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Hamilton Water Supply Reticulation Comprehensive Analysis Report 2013/14

Hamilton City Council undertakes the following drinking water quality analyses every 6 months to ensure the high Aa grade quality of Hamilton's treated drinking-water is being maintained. Sampling alternates between a Hamilton City sampling site and a Templeview sampling site.

The Guideline Values (GVs) and Maximum Acceptable Values (MAVs) are defined in the Ministry of Health Drinking-water Standards for New Zealand 2005 (Revised 2008) (DWSNZ). MAVs relate to parameters of health significance and should not be exceeded. GVs are the limits for aesthetic determinands that, if exceeded, may render the water unattractive to consumers.

Sample Type: Aqueous

Test	Unit	Templeview Site 23.08.13	Hamilton Site 12.02.14	Guideline Value	Maximum Acceptable Value
Chemical and Physical					
Total Hardness	g/m^3 as $CaCO_3$	44	41	200	
Dissolved Calcium	g/m^3	13.1	13.0		
Dissolved Magnesium	g/m^3	2.7	2.2		
Fluoride	g/m^3	0.16	0.19		1.5
Nitrite-N	g/m^3	< 0.002	<0.002		0.06 (long term) 0.91 (short term)
Nitrate-N	g/m^3	0.34	0.161		11.3
Nitrate-N + Nitrite-N	g/m^3	0.34	0.161		
Reactive Silica	g/m^3 as SiO_2	37	34		
Trace Metals					
Total Aluminium	g/m^3	0.02	0.025	0.1	
Total Antimony	g/m^3	0.00075	0.00090		0.02
Total Arsenic	g/m^3	< 0.0011	0.0028		0.01
Total Barium	g/m^3	0.0132	0.0153		0.7
Total Beryllium	g/m^3	< 0.00011	<0.00011		
Total Boron	g/m^3	0.28	0.28		1.4
Total Cadmium	g/m^3	< 0.000053	<0.000053		0.004
Total Calcium	g/m^3	13.2	13.5		
Total Chromium	g/m^3	< 0.00053	<0.00053		0.05
Total Copper	g/m^3	0.0041	0.00058	1.0	2.0
Total Iron	g/m^3	0.021	0.026	0.2	
Total Lead	g/m^3	0.00016	0.00039		0.01
Total Lithium	g/m^3	0.101	0.096		
Total Magnesium	g/m^3	2.8	2.3		
Total Manganese	g/m^3	0.00077	0.00085	0.04	0.4
Total Mercury	g/m^3	< 0.00008	<0.00008		0.007
Total Molybdenum	g/m^3	0.0004	0.00049		0.07
Total Nickel	g/m^3	< 0.00053	<0.00053		0.08
Total Potassium	g/m^3	3.5	3.6		
Total Selenium	g/m^3	< 0.0011	<0.0011		0.01
Total Silver	g/m^3	< 0.00011	<0.00011		

