Annual Report on Water Quality Monitoring - 2010

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Executive Summary

This report provides a snapshot of drinking water quality for the City of Madison during the calendar year 2010. The water utility delivers drinking water that meets all state and federal primary drinking water standards. Monitoring occurs at the source and at locations within the distribution system, and the number of samples collected significantly exceeds federal and state requirements. Madison Water Utility continues to report results in multiple media including on the website, the Drinking Water Quality listserv, and in the annual consumer confidence report.

Introduction

The City of Madison drinking water system consists of 22 active wells, 30 reservoirs (including 5 elevated water towers), and approximately 840 miles of interconnected water transmission and distribution mains. The water utility pumps groundwater from a deep sandstone aquifer. Wells are 500-1100 feet deep and deliver water to localized regions of the city. The distribution system is divided into ten pressure districts. The main pressure zone, which is the largest pressure zone, contains fifteen wells while some pressure zones do not contain any wells and are supplied water via a pump station.

The groundwater source of Madison's drinking water contributes to its quality. Organic matter, particulates, and microbes such as bacteria, algae and protozoa are naturally filtered as rainwater, snowmelt, and runoff percolate through the soil to replenish the aquifer. However, the physical and chemical properties of water allow it to dissolve minerals from the underlying rock or to pick up man-made contaminants left behind from spills or improper chemical storage as water moves from the surface to the saturated zone. The application of agricultural chemicals, such as nitrate and pesticides, and road salt can also impact groundwater and drinking water quality. Landfills represent yet another potential source of groundwater contamination. Madison drinking water contains significant amounts of hardness minerals and other dissolved solids. Consequently, area businesses and homeowners routinely employ water softening to prevent scale buildup on pipes and to promote longer life on water-using appliances. Naturally occurring trace metals are also present, to varying degrees, in Madison's water supply.

Madison Water Utility routinely collects and tests water samples for bacteria and chemicals that may be reasonably expected to be present in drinking water. Samples are taken at Water Utility facilities – wells, storage tanks, and pump stations – and locations within the distribution system (see table 2 & figure A-1). Location and frequency of sampling varies by the contaminant tested (see table 1). All monitoring complies with the federal Safe Drinking Water Act, as enforced by the Wisconsin Department of Natural Resources (DNR), while additional testing is performed to ensure drinking water safety, to track trends in water quality, and to better understand changes in distribution system water quality. The United States Environmental Protection Agency (EPA) and DNR have regulatory authority over the water quality monitoring performed by the utility.

Table 1. Frequency and locations of routine water quality monitoring

Testing Frequency	Contaminants Tested	Testing Location
Daily	Chlorine, Fluoride	Wells
Daily (M-Th)	Coliform Bacteria, *E. coli* Chlorine	Wells, Distribution Sites Distribution Sites
Monthly	Iron, Manganese	Some Wells
Quarterly	Coliform Bacteria (Raw Water) Volatile Organic Compounds	Wells Some Wells
Annually	Inorganic Compounds, Nitrate Volatile Organic Compounds Disinfection By-Products	Wells Wells Distribution Sites
Less Frequently Than Annually	Synthetic Organic Compounds Radionuclides Unregulated Contaminants	Wells Wells Wells, Distribution Sites

Table 2. Distribution (compliance) sample locations tested twice weekly for coliform bacteria

WEST SIDE SAMPLE LOCATIONS **Sampled Monday & Wednesday**	**EAST SIDE SAMPLE LOCATIONS** **Sampled Tuesday & Thursday**
Booster Station 128*	Booster Station 113
Hawks Landing Golf Course*	East High School
High Service Reservoir*	Fire Station 5*
Hill Farms Steam Plant	Glendale School
Isthmus Engineering*	Lindburg School
Jefferson Middle School	Maple Bluff Village Hall
Leopold School*	Mendota School*
Lincoln School	Reservoir 229
Midvale School	Schenk School
Orchard Ridge School	Streets Dept - East
Shorewood Fire Dept	Tower 225
Thoreau School	Tower 315
Tower 120	Truax Admin Building
Tower 126	WI Army National Guard
West High School	

* Tested annually for disinfection by-products (DBP) – trihalomethanes and haloacetic acid

Microbiological Testing – Coliform Bacteria

Coliform bacteria tests are an indicator of water safety; tests showing the presence of the bacteria indicate that the water may not be safe for human consumption. Coliforms are a class of bacteria that may be found in soil, on vegetation, or in feces of warm-blooded animals such as humans. Most coliforms are harmless soil organisms that do not make people sick. However, some types of fecal coliforms (e.g. *E. coli*), which grow in the intestines of animals, may be disease-causing and can lead to diarrhea, intestinal cramps, or nausea. Coliform bacteria may also indicate the presence of other harmful bacteria or microbes that are not as easily detected. Water samples are collected from wells and at representative distribution locations (see table 2) multiple times each week and tested for coliform bacteria. The absence of coliform bacteria indicates that the water is safe for human use such as for cooking and drinking.

Based on the population served, Madison Water Utility is required to collect a minimum of 150 distribution system water samples each month and have them tested for coliform bacteria. In a typical month, the utility collects about 400 water samples for bacteriological analysis, of which 200-250 samples are from distribution system locations (see table 3). In addition, on a quarterly basis (once per three month period), the water utility must collect an untreated, non-chlorinated raw water sample from each operating well immediately after water is pumped from the ground, and test these source water samples for coliform bacteria.

Table 3. Monthly number of total coliform samples collected in 2010.

	Distribution	Raw Water	City-County	Wells	Total	YTD
January	207	13	15	98	333	333
February	226	4	14	100	344	677
March	269	0	19	131	419	1096
April	236	15	17	125	393	1489
May	215	4	18	125	362	1851
June	249	2	34	142	427	2278
July	220	20	32	135	407	2685
August	243	2	36	157	438	3123
September	235	0	32	149	416	3539
October	218	17	34	136	405	3944
November	223	2	32	117	374	4318
December	228	0	30	117	375	4693
TOTAL	**2769**	**79**	**313**	**1532**	**4693**	

Table 3 shows the number of monthly routine total coliform samples collected in 2010. Of 4693 samples collected, thirteen tested positive for coliform bacteria. Follow-up samples did not show the presence of bacteria at the original or check sample locations. Compared to federal and state regulations, which require that not more than 5% of monthly samples are coliform positive, the frequency of positive test results [highest monthly total was <1%] is very low. Maintaining the appropriate chlorine level in the distribution system helps to ensure the safety of Madison water.

Chemical Treatment – Fluoride

Fluoride is added to Madison tap water to improve dental health and reduce tooth decay. Water is tested daily to achieve the target level. In 2010, the average system-wide concentration was 1.08 mg/L, and 95% of 5298 results fell between 0.9 and 1.3 mg/L fluoride. Table 4 shows the number of tests and the typical range of fluoride for all Madison wells.

The US Department of Health and Human Services recently recommended that to reduce the potential for severe dental fluorosis in children, the optimal dose should be 0.7 mg/L fluoride. In January, the utility began adjusting the chemical pumps to meet the new recommendation. Previously, the target level was 1.1 mg/L fluoride.

Table 4. Summary of results, measured in mg/L, after fluoride addition at Madison wells.

Well	Samples	5th Pct	50th Pct	95 Pct
6	83	0.97	1.12	1.22
7	97	0.94	1.05	1.23
8	52	0.72	1.01	1.21
9	354	0.89	1.06	1.22
11	214	0.98	1.10	1.23
12	249	0.94	1.08	1.27
13	339	0.93	1.07	1.23
14	365	0.91	1.08	1.22
15	292	0.91	1.07	1.21
16	246	0.91	1.03	1.19
17	108	1.06	1.16	1.31
18	322	0.90	1.07	1.22
19	294	0.89	1.08	1.20
20	364	0.92	1.06	1.21
23	161	0.95	1.13	1.27
24	243	0.96	1.11	1.25
25	235	0.90	1.03	1.19
26	363	0.93	1.07	1.20
27	41	0.98	1.11	1.22
28	150	0.96	1.10	1.28
29	362	0.95	1.10	1.24
30	364	0.95	1.12	1.27

Chemical Testing

Inorganics – Inorganic compounds are rather simple chemicals present in groundwater. They are generally described as mineral in nature and usually exist as ions – substances with a positive or negative charge – when dissolved in water. Familiar examples include calcium, chloride, sodium, iron, magnesium, manganese, nitrate, sulfate, and zinc. Many inorganic substances are naturally occurring minerals that are dissolved from the rock which makes up the aquifer. However, some of these compounds may be introduced into groundwater by human activities; nitrate (an agricultural fertilizer) and sodium chloride (road salt) are two examples. The utility annually tests its wells for thirty different inorganic substances including those named above plus arsenic, barium, cadmium, chromium, lead, mercury, selenium, and thallium.

