTU but < 5 NTU	19	5	4
Number of samples > 5 NTU	2	0	0
Percentage of samples < 1 NTU	91.43	97.96	98.36
Percentage of samples > 1 NTU but < 5 NTU	7.76	2.04	1.64
Percentage of samples > 5 NTU	0.82	0	0

The Canadian Drinking Water Guidelines (and the US Environmental Protection Agency) state that the turbidity of an unfiltered treated water supply should generally be around 1 NTU, and should not exceed 5 NTU. As can be seen from the above summary table, treated water turbidity from Harvey during 2010 was generally acceptable for unfiltered treated water, and ranged around 0.40 NTU most of the time. During 2010, only two samples with more than 5 NTU were obtained: PRV-3 with 5.88 NTU on January 12 and PRV-3 with 10.10 NTU on October 26, which indicates the good quality of the water sent to the Harvey System during this year.

Magnesia Turbidity

	W.D.S. MAGNESIA 2010	
	PRV-5	B. B.
Count	245	246
Maximum Result (NTU)	22.10	24.00
Minimum Result (NTU)	0.09	0.09
Average (NTU)	0.85	0.66
Number of samples < 1 NTU	220	226
Number of samples > 1 NTU but < 5 NTU	19	17
Number of samples > 5 NTU	6	3
Percentage of samples < 1 NTU	89.80	91.87
Percentage of samples > 1 NTU but < 5 NTU	7.76	6.91
Percentage of samples > 5 NTU	2.45	1.22



The Canadian Drinking Water Guidelines (and the US Environmental Protection Agency) state that the turbidity of an unfiltered treated water supply should generally be around 1 NTU, and should not exceed 5 NTU. As can be seen from the above summary table, treated water turbidity from Magnesia during 2010 was generally acceptable for unfiltered treated water, and ranged around 0.76 NTU most of the time. During 2010, only nine samples with more than 5 NTU were obtained: PRV-5 (October 25 with 19.60 NTU, October 26 with 21.80, October 27 with 6.40 NTU, December 8 with 22.10 NTU, December 9 with 5.38 NTU, and December 22 with 20.50 NTU), and Brunswick Beach (October 25 with 18.70 NTU, October 26 with 24.00 NTU, and October 27 with 14.90 NTU), which indicates the good quality of the water sent to the Magnesia system during this year.

Due to heavy rain and high Turbidity results, on Sunday, October 24, 2010 the Village issued a Boil Water Advisory. On Monday, October 25, 2010 high Turbidity results were obtained in the Magnesia System: 19.60 NTU for PRV-5, 20.70 NTU for Magnesia Tank, 18.70 NTU for Brunswick Beach, and 397 NTU for Magnesia Raw Water. On Tuesday, October 26, 2010 the weekly Water Samples were sent to the Laboratory and the results in all of them were Negative. On Thursday, October 28, 2010 more Water Samples were sent to the Laboratory and the results were negative, too. The Boil Water Advisory was lifted on Wednesday, November 3, 2010.

Harvey Chlorine Residual

	TREATED WATER 2010		
	PRV-3	CAFE	KELVIN G.
Count	246	246	244
Maximum Result (mg/l)	1.94	1.08	1.26
Minimum Result (mg/l)	0.14	0.08	0.12
Average (mg/l)	0.72	0.51	0.40
No. of Samples Outside Limits	1	4	4
% Samples Outside Limits	0.41	1.63	1.64

The generally agreed Minimum Acceptable Residual Chlorine level in treated drinking water is 0.2 mg/l, as recommended by Vancouver Coastal Health. The generally agreed Maximum Acceptable Residual Chlorine level in treated drinking water is 4.0 mg/l as recommended by the US Environmental Protection Agency.

As shown in the above analysis, a small number of samples (0.41% in PRV-3, 1.63% at the Cafe, and 1.64% in Kelvin Grove) had levels less than 0.2 mg/l. This indicates that 99.59% of samples in PRV-3, 98.37% at the Cafe, and 98.36% of samples in Kelvin Grove, had acceptable levels of residual chlorine during 2010 (greater than 0.2 mg/l but less than 4 mg/l).



Magnesia Chlorine Residual

	TREATED WATER 2010	
	PRV-5	B. B.
Count	246	246
Maximum Result (mg/l)	1.30	1.00
Minimum Result (mg/l)	0.13	0.00
Average (mg/l)	0.78	0.52
No. of Samples Outside Limits	3	2
% Samples Outside Limits	1.22	0.81

The generally agreed Minimum Acceptable Residual Chlorine level in treated drinking water is 0.2 mg/l, as recommended by Vancouver Coastal Health. The generally agreed Maximum Acceptable Residual Chlorine level in treated drinking water is 4.0 mg/l as recommended by the US Environmental Protection Agency.