Test	Unit	Templeview 23.08.13	Hamilton 12.02.14	GV	MAV
Trace Metals continued					
Total Sodium	g/m^3	21	23	200	
Total Tin	g/m^3	< 0.00053	<0.00053		
Total Uranium	g/m^3	< 0.000021	<0.000021		0.02
Total Zinc	g/m^3	0.0057	0.0017	1.5	
Halogenated Volatile Disinfection By-Products					
Sum of Haloacetonitriles MAV ratios (DWSNZ)	ratio	0.044	0.040		
Bromochloroacetonitrile	g/m^3	0.0008	0.00128		
Bromodichloromethane	g/m^3	0.0049	0.0078		0.06
Bromoform (tribromomethane)	g/m^3	0.0031	0.0025		0.1
Carbon tetrachloride	g/m^3	< 0.0007	<0.0007		0.005
Chloral Hydrate/ Trichloroacetaldehyde	g/m^3	0.0008	not tested		
Chloroform (Trichloromethane)	g/m^3	< 0.007	<0.007		0.4
Chloropicrin	g/m^3	< 0.0003	<0.0003		
1,2-Dibromo-3-chloropropane	g/m^3	< 0.0003	<0.0003		0.001
Dibromoacetonitrile	g/m^3	0.0019	0.0012		0.08
Dibromochloromethane	g/m^3	0.0082	0.0103		0.15
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m^3	< 0.0003	<0.0003		0.0004
1,1-Dichloro-2-propanone	g/m^3	< 0.0003	<0.0003		
Dichloroacetonitrile	g/m^3	0.0004	0.0005		0.02
Tetrachloroethene (tetrachloroethylene)	g/m^3	< 0.00014	<0.00014		0.05
1,1,1-Trichloro-2-propanone	g/m^3	< 0.0003	<0.0003		
Trichloroacetonitrile	g/m^3	< 0.0003	<0.0003		
1,1,1-Trichloroethane	g/m^3	< 0.00014	<0.00014		
Trichloroethene (trichloroethylene)	g/m^3	< 0.00007	<0.00007		0.02
Total Trihalomethanes (THM)	g/m^3	0.018	0.025		
Chloroform MAV ratio	ratio	< 0.018	<0.018		
Bromodichloromethane MAV ratio	ratio	0.081	0.130		
Dibromochloromethane MAV ratio	ratio	0.055	0.069		
Bromoform MAV ratio	ratio	0.031	0.025		
Sum of THM MAV ratios (DWSNZ)	ratio	0.171	0.235		1
Benzene	g/m^3	< 0.0005	<0.0005		0.01
Toluene	g/m^3	< 0.0010	<0.0010	0.03	0.8
Ethylbenzene	g/m^3	< 0.0005	<0.0005	0.002	0.3
m&p-Xylene	g/m^3	< 0.0005	<0.0005		
o-Xylene	g/m^3	< 0.0005	<0.0005		
Bromomethane (Methyl Bromide)	g/m^3	< 0.002	<0.002		
Carbon tetrachloride	g/m^3	< 0.0005	<0.0005		0.005
Chloroethane	g/m^3	< 0.0005	<0.0005		
Chloromethane	g/m^3	< 0.0005	<0.0005		
1,2-Dibromo-3-chloropropane	g/m^3	< 0.0005	<0.0005		0.001
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m^3	< 0.0004	<0.0004		0.0004
Dibromomethane	g/m^3	< 0.0005	<0.0005		
Dichlorodifluoromethane	g/m^3	< 0.0005	<0.0005		
1,1-Dichloroethane	g/m^3	< 0.0005	<0.0005		

Test	Unit	Templeview 23.08.13	Hamilton 12.02.14	GV	MAV
Volatile Organic Compounds - Halogenated Aliphatics continued					
1,2-Dichloroethane	g/m^3	< 0.0005	<0.0005		0.03
1,1-Dichloroethene	g/m^3	< 0.0005	<0.0005		
cis-1,2-Dichloroethene	g/m^3	< 0.0005	<0.0005		
trans-1,2-Dichloroethene	g/m^3	< 0.0005	<0.0005		
Dichloromethane (methylene chloride)	g/m^3	< 0.010	<0.010		0.02
1,2-Dichloropropane	g/m^3	< 0.0005	<0.0005		0.05
1,3-Dichloropropane	g/m^3	< 0.0005	<0.0005		
1,1-Dichloropropene	g/m^3	< 0.0005	<0.0005		
cis-1,3-Dichloropropene	g/m^3	< 0.0005	<0.0005		
trans-1,3-Dichloropropene	g/m^3	< 0.0005	<0.0005		
Hexachlorobutadiene	g/m^3	< 0.0005	<0.0005		0.0007
1,1,1,2-Tetrachloroethane	g/m^3	< 0.0005	<0.0005		
1,1,2,2-Tetrachloroethane	g/m^3	< 0.0005	<0.0005		
Tetrachloroethene (tetrachloroethylene)	g/m^3	< 0.0005	<0.0005		0.05
1,1,1-Trichloroethane	g/m^3	< 0.0005	<0.0005		
1,1,2-Trichloroethane	g/m^3	< 0.0005	<0.0005		
Trichloroethene (trichloroethylene)	g/m^3	< 0.0005	<0.0005		0.02
Trichlorofluoromethane	g/m^3	< 0.0005	<0.0005		
1,2,3-Trichloropropane	g/m^3	< 0.0005	<0.0005		
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m^3	< 0.004	<0.004		
Vinyl chloride	g/m^3	< 0.0005	<0.0005		0.0003
Volatile Organic Compounds - Halogenated Aromatics					
Bromobenzene	g/m^3	< 0.0005	<0.0005		
Chlorobenzene (monochlorobenzene)	g/m^3	< 0.0005	<0.0005	0.01	
2-Chlorotoluene	g/m^3	< 0.0005	<0.0005		
4-Chlorotoluene	g/m^3	< 0.0005	<0.0005		
1,2-Dichlorobenzene	g/m^3	< 0.0005	<0.0005	0.001	1.5
1,3-Dichlorobenzene	g/m^3	< 0.0005	<0.0005		
1,4-Dichlorobenzene	g/m^3	< 0.0005	<0.0005	0.0003	0.4
1,2,3-Trichlorobenzene	g/m^3	< 0.0005	<0.0005	0.01	
1,2,4-Trichlorobenzene	g/m^3	< 0.0005	<0.0005	0.005	
1,3,5-Trichlorobenzene	g/m^3	< 0.0005	<0.0005	0.05	
Volatile Organic Compounds - Monoaromatic Hydrocarbons					
n-Butylbenzene	g/m^3	< 0.0005	<0.0005		
tert-Butylbenzene	g/m^3	< 0.0005	<0.0005		
Isopropylbenzene (Cumene)	g/m^3	< 0.0005	<0.0005		
4-Isopropyltoluene (p-Cymene)	g/m^3	< 0.0005	<0.0005		
n-Propylbenzene	g/m^3	< 0.0005	<0.0005		
sec-Butylbenzene	g/m^3	< 0.0005	<0.0005		
Styrene	g/m^3	< 0.0005	<0.0005	0.004	0.03
1,2,4-Trimethylbenzene	g/m^3	< 0.0005	<0.0005		
1,3,5-Trimethylbenzene	g/m^3	< 0.0005	<0.0005		
Volatile Organic Compounds - Ketones					
Acetone	g/m^3	< 0.05	<0.05		
2-Butanone (MEK)	g/m^3	< 0.005	<0.005		
Methyl tert-butylether (MTBE)	g/m^3	< 0.005	<0.005		