Table 5 summarizes the annual inorganic test results for well samples collected in June and July. With few exceptions, notably nitrate, the regulated inorganic contaminants that were detected are found at levels near the detection limit, generally <1 ug/L [or part per billion], and well below the maximum contaminant level (MCL). The range of results is similar to the range observed in 2009. Complete inorganic test results can be found in the appendix.

Nitrate – Nitrate is an essential plant nutrient. Fertilizer application, barnyard runoff, and septic systems can increase the amount of nitrate in soil and groundwater. Shallow wells located adjacent to or downhill from farmland or septic fields may be more vulnerable to nitrate contamination. Municipal wells with short casing lengths can also be susceptible to contamination at the land surface.

Nitrate in Madison wells ranges from below detection (<0.12 mg/L) to 3.5 mg/L. Six wells tested above 2 mg/L with the highest level measured at Well 14. Madison's older wells, which are less likely to be cased through the Eau Claire shale, have higher nitrate generally when compared to wells constructed more recently. Except for Well 26, wells drilled after 1968 have nitrate levels below 1 mg/L. Nitrate levels have been stable and they remain well below the MCL, which is 10 mg/L.

Chromium – Chromium is a metallic element found naturally in rocks, soil, plants, and animals including humans. It is used in many products and processes including stainless steel, textile dyes, wood preservation, leather tanning, and anti-corrosion coatings. These coatings are applied to a variety of metals to prevent rust and other damage caused by the exposure to oxygen. Chromium in water exists in two principal forms: chromium 3 (III), or trivalent chromium, and chromium 6 (VI), or hexavalent chromium. Chromium 3 is an essential dietary nutrient found in many vegetables, fruits, grains, and meat while the more toxic form, chromium 6, is generally produced by industrial processes. Hexavalent chromium can occur naturally but may enter drinking water supplies from historic leaks or industrial emissions.

Total chromium, which measures both chromium 3 and chromium 6, has been monitored in Madison drinking water since at least the 1970s. Levels of total chromium have been consistently below 3 parts per billion (ppb), and in many cases below 1 ppb, compared to the regulatory standard (MCL) of 100 ppb. New research that suggests potential cancer-causing effects of chromium 6 at levels below the current MCL have prompted the EPA to review the current standard. In the meantime, the water utility voluntarily initiated a

Table 5. Summary of annual inorganic test results after chemical treatment for Madison wells

Analyte	Units	LOD	MCL	Minimum	Median	Maximum
Alkalinity ($CaCO_3$)	(mg/l)	10.0		272	311	343
Aluminum	(ug/l)	0.40		0.46	0.96	7.2
Antimony	(ug/l)	0.40	6	<0.40	<0.40	<0.40
Arsenic	(ug/l)	0.40	10	<0.40	<0.40	1.1
Barium	(ug/l)	0.40	2000	7.6	18	52
Beryllium	(ug/l)	0.40	4	<0.40	<0.40	<0.40
Cadmium	(ug/l)	0.20	5	<0.20	<0.20	<0.20
Calcium	(mg/l)	0.01		59	69	107
Chloride	(mg/l)	1.20		2.7	13	94
Chromium	(ug/l)	0.80	100	<0.80	1.0	2.7
Conductivity	umhos / cm	3.00		512	620	992
Copper	(ug/l)	0.40	1300	1.0	3.6	42
Fluoride	(mg/l)	0.12	4	1.0	1.1	1.3
Hardness ($CaCO_3$)	(mg/l)	0.14		290	342	501
Iron	(mg/l)	0.001		<0.001	0.05	0.56
Lead	(ug/l)	0.20	15	<0.20	<0.20	1.6*
Magnesium	(mg/l)	0.03		26	41	57
Manganese	(ug/l)	0.40		<0.40	11	53
Mercury	(ug/l)	0.04	2	<0.04	0.04	0.89*
Nickel	(ug/l)	0.40	100	<0.40	0.81	3.0
Nitrogen-Nitrate	(mg/l)	0.12	10	<0.12	0.60	3.7
Nitrogen-Nitrite	(mg/l)	0.06	1	<0.06	<0.06	<0.06
pH (Lab)	s.u.			7.2	7.4	7.7
Selenium	(ug/l)	0.80	50	<0.80	<0.80	1.2
Silver	(ug/l)	0.40		<0.40	<0.40	<0.40
Sodium	(mg/l)	0.03		2.3	8.1	34
Sulfate	(mg/l)	1.20		4.3	16	65
Thallium	(ug/l)	0.20	2	<0.20	<0.20	0.22
Total Solids	(mg/l)	6.00		296	391	819
Zinc	(ug/l)	0.52		1.1	5.5	12

Shaded boxes correspond to regulated contaminants
*Suspected lab contaminant, resample tested below detection

LOD - Limit of Detection
MCL - Maximum Contaminant Level

monitoring program for chromium 6 that will involve testing two samples from each well and a limited number of samples from the distribution system during 2011. Test results will be reported on the utility's website and the water quality listserv.

Sodium and Chloride – Elevated levels of sodium and chloride (salt) in groundwater are often the result of road salt use for clearing snow. Increasing trends for these substances in Madison lakes and some municipal wells have been well documented by Public Health Madison & Dane County. Figure 1 below illustrates 12-year trends for chloride at some Madison wells. The figure shows a clear increase at three wells (#11, #14, and #23), a significant inter-annual variation at two wells (#17 and #23), and low yet stable levels at three wells (#18, #28, and #30). The wells with the highest chloride concentrations are located near heavily traveled roads such as Stoughton Road/Highway 51 (#11 and #23), University Avenue (#14), and John Nolen Drive (#17). Some of these wells also have a shallow casing (#14) or a shallow well depth (#23). Low chloride concentrations found at wells #28 and #30 likely reflect new construction protocols that involve casing the well through the Eau Claire formation into the lower Mt. Simon sandstone aquifer to minimize the potential impact of surface level contamination on water quality. Although not shown, similar trends are seen with sodium. Complete sodium and chloride results can be found in the appendix.

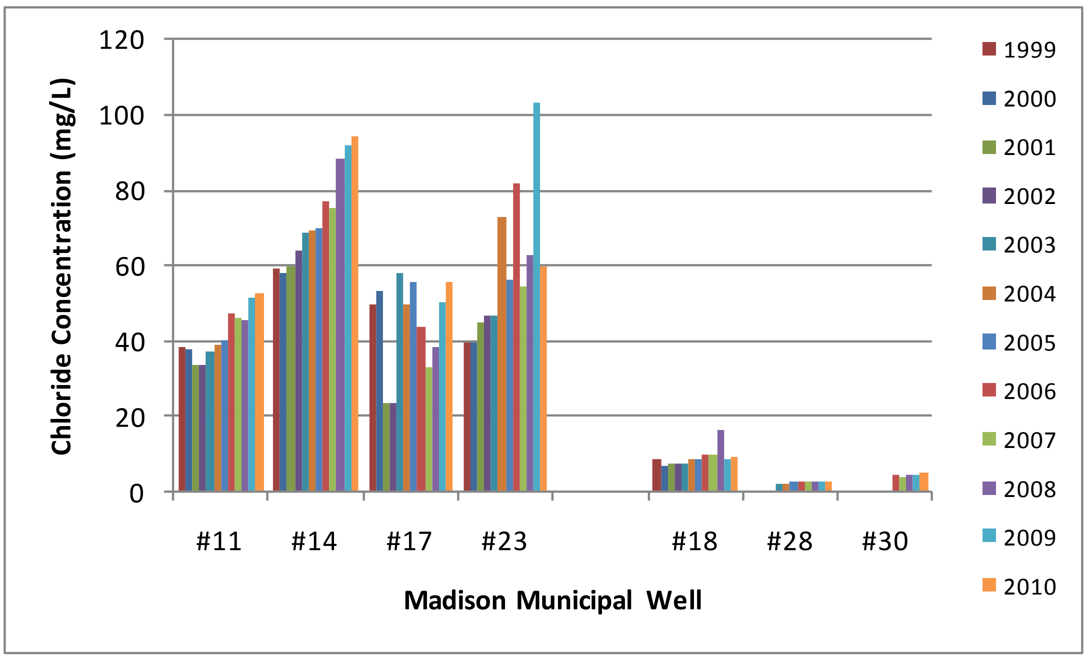

Figure 1. Chloride trends at seven Madison municipal wells

Lead and Mercury – The annual lead and mercury test results at some wells were found to be significantly higher than those observed in previous years. Re-sampling these wells showed much lower levels, which are more typical of earlier years, indicating that either a sampler or laboratory error had occurred. The results in the appendix include both the original and re-sample (see table A-2) results.