As shown in the above analysis, a small number of samples (1.22% in PRV-5 and 0.81% in Brunswick Beach) had a level less than 0.2 mg/l. This indicates that 98.78% of samples in PRV-5, and 99.19% of samples in Brunswick Beach, had acceptable levels of residual chlorine during 2010 (greater than 0.2 mg/l but less than 4 mg/l).

Fecal and Total Coliforms

	PRV-3	STORE/CAFE	KELVIN G.	PRV-5	BRUNSWICK B
Count	52	52	52	52	52
Max Result (mg/l)	N	N	N	N	N
Min Result (mg/l)	N	N	N	N	N
Average (mg/l)	N	N	N	N	N
No. Outside Limits	0	0	1	0	0
% Outside Limits	0%	0%	1.92%	0%	0%

In the Total and Fecal Coliform tests, the result is either Positive (P) or Negative (N), where a Positive result is not acceptable as it indicates the presence of coliforms. There was one Positive result in Kelvin Grove during 2010 (see information below).

The BC Water Protection Regulation establishes the following Water Quality Standards:

- Fecal Coliforms: <1cfu/100ml
- E. Coli: <1cfu/100ml
- Total Coliforms for 1 sample in 30 days: <1cfu/100ml
- Total Coliforms for more than 1 sample in 30 days: 90% of samples must be <1cfu/100ml and no sample >10cfu/100ml



“Immediate Reporting Standard”: If the fecal Coliform or E. Coli parameter fails to meet the water quality standard results must be immediately reported to:

- The Manager of Public Works
- The Drinking Water Officer
- The Medical Health Officer

The Canadian Drinking Water Quality Guidelines establishes

- Maximum Acceptable Concentration (MAC) for Coliforms = 0 cfu/100ml
- A single sample may contain up to 10 cfu/100ml Total Coliforms, but no samples should contain Fecal Coliform

Note: 1cfu/100ml = 1 MPN/100ml

On September 27, 2010 the Village received from The ALS Laboratories a positive result with Total Coliform = 1 MPN/100ml for the Kelvin Grove sample station, and according to the Canadian Drinking Water Quality Guidelines, this result was within the acceptable limits. On September 29, 2010 another sample from the Kelvin Grove sample station was sent to the ALS laboratory and the result was Negative.

On December 7, 2010 the Village received from The ALS Laboratories a positive result with Total Coliform = 3 MPN/100ml for the Harvey UV Reactor, and according to the Canadian Drinking Water Quality Guidelines, this result was within the acceptable limits. On December 10, 2010 another sample from the Harvey UV Reactor was sent to the ALS laboratory and the result was Negative. Samples from the UV Reactors on both plants are sent to the Laboratory in a Monthly basis.

Metals and General Chemistry

See results in Appendix “C”

UPGRADING WORK IN 2010

Finish the construction of the Water Treatment Plants to replace Harvey and Magnesia Chlorinators. These two plants consist of:

- ❖ Pressure Reducing Valve Chambers before the UV Reactor Rooms
- ❖ UV Reactors Rooms
- ❖ Liquid Chlorine Injection Rooms
- ❖ Turbidity Analysers
- ❖ Chlorine Analyzers
- ❖ SCADA System



UPGRADING WORK PLANNED FOR 2011

Works to be performed in Lions Bay Avenue, Seaview Place, and Cloudview Place:

- ❖ Replace Water Main with Ductile Iron Pipe
- ❖ Install new Isolation Valves
- ❖ Install new Fire Hydrants
- ❖ Install new Service Connections.

OPERATOR TRAINING

The Village’s Water Treatment/Distribution System has been evaluated as “Village of Lions Bay Water System Class II” by the Environmental Operators Certification Program (EOCP). The Operator for the Village’s Water System is Alberto Urrutia, and He has completed the following courses:

Description	Year
❖ Truck Mounted Manlift	2010
❖ Water Distribution I	2010
❖ Trojan UV Swift Reactors	2010
❖ Instrumentation 1	2008
❖ Electrical Principles Level 1	2007
❖ Hydrant Maintenance and Testing	2007
❖ Water Sources	2007
❖ Water Treatment 2	2006
❖ Confined Space Workshop	2005
❖ Water Treatment I	2005
❖ Chlorine Handling	2005
❖ Utility Management	2004
❖ Water Treatment Plant Operation II	2004
❖ Water Treatment Plant Operation I	2004
❖ Water Distribution System Operation and Maintenance	2004
❖ Small Water System Operation and Maintenance	2004
❖ Small Water Systems	2003
❖ Waterworks Technology.	2002

EOCP Certificates obtained by Alberto Urrutia:

Description	Year
❖ Water Distribution Level 2	2006
❖ Chlorine Handler	2005
❖ Water Distribution Level 1	2005
❖ Water Distribution Operator-In-Training .	2004