Test	Unit	Templeview 23.08.13	Hamilton 12.02.14	GV	MAV
4-Methylpentan-2-one (MIBK)	g/m^3	< 0.005	<0.005		
Volatile Organic Compounds - Trihalomethanes					
Bromodichloromethane	g/m^3	0.0032	0.0067		0.06
Bromoform (tribromomethane)	g/m^3	0.0012	0.0017		0.1
Chloroform (trichloromethane)	g/m^3	0.0015	0.0050		0.4
Dibromochloromethane	g/m^3	0.0044	0.0068		0.15
Other Volatile Organic Compounds					
Carbon disulphide	g/m^3	< 0.005	<0.005		
Naphthalene	g/m^3	< 0.0005	<0.0005		
System monitoring Compounds for Volatile Organic Compounds - % Recovery					
4-Bromofluorobenzene	%	103	107		
Toluene-d8	%	104	99		

SUMMARY OF METHODS

These analyses were undertaken for Hamilton City Council by RJ Hill Laboratories Ltd (www.hill-labs.co.nz).

The following table gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Test	Method Description	Default Detection Limit
Individual Tests		
Sum of Haloacetonitriles MAV ratios (NZ DW Stds)	Calculated as the sum of the individual haloacetonitriles specified in the DWSNZ (dibromoacetonitrile & dichloroacetonitrile) to their respective MAVs.	0
Total Digestion	Boiling nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-
Total acid digest for Silver analysis	Boiling nitric / hydrochloric acid digestion (5:1 ratio). APHA 3030 F (modified) 22nd ed. 2012.	-
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 21st ed. 2005.	-
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 22nd ed. 2012.	0.02 g/m^3
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F-C 22nd ed. 2012.	0.05 g/m^3
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3-I 22nd ed. 2012.	0.002 g/m^3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) – NO_2N.	0.002 g/m^3
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3-I 22nd ed. 2012.	0.002 g/m^3
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2
Halogenated Volatile Disinfection By-Products in Water by GCMS	Solvent extraction, GC-MS SIM analysis	-

Test	Method Description	Default Detection Limit
Volatile Organic Compounds Trace in Water by Purge & Trap	Purge & Trap, GC-MS FS analysis [KBIs:28233,2694]	-
Drinking water metals suite, totals, trace		
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3
Total Antimony	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021 g/m^3
Total Arsenic	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0011 g/m^3
Total Barium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00011 g/m^3
Total Beryllium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00011 g/m^3
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m^3
Total Cadmium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.000053 g/m^3
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3
Total Chromium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3
Total Copper	Nitric acid digestion, ICP-MS, trace level. APHA 3125 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3
Total Lead	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00011 g/m^3
Total Lithium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00021 g/m^3
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3
Total Molybdenum	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021g/m^3
Total Nickel	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 21st ed. 2005	0.053 g/m^3
Total Selenium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0011 g/m^3
Total Silver	Boiling nitric / hydrochloric acid digestion (5:1 ratio), ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00011 g/m^3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3
Total Tin	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00053 g/m^3
Total Uranium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.000021 g/m^3
Total Zinc	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0011 g/m^3