Iron and Manganese – Accumulation and later re-suspension of iron and manganese particles in water distribution mains is the primary cause of discolored water at the tap. The release of iron due to corrosion of water pipes can also contribute to orange colored water. The flushing of hydrants helps remove the accumulated sediment; however, the groundwater source of Madison drinking water continually introduces new iron and manganese into the distribution system. The utility is currently evaluating treatment alternatives for two wells (#7 and #8) that have the highest levels of these minerals.

Monthly samples are collected at wells that consistently have iron and manganese above 0.15 mg/L and 20 μg/L, respectively. Four wells produce water with an intermediate amount of iron, defined as ranging from 0.15 to 0.25 mg/L, while two wells exceed the national secondary drinking water standard of 0.3 mg/L – the level above which aesthetic concerns such as an unpleasant taste, odor, or appearance (color) may be present. Eight Madison wells have manganese between 20 ug/L and the secondary standard of 50 ug/L. Summary iron and manganese results for select wells are shown in table 6 with complete results in the appendix.

Table 6. Summary statistics for wells with higher levels of iron and manganese

Well	Samples	MANGANESE (ug/L)		IRON (mg/L)	
		Mean	St Dev	Mean	St Dev
7	11	28	3.9	0.37	0.04
8*	2	50	2.1	0.68	0.16
17*	3	33	5.5	0.10	0.02
19	9	45	5.0	0.21	0.02
23*	5	28	3.2	0.07	0.01
24	11	27	8.0	0.17	0.07
27*	3	25	2.0	0.10	0.02
28*	5	23	1.5	0.19	0.01
30	11	15	1.2	0.23	0.03

* Seasonal well, typically operates during a period between April and September

Volatile Organic Compounds (VOC) – Volatile organic compounds are chemical solvents or cleaning agents derived from petroleum products. They are man-made contaminants that arise from industrial processes. These contaminants leach into groundwater from improper storage, chemical spills, or wastewater discharge from industrial activities. Some can also be found in landfill leachate. At high levels, some of these substances are known carcinogens. The utility tests all its wells for 50 different VOCs including tetrachloroethylene (PCE), trichloroethylene (TCE), and methyl t-butyl ether (MTBE). Additional monitoring is triggered if the level of one VOC exceeds a threshold, typically one tenth of the maximum contaminant level (MCL).

The most frequently detected VOC in Madison wells is tetrachloroethylene (PCE). In 2010, PCE was detected at seven wells (see table 7). Although the amount of PCE detected at most wells is 1 ug/L or lower, the average at well #9 is 1.8 ug/L while at well #15 it is 3.5 ug/L. These levels compare to an MCL of 5 ug/L. The amount of PCE at well #9 has been gradually declining since 2002 while the level at well #15 (see figure 2) appears to be trending higher.

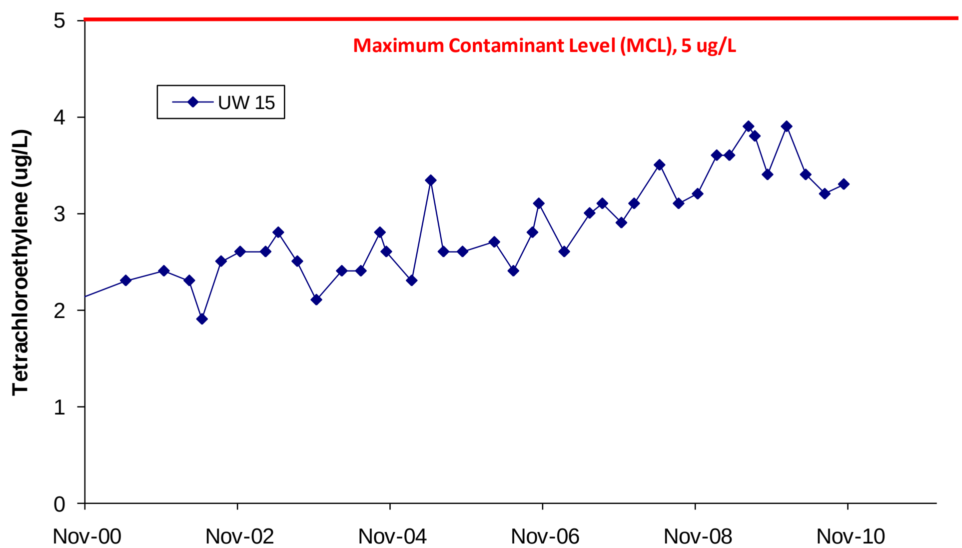

Figure 2. Tetrachloroethylene (PCE) level at well #15 over the last decade

A limited number of other VOCs have been found in some Madison municipal wells. Except for trichloroethylene (TCE), these contaminants are found in only one or two wells and are generally detected at trace levels (<0.5 ug/L). Table 7 identifies the chemical, maximum amount detected, and the well in which each was found. Complete test results can be found in the appendix.

Table 7. Summary of VOC detections in Madison wells

VOLATILE ORGANIC COMPOUND	MAXIMUM	UNITS	WELL(S) PRESENT	MCL[1]	MCLG[2]
Dichlorodifluoromethane	[0.22][3]	ug/L	14	--	--
1,2-Dichloroethylene (cis)	0.36	ug/L	8, 11	70	70
Methyl t-butyl ether [MTBE]	[0.14]	ug/L	15	--	--
Tetrachloroethylene [PCE]	3.9	ug/L	6, 9, 11, 14, 15, 18, 27	5	0
Toluene	[0.12]	ug/L	25	1000	1000
1,1,1-Trichloroethane	[0.15]	ug/L	9, 18	200	200
Trichloroethylene [TCE]	[0.41]	ug/L	11, 14, 15, 18, 27	5	0
Trichlorofluoromethane	1.1	ug/L	11	--	--
1,2,4-Trimethylbenzene	0.64	ug/L	7	--	--
Xylene, Total	[0.79]	ug/L	225	10000	10000

[1] Maximum Contaminant Level (MCL) - the maximum amount allowed in drinking water

[2] Maximum Contaminant Level Goal (MCLG) - the level below which there is no known or expected risk to health

[3] Bracketed numbers correspond to measurements above the detection limit but below the limit of quantification (LOQ)

Disinfection By-Products (DBP) – These chemical by-products form when chlorine combines with impurities in groundwater. Chlorine is added to treat water for the control of microbes such as bacteria and viruses. If organic matter is present, chlorine may react to form any of a variety of trihalomethanes: bromodichloromethane, bromoform, chloroform, or dibromochloromethane. The formation of disinfection by-products is limited by the amount of available organic matter, chlorine dose, temperature, and reaction time. Because little organic matter is present in ground water, the level of DBPs found in Madison drinking water is low.

Annual samples are required from seven representative locations within the distribution system. In 2010, the water utility also collected samples from some reservoirs and water towers. The total trihalomethane (TTHM) concentration ranged from 0.4 to 10.5 ug/L; the highest amounts were observed at the towers and reservoirs. The regulatory limit corresponds to the combined sum of the four trihalomethanes named above and is 80 ug/L. Complete results can be found in the appendix.

In addition to TTHMs, 14 samples were collected from 12 distribution locations and tested for five haloacetic acids (HAA5). Dibromoacetic acid was detected at seven locations and ranged from <0.1 to 0.9 ug/L. Dichloroacetic acid was found in one of two samples collected at tower 225 and reservoir 229. The maximum concentration was 6.8 ug/L. The detection at tower 225 likely reflects the disinfection of well #25 prior to its return to service in July. Dichloroacetic acid was not detected at tower 225 in an August re-sample. Trichloroacetic acid was detected in a single sample and measured 0.25 ug/L. The regulatory limit for the combined total of the five haloacetic acids is 60 ug/L.

Conclusions

Madison drinking water continues to meet all federal and state primary drinking water standards.

Madison Water Utility collects nearly twice the number of bacteriological samples required each month for regulatory compliance. In addition, samples are routinely collected from entry points into the distribution system to confirm the safety of drinking water.

Madison drinking water is high in dissolved solids and hardness minerals due to its groundwater source, a deep sandstone aquifer. Some wells produce water with elevated levels of iron and/or manganese, two minerals that can discolor drinking water.

Sodium, chloride, and nitrate concentrations in groundwater are influenced by human activities including the application of road salt (sodium chloride) and fertilizer (nitrate). Nitrate levels are stable while sodium and chloride levels are rising.

Tetrachloroethylene is the most common man-made contaminant found in Madison well water. Seven wells have detectable levels with the highest levels at wells #9 and #15. The level of PCE found at all Madison wells is below the maximum contaminant level.

APPENDIX

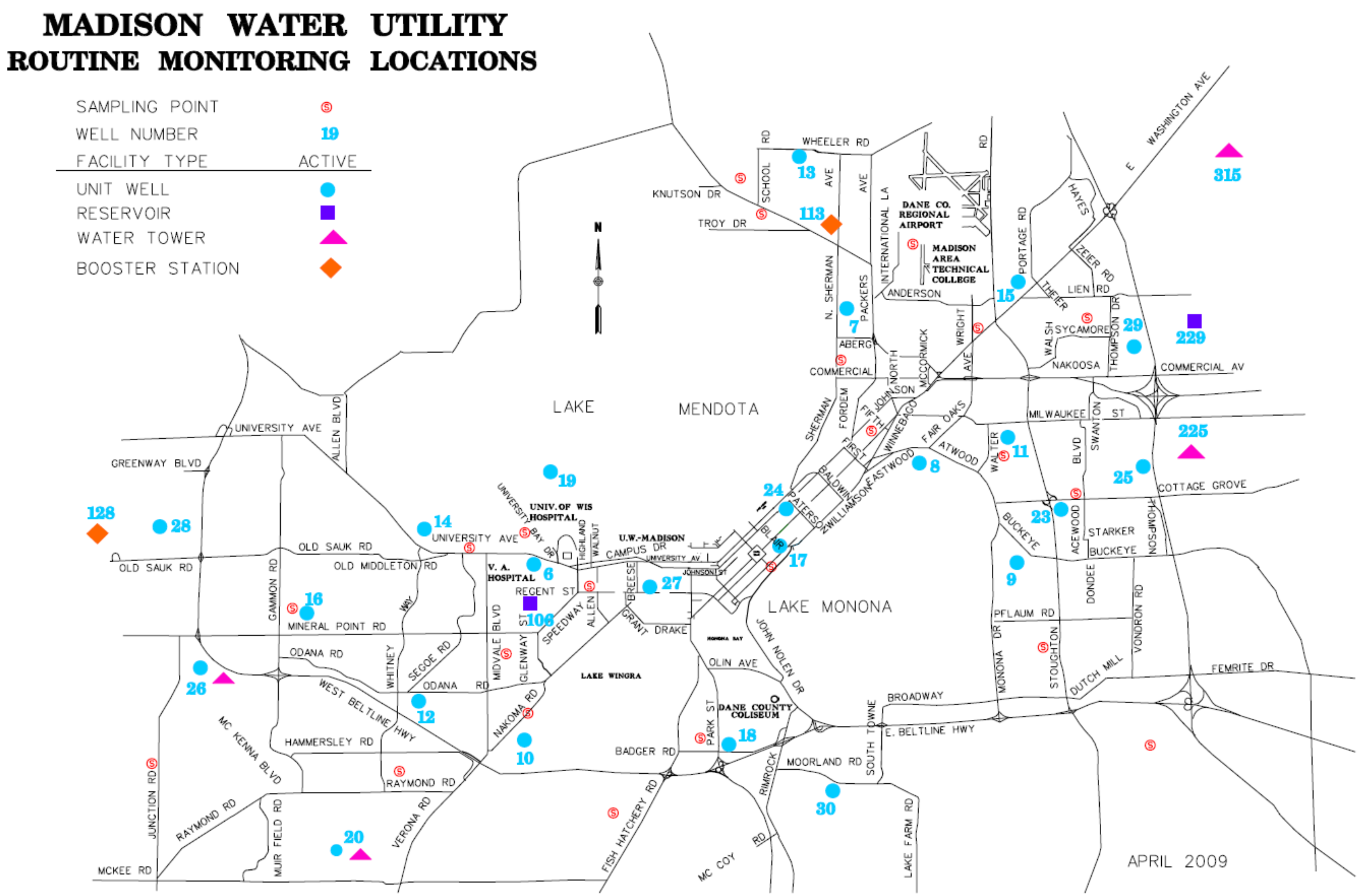

Figure A-1. Water quality monitoring locations – wells, reservoirs, water towers, and distribution sites

Table A-1. Annual Inorganic Test Results for Samples Collected in June 2010

PARAMETER	UNITS	LOD	MCL	Well 6	Well 7	Well 8	Well 9	Well 11	Well 12	Well 13	Well 14	Well 15	Well 16	Well 17
Sample Date				6/16	6/8	8/31	6/8	6/8	6/9	6/8	6/9	6/8	6/9	6/15
Alkalinity ($CaCO_3$)	(mg/l)	10.000		320	326	314	338	338	278	299	343	318	290	309
Aluminum	(ug/l)	0.40		1.2	1.5	3.1	0.79	0.93	1.4	1.7	0.60	1.1	0.68	0.71
Antimony	(ug/l)	0.40	6	<0.40	<0.40	ND	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Arsenic	(ug/l)	0.40	10	<0.40	<0.40	1.1	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Barium	(ug/l)	0.40	2000	22	37	34	27	18	15	32	52	9	18	31
Beryllium	(ug/l)	0.40	4	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Cadmium	(ug/l)	0.20	5	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Calcium	(mg/l)	0.011		91	84	67	87	88	62	69	107	91	70	82
Chloride	(mg/l)	1.200		38	14	17	36	52	3.5	9.2	94	49	44	56
Chromium	(ug/l)	0.80	100	2.7	<0.80	<0.80	1.4	1.4	1.7	1.2	2.5	1.0	1.5	<0.80
Conductivity	umhos / cm	3.00		753	695	638	752	823	519	601	992	791	694	856
Copper	(ug/l)	0.40	1300	1.8	5.5	4.1	14	4.5	1.5	1.2	1.7	33	3.7	1.7
Fluoride	(mg/l)	0.12	4	1.3	1.0	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.0	1.2
Hardness ($CaCO_3$)	(mg/l)	0.139		413	403	334	419	440	292	341	501	433	342	432
Iron	(mg/l)	0.0011		0.008	0.361	0.558	0.001	0.007	0.003	0.055	0.002	0.043	0.005	0.077
Lead	(ug/l)	0.20	15	<0.20	0.25	0.66	<0.20	1.6*	<0.20	<0.20	<0.20	0.24	0.83*	<0.20
Magnesium	(mg/l)	0.027		45	47	41	49	54	33	41	57	50	41	55
Manganese	(ug/l)	0.40		0.7	28	53	0.7	10	0.6	13	<0.40	13	0.6	39
Mercury	(ug/l)	0.04	2	0.08	<0.04	<0.04	<0.04	<0.04	0.89*	0.25*	0.05	0.16*	<0.04	0.04
Nickel	(ug/l)	0.40	100	0.89	0.69	1.1	0.58	1.2	1.0	0.57	0.80	0.83	1.6	0.73
Nitrogen-Nitrate	(mg/l)	0.120	10	3.5	<0.12	<0.12	1.8	2.7	1.6	1.9	3.7	2.2	2.8	<0.12
Nitrogen-Nitrite	(mg/l)	0.060	1	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
pH (Lab)	s.u.			7.7	7.2	7.5	7.5	7.4	7.6	7.4	7.4	7.3	7.5	7.4
Selenium	(ug/l)	0.80	50	1.2	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	0.9	<0.80	<0.80	<0.80
Silver	(ug/l)	0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Sodium	(mg/l)	0.025		13	7.2	9.0	15	18	2.3	5.1	34	19	16	23
Sulfate	(mg/l)	1.20		25	39	16	16	26	4.3	14	24	31	11	65
Thallium	(ug/l)	0.20	2	<0.20	<0.20	<0.20	<0.20	0.21	<0.20	<0.20	<0.20	0.22	<0.20	<0.20
Total Solids	(mg/l)	6.00		506	444	396	476	555	303	386	819	520	472	590
Zinc	(ug/l)	0.52		5.7	6.6	3.8	1.2	5.5	12	1.1	1.7	3.2	10	2.3

LOD - Limit of Detection   MCL - Maximum Contaminant Level   * Suspected laboratory contaminant; resample tested below detection

Table A-1, continued. Annual Inorganic Test Results for Samples Collected in June 2010

PARAMETER	UNITS	LOD	MCL		Well 18	Well 19	Well 20	Well 23	Well 24	Well 25	Well 26	Well 27	Well 28	Well 29	Well 30
Sample Date					6/9	6/9	6/9	6/8	6/8	7/21	6/9	6/23	6/9	6/8	6/9
Alkalinity ($CaCO_3$)	(mg/l)	10.000			278	291	276	333	272	320	288	312	284	321	272
Aluminum	(ug/l)	0.40			0.74	0.58	0.92	1.0	1.3	7.2	1.5	1.2	0.46	<0.40	0.64
Antimony	(ug/l)	0.40	6		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Arsenic	(ug/l)	0.40	10		<0.40	<0.40	<0.40	0.45	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Barium	(ug/l)	0.40	2000		15	17	11	46	14	8	19	26	15	52	17
Beryllium	(ug/l)	0.40	4		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Cadmium	(ug/l)	0.20	5		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Calcium	(mg/l)	0.011			65	67	59	94	63	63	68	84	66	77	60
Chloride	(mg/l)	1.200			8.9	6.4	2.7	60	6.2	3.0	13	35	2.7	3.5	4.9
Chromium	(ug/l)	0.80	100		<0.80	<0.80	1.0	1.6	<0.80	1.7	<0.80	1.1	<0.80	<0.80	<0.80
Conductivity	umhos / cm	3.00			560	552	512	868	529	586	586	742	547	587	528
Copper	(ug/l)	0.40	1300		1.0	12	2.0	42	3.5	4.5	1.3	1.8	4.1	2.4	4.4
Fluoride	(mg/l)	0.12	4		1.2	1.1	1.0	1.2	1.2	1.1	1.2	1.2	1.1	1.1	1.3
Hardness ($CaCO_3$)	(mg/l)	0.139			311	316	290	458	308	335	319	389	309	353	291
Iron	(mg/l)	0.0011			0.024	0.225	<0.0011	0.059	0.186	0.137	0.004	0.115	0.186	0.006	0.199
Lead	(ug/l)	0.20	15		<0.20	<0.20	<0.20	<0.20	0.32	<0.20	<0.20	<0.20	0.61*	<0.20	<0.20
Magnesium	(mg/l)	0.027			36	26	35	54	37	43	36	44	35	39	35
Manganese	(ug/l)	0.40			7.3	47	<0.40	27	35	9.8	7.5	24	24	0.6	14
Mercury	(ug/l)	0.04	2		<0.04	0.14*	0.04	<0.04	0.14*	0.06	0.04	0.04	0.07	<0.04	0.10
Nickel	(ug/l)	0.40	100		0.51	0.97	0.48	2.6	0.44	0.58	1.1	3.0	0.88	0.79	<0.40
Nitrogen-Nitrate	(mg/l)	0.120	10		0.53	<0.12	0.48	3.3	<0.12	0.58	2.0	0.37	<0.12	0.62	<0.12
Nitrogen-Nitrite	(mg/l)	0.060	1		<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
pH (Lab)	s.u.				7.5	7.2	7.6	7.5	7.5	7.3	7.5	7.3	7.4	7.4	7.6
Selenium	(ug/l)	0.80	50		<0.80	<0.80	<0.80	1.0	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Silver	(ug/l)	0.40			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Sodium	(mg/l)	0.025			4.8	4.0	2.4	22	5.2	3.3	6.4	16	2.4	19	3.6
Sulfate	(mg/l)	1.20			17	7.4	7.8	26	14	7.4	12	40	19	6.2	18
Thallium	(ug/l)	0.20	2		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Total Solids	(mg/l)	6.00			349	342	296	574	313	356	379	455	333	342	337
Zinc	(ug/l)	0.52			5.7	5.5	3.1	6.9	4.7	9.2	8.5	7.8	11	2.3	5.3

LOD - Limit of Detection MCL - Maximum Contaminant Level * Suspected laboratory contaminant; resample tested below detection

Table A-2. Re-sample Results for Lead and Mercury (ug/L) at Select Wells

PARAMETER	Well 7	Well 7	Well 11	Well 11	Well 11	Well 12	Well 12	Well 13	Well 13	Well 14	Well 14
Sample Date	12/10	12/10	7/21	12/14	12/14	12/14	12/14	12/14	12/14	12/14	12/14
Laboratory	PHMDC	NLS	PHMDC	PHMDC	NLS	PHMDC	NLS	PHMDC	NLS	PHMDC	NLS
Chloride					56						99
Lead	0.14	0.15	<0.5	0.21	0.28					0.18	0.16
Mercury		<0.07			<0.07	<0.02	<0.07	<0.02	<0.07		<0.07
Nitrogen-Nitrate					3.2		1.7		1.9		3.2
Sodium					18						32
Sulfate					31						27

PARAMETER	Well 15	Well 15	Well 16	Well 16	Well 16	Well 19	Well 19	Well 24	Well 24	Well 28
Sample Date	12/14	12/14	7/20	12/14	12/14	12/9	12/9	12/9	12/9	7/20
Laboratory	PHMDC	NLS	PHMDC	PHMDC	NLS	PHMDC	NLS	PHMDC	NLS	PHMDC
Chloride		52			49					
Lead	0.19	0.25	<0.5	0.46	0.56	<0.5	0.14	<0.5	0.21	<0.5
Mercury	<0.02	<0.07			<0.07	<0.10	<0.07	<0.10	<0.07	
Nitrogen-Nitrate		2.3			2.9					
Sodium		17			16					
Sulfate		33			11					

PHMDC - Public Health Madison & Dane County (Madison, WI)

NLS - Northern Lake Service (Crandon, WI)

Table A-3. Monthly Well Samples – Manganese Levels

	Manganese Concentration (ug/L)											
	January	February	March	April	May	June	July	August	September	October	November	December
Well #6	n/s	n/s	n/s	1.1	n/s	0.7	n/s	n/s	0.9	n/s	n/s	n/s
Well #7	28	24	39	27	26	28	27	27	26	28	n/s	27
Well #8	n/s	n/s	n/s	n/s	n/s	n/s	52	49	n/s	n/s	n/s	n/s
Well #9	n/s	n/s	n/s	n/s	n/s	0.7	n/s	n/s	n/s	n/s	n/s	0.2
Well #11	n/s	n/s	n/s	n/s	n/s	10	2.6	n/s	n/s	n/s	n/s	0.6
Well #12	n/s	n/s	n/s	n/s	n/s	0.6	n/s	n/s	n/s	n/s	n/s	0.3
Well #13	n/s	n/s	n/s	n/s	n/s	13	n/s	n/s	n/s	n/s	n/s	11
Well #14	n/s	n/s	n/s	n/s	n/s	<0.4	n/s	n/s	n/s	n/s	n/s	0.5
Well #15	n/s	n/s	7.6	n/s	n/s	13	n/s	n/s	28	5.7	n/s	6.4
Well #16	n/s	n/s	n/s	n/s	n/s	0.6	n/s	n/s	n/s	n/s	n/s	0.2
Well #17	n/s	n/s	n/s	n/s	n/s	39	30	29	n/s	n/s	n/s	n/s
Well #18	3.6	n/s	7.7	n/s	n/s	7.3	5.5	n/s	3.7	n/s	n/s	4.7
Well #19	n/s	45	45	35	55	47	n/s	n/s	44	44	46	44
Well #20	n/s	n/s	n/s	n/s	n/s	<0.4	n/s	n/s	n/s	n/s	n/s	0.8
Well #23	n/s	n/s	n/s	24	n/s	27	n/s	31	25	31	n/s	n/s
Well #24	30	28	28	30	4.3	35	n/s	31	28	31	27	27
Well #25	n/s	n/s	7.0	n/s	n/s	n/s	n/s	n/s	n/s	9.2	n/s	n/s
Well #26	14	20	11	9.3	6.7	7.5	18	n/s	n/s	n/s	n/s	18
Well #27	n/s	n/s	n/s	n/s	27	24	n/s	25	n/s	n/s	n/s	n/s
Well #28	n/s	n/s	n/s	n/s	n/s	24	24	25	22	21	n/s	n/s
Well #30	14	15	17	14	16	14	n/s	16	14	18	15	14

Table A-4. Monthly Well Samples – Iron Levels

	Iron Concentration (ug/L)											
	January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Well #6	n/s	n/s	n/s	0.004	n/s	0.008	n/s	n/s	0.014	n/s	n/s	n/s
Well #7	0.346	0.299	0.437	0.421	0.346	0.361	0.378	0.376	0.400	0.393	n/s	0.358
Well #8	n/s	n/s	n/s	n/s	n/s	n/s	0.793	0.560	n/s	n/s	n/s	n/s
Well #9	n/s	n/s	n/s	n/s	n/s	0.001	n/s	n/s	n/s	n/s	n/s	< 0.001
Well #11	n/s	n/s	n/s	n/s	n/s	0.007	0.004	n/s	n/s	n/s	n/s	0.008
Well #12	n/s	n/s	n/s	n/s	n/s	0.003	n/s	n/s	n/s	n/s	n/s	< 0.001
Well #13	n/s	n/s	n/s	n/s	n/s	0.055	n/s	n/s	n/s	n/s	n/s	0.045
Well #14	n/s	n/s	n/s	n/s	n/s	0.002	n/s	n/s	n/s	n/s	n/s	< 0.001
Well #15	n/s	n/s	0.018	n/s	n/s	0.043	n/s	n/s	0.148	0.013	n/s	0.016
Well #16	n/s	n/s	n/s	n/s	n/s	0.005	n/s	n/s	n/s	n/s	n/s	0.005
Well #17	n/s	n/s	n/s	n/s	n/s	0.077	0.097	0.111	n/s	n/s	n/s	n/s
Well #18	0.003	n/s	0.015	n/s	n/s	0.024	0.006	n/s	< 0.001	n/s	n/s	< 0.001
Well #19	n/s	0.201	0.197	0.186	0.239	0.225	n/s	n/s	0.198	0.204	0.199	0.199
Well #20	n/s	n/s	n/s	n/s	n/s	<0.001	n/s	n/s	n/s	n/s	n/s	< 0.001
Well #23	n/s	n/s	n/s	0.058	n/s	0.059	n/s	0.079	0.058	0.088	n/s	n/s
Well #24	0.130	0.122	0.125	0.144	0.023	0.186	n/s	0.264	0.222	0.205	0.205	0.192
Well #25	n/s	n/s	0.029	n/s	n/s	n/s	n/s	n/s	n/s	0.063	n/s	n/s
Well #26	0.003	0.007	0.003	0.001	0.004	0.004	0.006	n/s	n/s	n/s	n/s	0.005
Well #27	n/s	n/s	n/s	n/s	0.101	0.115	n/s	0.084	n/s	n/s	n/s	n/s
Well #28	n/s	n/s	n/s	n/s	n/s	0.186	0.186	0.211	0.178	0.173	n/s	n/s
Well #30	0.205	0.240	0.261	0.206	0.204	0.199	n/s	0.244	0.195	0.302	0.220	0.200

Table A-5. Volatile Organic Compound Test Results for Water Utility Facilities

VOLATILE ORGANIC COMPOUND	UNITS	MCL	MCLG[1]	Well #	6	7	7	8	9	9	9	9	11	11	11	11
				Date	7/20	6/8	7/16	8/31	1/26	4/27	7/16	10/20	1/26	4/27	7/16	10/20
Benzene	ppb	5	0		<0.13	<0.13	<0.12	<0.12	<0.24	<0.12	<0.12	<0.12	<0.24	<0.12	<0.12	<0.12
Bromobenzene	ppb	--	--		<0.16	<0.16	<0.21	<0.21	<0.14	<0.21	<0.21	<0.21	<0.14	<0.21	<0.21	<0.21
Bromodichloromethane*	ppb	80*	0		<0.14	[0.45][2]	[0.67]	[0.45]	[0.33]	[0.53]	[0.51]	[0.42]	<0.21	<0.21	<0.21	<0.21
Bromoform*	ppb	80*	0		[0.26]	<0.14	<0.33	<0.33	[0.24]	<0.14	[0.43]	<0.33	[0.19]	<0.33	<0.33	<0.33
Bromomethane	ppb	--	--		<0.20	<0.20	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26
Carbon Tetrachloride	ppb	5	0		<0.13	<0.13	<0.19	<0.19	<0.27	<0.19	<0.19	<0.19	<0.27	<0.19	<0.19	<0.19
Chloroethane	ppb	--	--		<0.78	<0.78	<1.0	<1.0	<0.95	<1.0	<1.0	<1.0	<0.95	<1.0	<1.0	<1.0
Chloroform*	ppb	80*	--		<0.14	[0.35]	0.54	0.71	[0.14]	[0.21]	[0.21]	[0.18]	<0.12	<0.11	<0.11	<0.11
Chloromethane (Methyl Chloride)	ppb	--	--		<0.15	<0.15	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
o-Chlorotoluene	ppb	--	--		<0.22	<0.22	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
p-Chlorotoluene	ppb	--	--		<0.11	<0.11	<0.11	<0.11	<0.13	<0.11	<0.11	<0.11	<0.13	<0.11	<0.11	<0.11
Dibromochloromethane*	ppb	80*	60		[0.20]	[0.24]	[0.54]	<0.27	[0.50]	[0.82]	[0.89]	[0.58]	[0.18]	<0.27	<0.27	<0.27
Dibromomethane	ppb	--	--		<0.12	<0.12	<0.24	<0.24	<0.13	<0.24	<0.24	<0.24	<0.13	<0.24	<0.24	<0.24
m-Dichlorobenzene (1,3)	ppb	--	--		<0.11	<0.11	<0.11	<0.11	<0.17	<0.11	<0.11	<0.11	<0.17	<0.11	<0.11	<0.11
o-Dichlorobenzene (1,2)	ppb	600	600		<0.13	<0.13	<0.17	<0.17	<0.15	<0.17	<0.17	<0.17	<0.15	<0.17	<0.17	<0.17
p-Dichlorobenzene (1,4)	ppb	75	75		<0.13	<0.13	<0.12	<0.12	<0.17	<0.12	<0.12	<0.12	<0.17	<0.12	<0.12	<0.12
Dichlorodifluoromethane	ppb	--	--		<0.17	<0.17	<0.11	<0.11	<0.16	<0.11	<0.11	<0.11	<0.16	<0.11	<0.11	<0.11
1,1-Dichloroethane	ppb	--	--		<0.27	<0.27	<0.14	<0.14	<0.25	<0.14	<0.14	<0.14	<0.25	<0.14	<0.14	<0.14
1,2-Dichloroethane	ppb	5	0		<0.12	<0.12	<0.16	<0.16	<0.15	<0.16	<0.16	<0.16	<0.15	<0.16	<0.16	<0.16
1,1-Dichloroethylene	ppb	7	7		<0.13	<0.13	<0.11	<0.11	<0.18	<0.11	<0.11	<0.11	<0.18	<0.11	<0.11	<0.11
1,2-Dichloroethylene (cis)	ppb	70	70		<0.13	<0.13	<0.13	[0.19]	<0.10	<0.13	<0.13	<0.13	0.36	[0.30]	[0.32]	[0.34]
1,2-Dichloroethylene (trans)	ppb	100	100		<0.19	<0.19	<0.11	<0.11	<0.28	<0.11	<0.11	<0.11	<0.28	<0.11	<0.11	<0.11
Dichloromethane	ppb	5	0		<0.40	<0.11	<0.34	<0.34	<0.25	<0.34	<0.34	<0.34	<0.25	<0.34	<0.34	<0.34
1,2-Dichloropropane	ppb	5	0		<0.29	<0.29	<0.16	<0.16	<0.22	<0.16	<0.16	<0.16	<0.22	<0.16	<0.16	<0.16
1,3-Dichloropropane	ppb	--	--		<0.16	<0.16	<0.26	<0.26	<0.14	<0.26	<0.26	<0.26	<0.14	<0.26	<0.26	<0.26
2,2-Dichloropropane	ppb	--	--		<0.11	<0.11	<0.13	<0.13	<0.17	<0.13	<0.13	<0.13	<0.17	<0.13	<0.13	<0.13
1,1-Dichloropropene	ppb	--	--		<0.18	<0.18	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
1,3-Dichloropropene	ppb	--	--		<0.36	<0.36	<0.40	<0.40	<0.33	<0.40	<0.40	<0.40	<0.33	<0.40	<0.40	<0.40
Ethylbenzene	ppb	700	700		<0.16	<0.16	<0.11	<0.11	<0.24	<0.11	<0.11	<0.11	<0.24	<0.11	<0.11	<0.11
Hexachlorobutadiene	ppb	--	--		<0.20	<0.20	<0.17	<0.17	<0.18	<0.17	<0.17	<0.17	<0.18	<0.17	<0.17	<0.17
Isopropylbenzene	ppb	--	--		<0.11	<0.11	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
p-Isopropyltoluene	ppb	--	--		<0.11	<0.11	<0.12	<0.12	<0.20	<0.12	<0.12	<0.12	<0.20	<0.12	<0.12	<0.12
Methyl t-butyl ether [MTBE]	ppb	--	--		<0.13	<0.13	<0.32	<0.32	<0.13	<0.32	<0.32	<0.32	<0.13	<0.32	<0.32	<0.32
Monochlorobenzene	ppb	100	100		<0.12	<0.12	<0.13	<0.13	<0.11	<0.13	<0.13	<0.13	<0.11	<0.13	<0.13	<0.13
Naphthalene	ppb	--	--		<0.28	<0.28	<0.44	<0.44	<0.23	<0.44	<0.44	<0.44	<0.23	<0.44	<0.44	<0.44
Styrene	ppb	100	100		<0.11	<0.11	<0.14	<0.14	<0.11	<0.14	<0.14	<0.14	<0.11	<0.14	<0.14	<0.14
1,1,1,2-Tetrachloroethane	ppb	--	--		<0.12	<0.12	<0.18	<0.18	<0.12	<0.18	<0.18	<0.18	<0.12	<0.18	<0.18	<0.18
1,1,2,2-Tetrachloroethane	ppb	--	--		<0.12	<0.12	<0.33	<0.33	<0.19	<0.33	<0.33	<0.33	<0.19	<0.33	<0.33	<0.33
Tetrachloroethylene [PCE]	ppb	5	0		0.42	<0.10	<0.10	<0.10	2.0	1.7	1.8	1.6	[0.73]	0.60	0.58	0.51
Toluene	ppb	1000	1000		<0.10	<0.10	<0.11	<0.11	<0.12	<0.11	<0.11	<0.11	<0.12	<0.11	<0.11	<0.11
1,2,4-Trichlorobenzene	ppb	70	70		<0.33	<0.33	<0.36	<0.36	<0.20	<0.36	<0.36	<0.36	<0.20	<0.36	<0.36	<0.36
1,1,1-Trichloroethane	ppb	200	200		<0.17	<0.17	<0.12	<0.12	[0.10]	<0.12	<0.12	<0.12	<0.10	<0.12	<0.12	<0.12
1,1,2-Trichloroethane	ppb	5	3		<0.26	<0.26	<0.28	<0.28	<0.13	<0.28	<0.28	<0.28	<0.13	<0.28	<0.28	<0.28
Trichloroethylene [TCE]	ppb	5	0		<0.15	<0.15	<0.12	<0.12	<0.25	<0.12	<0.12	<0.12	[0.29]	[0.25]	[0.26]	[0.25]
Trichlorofluoromethane	ppb	--	--		<0.10	<0.10	<0.12	<0.12	<0.16	<0.12	<0.12	<0.12	1.1	0.92	0.84	0.79
1,2,3-Trichloropropane	ppb	--	--		<0.23	<0.23	<0.46	<0.46	<0.35	<0.46	<0.46	<0.46	<0.35	<0.46	<0.46	<0.46
Trichlortrifluoroethane	ppb	--	--		<0.14	<0.14	<0.10	<0.10	<0.18	<0.10	<0.10	<0.10	<0.18	<0.10	<0.10	<0.10
1,2,4-Trimethylbenzene	ppb	--	--		<0.19	0.64	<0.10	<0.10	<0.15	<0.10	<0.10	<0.10	<0.15	<0.10	<0.10	<0.10
1,3,5-Trimethylbenzene	ppb	--	--		<0.20	<0.20	<0.15	<0.15	<0.14	<0.15	<0.15	<0.15	<0.14	<0.15	<0.15	<0.15
Vinyl Chloride	ppb	0.2	0		<0.15	<0.15	<0.13	<0.13	<0.19	<0.13	<0.13	<0.13	<0.19	<0.13	<0.13	<0.13
Xylene, Total	ppb	10000	10000		<0.33	<0.33	<0.33	<0.33	<0.63	<0.33	<0.33	<0.33	<0.63	<0.33	<0.33	<0.33

[1] Maximum Contaminant Level Goal (MCLG) - the level below which there is no known or expected risk to health

[2] Bracketed numbers correspond to measurements above the detection limit but below the limit of quantification (LOQ)

* Disinfection By-Products - 80 ppb is the Maximum Contaminant Level (MCL) for the combined concentrations of these four contaminants

Suspected Laboratory Contaminant

Table A-5, continued. Volatile Organic Compound Test Results for Water Utility Facilities

VOLATILE ORGANIC COMPOUND	UNITS	MCL	MCLG[1]	Well #	12	13	14	14	14	14	15	15	15	15	16	17
				Date	6/9	6/8	1/25	6/7	7/20	11/1	1/26	4/27	7/16	10/20	6/9	7/16
Benzene	ppb	5	0		<0.13	<0.13	<0.24	<0.13	<0.12	<0.12	<0.24	<0.12	<0.12	<0.12	<0.13	<0.13
Bromobenzene	ppb	--	--		<0.16	<0.16	<0.14	<0.16	<0.21	<0.21	<0.14	<0.21	<0.21	<0.21	<0.16	<0.16
Bromodichloromethane*	ppb	80*	0		<0.14	<0.14	<0.21	<0.14	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.14	1.2
Bromoform*	ppb	80*	0		<0.14	<0.14	[0.31]	[0.21]	<0.33	<0.33	<0.14	<0.33	<0.33	<0.33	<0.14	[0.40]
Bromomethane	ppb	--	--		<0.20	<0.20	<0.26	<0.20	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.20	<0.20
Carbon Tetrachloride	ppb	5	0		<0.13	<0.13	<0.27	<0.13	<0.19	<0.19	<0.27	<0.19	<0.19	<0.19	<0.13	<0.13
Chloroethane	ppb	--	--		<0.78	<0.78	<0.95	<0.78	<1.0	<1.0	<0.95	<1.0	<1.0	<1.0	<0.78	<0.78
Chloroform*	ppb	80*	--		<0.14	<0.14	<0.12	<0.14	<0.11	<0.11	<0.12	<0.11	<0.11	<0.11	<0.14	0.90
Chloromethane (Methyl Chloride)	ppb	--	--		<0.15	<0.15	<0.16	<0.15	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.15	<0.15
o-Chlorotoluene	ppb	--	--		<0.22	<0.22	<0.15	<0.22	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.22	<0.22
p-Chlorotoluene	ppb	--	--		<0.11	<0.11	<0.13	<0.11	<0.11	<0.11	<0.13	<0.11	<0.11	<0.11	<0.11	<0.11
Dibromochloromethane*	ppb	80*	60		<0.17	<0.17	[0.26]	[0.17]	<0.27	<0.27	<0.16	<0.27	<0.27	<0.27	<0.17	1.3
Dibromomethane	ppb	--	--		<0.12	<0.12	<0.13	<0.12	<0.24	<0.24	<0.13	<0.24	<0.24	<0.24	<0.12	<0.12
m-Dichlorobenzene (1,3)	ppb	--	--		<0.11	<0.11	<0.17	<0.11	<0.11	<0.11	<0.17	<0.11	<0.11	<0.11	<0.11	<0.11
o-Dichlorobenzene (1,2)	ppb	600	600		<0.13	<0.13	<0.15	<0.13	<0.17	<0.17	<0.15	<0.17	<0.17	<0.17	<0.13	<0.13
p-Dichlorobenzene (1,4)	ppb	75	75		<0.13	<0.13	<0.17	<0.13	<0.12	<0.12	<0.17	<0.12	<0.12	<0.12	<0.13	<0.13
Dichlorodifluoromethane	ppb	--	--		<0.17	<0.17	[0.20]	[0.22]	[0.19]	<0.11	<0.16	<0.11	<0.11	<0.11	<0.17	<0.17
1,1-Dichloroethane	ppb	--	--		<0.27	<0.27	<0.25	<0.27	<0.14	<0.14	<0.25	<0.14	<0.14	<0.14	<0.27	<0.27
1,2-Dichloroethane	ppb	5	0		<0.12	<0.12	<0.15	<0.12	<0.16	<0.16	<0.15	<0.16	<0.16	<0.16	<0.12	<0.12
1,1-Dichloroethylene	ppb	7	7		<0.13	<0.13	<0.18	<0.13	<0.11	<0.11	<0.18	<0.11	<0.11	<0.11	<0.13	<0.13
1,2-Dichloroethylene (cis)	ppb	70	70		<0.13	<0.13	<0.10	<0.13	<0.13	<0.13	<0.10	<0.13	<0.13	<0.13	<0.13	<0.13
1,2-Dichloroethylene (trans)	ppb	100	100		<0.19	<0.19	<0.28	<0.19	<0.11	<0.11	<0.28	<0.11	<0.11	<0.11	<0.19	<0.19
Dichloromethane	ppb	5	0		<0.11	<0.11	<0.25	<0.11	<0.34	2.7#	<0.25	<0.34	<0.34	<0.34	<0.11	<0.40
1,2-Dichloropropane	ppb	5	0		<0.29	<0.29	<0.22	<0.29	<0.16	<0.16	<0.22	<0.16	<0.16	<0.16	<0.29	<0.29
1,3-Dichloropropane	ppb	--	--		<0.16	<0.16	<0.14	<0.16	<0.26	<0.26	<0.14	<0.26	<0.26	<0.26	<0.16	<0.16
2,2-Dichloropropane	ppb	--	--		<0.11	<0.11	<0.17	<0.11	<0.13	<0.13	<0.17	<0.13	<0.13	<0.13	<0.11	<0.11
1,1-Dichloropropene	ppb	--	--		<0.18	<0.18	<0.11	<0.18	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.18	<0.18
1,3-Dichloropropene	ppb	--	--		<0.36	<0.36	<0.33	<0.36	<0.40	<0.40	<0.33	<0.40	<0.40	<0.40	<0.36	<0.36
Ethylbenzene	ppb	700	700		<0.16	<0.16	<0.24	<0.16	<0.11	<0.11	<0.24	<0.11	<0.11	<0.11	<0.16	<0.16
Hexachlorobutadiene	ppb	--	--		<0.20	<0.20	<0.18	<0.20	<0.17	<0.17	<0.18	<0.17	<0.17	<0.17	<0.20	<0.20
Isopropylbenzene	ppb	--	--		<0.11	<0.11	<0.14	<0.11	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.11	<0.11
p-Isopropyltoluene	ppb	--	--		<0.11	<0.11	<0.20	<0.11	<0.12	<0.12	<0.20	<0.12	<0.12	<0.12	<0.11	<0.11
Methyl t-butyl ether [MTBE]	ppb	--	--		<0.13	<0.13	<0.13	<0.13	<0.32	<0.32	[0.14]	<0.32	<0.32	<0.32	<0.13	<0.13
Monochlorobenzene	ppb	100	100		<0.12	<0.12	<0.11	<0.12	<0.13	<0.13	<0.11	<0.13	<0.13	<0.13	<0.12	<0.12
Naphthalene	ppb	--	--		<0.28	<0.28	<0.23	<0.28	<0.44	<0.44	<0.23	<0.44	<0.44	<0.44	<0.28	<0.28
Styrene	ppb	100	100		<0.11	<0.11	<0.11	<0.11	<0.14	<0.14	<0.11	<0.14	<0.14	<0.14	<0.11	<0.11
1,1,1,2-Tetrachloroethane	ppb	--	--		<0.12	<0.12	<0.12	<0.12	<0.18	<0.18	<0.12	<0.18	<0.18	<0.18	<0.12	<0.12
1,1,2,2-Tetrachloroethane	ppb	--	--		<0.12	<0.12	<0.19	<0.12	<0.33	<0.33	<0.19	<0.33	<0.33	<0.33	<0.12	<0.12
Tetrachloroethylene [PCE]	ppb	5	0		<0.10	<0.10	[0.71]	[0.66]	0.59	0.52	3.9	3.4	3.2	3.3	<0.10	<0.10
Toluene	ppb	1000	1000		<0.10	<0.10	<0.12	<0.10	<0.11	<0.11	<0.12	<0.11	<0.11	<0.11	<0.10	<0.10
1,2,4-Trichlorobenzene	ppb	70	70		<0.33	<0.33	<0.20	<0.33	<0.36	<0.36	<0.20	<0.36	<0.36	<0.36	<0.33	<0.33
1,1,1-Trichloroethane	ppb	200	200		<0.17	<0.17	<0.10	<0.17	<0.12	<0.12	<0.10	<0.12	<0.12	<0.12	<0.17	<0.17
1,1,2-Trichloroethane	ppb	5	3		<0.26	<0.26	<0.13	<0.26	<0.28	<0.28	<0.13	<0.28	<0.28	<0.28	<0.26	<0.26
Trichloroethylene [TCE]	ppb	5	0		<0.15	<0.15	[0.31]	[0.31]	[0.28]	[0.26]	[0.41]	[0.34]	[0.40]	[0.39]	<0.15	<0.15
Trichlorofluoromethane	ppb	--	--		<0.10	<0.10	<0.16	<0.10	<0.12	<0.12	<0.16	<0.12	<0.12	<0.12	<0.10	<0.10
1,2,3-Trichloropropane	ppb	--	--		<0.23	<0.23	<0.35	<0.23	<0.46	<0.46	<0.35	<0.46	<0.46	<0.46	<0.23	<0.23
Trichlortrifluoroethane	ppb	--	--		<0.14	<0.14	<0.18	<0.14	<0.10	<0.10	<0.18	<0.10	<0.10	<0.10	<0.14	<0.14
1,2,4-Trimethylbenzene	ppb	--	--		<0.19	<0.19	<0.15	<0.19	<0.10	<0.10	<0.15	<0.10	<0.10	<0.10	<0.19	<0.19
1,3,5-Trimethylbenzene	ppb	--	--		<0.20	<0.20	<0.14	<0.20	<0.15	<0.15	<0.14	<0.15	<0.15	<0.15	<0.20	<0.20
Vinyl Chloride	ppb	0.2	0		<0.15	<0.15	<0.19	<0.15	<0.13	<0.13	<0.19	<0.13	<0.13	<0.13	<0.15	<0.15
Xylene, Total	ppb	10000	10000		<0.33	<0.33	<0.63	<0.33	<0.33	<0.33	<0.63	<0.33	<0.33	<0.33	<0.33	<0.33

[1] Maximum Contaminant Level Goal (MCLG) - the level below which there is no known or expected risk to health

[2] Bracketed numbers correspond to measurements above the detection limit but below the limit of quantification (LOQ)

* Disinfection By-Products - 80 ppb is the Maximum Contaminant Level (MCL) for the combined concentrations of these four contaminants

Suspected Laboratory Contaminant

Table A-5, continued. Volatile Organic Compound Test Results for Water Utility Facilities

VOLATILE ORGANIC COMPOUND	UNITS	MCL	MCLG[1]	Well #	18	18	18	18	19	20	23	24	25	25	25	26
				Date	1/25	4/27	7/16	10/20	6/7	6/9	4/27	7/16	7/21	8/30	10/20	6/9
Benzene	ppb	5	0		<0.24	<0.12	<0.13	<0.12	<0.13	<0.13	<0.12	<0.13	<0.12	<0.12	<0.12	<0.13
Bromobenzene	ppb	--	--		<0.14	<0.21	<0.16	<0.21	<0.16	<0.16	<0.21	<0.16	<0.21	<0.21	<0.21	<0.16
Bromodichloromethane*	ppb	80*	0		<0.21	<0.21	<0.14	<0.21	3.4	[0.37]	[0.22]	1.7	[0.25]	<0.21	<0.21	[0.32]
Bromoform*	ppb	80*	0		<0.14	<0.33	<0.14	<0.33	[0.16]	<0.14	[0.44]	0.48	<0.33	<0.33	<0.33	[0.16]
Bromomethane	ppb	--	--		<0.26	<0.26	<0.20	<0.26	<0.20	<0.20	<0.26	<0.20	<0.26	<0.26	<0.26	<0.20
Carbon Tetrachloride	ppb	5	0		<0.27	<0.19	<0.13	<0.19	<0.13	<0.13	<0.19	<0.13	<0.19	<0.19	<0.19	<0.13
Chloroethane	ppb	--	--		<0.95	<1.0	<0.78	<1.0	<0.78	<0.78	<1.0	<0.78	<1.0	<1.0	<1.0	<0.78
Chloroform*	ppb	80*	--		<0.12	<0.11	<0.14	<0.11	4.5	[0.45]	<0.11	0.95	3.6	[0.17]	<0.11	[0.15]
Chloromethane (Methyl Chloride)	ppb	--	--		<0.16	<0.16	<0.15	<0.16	<0.15	<0.15	<0.16	<0.15	<0.16	<0.16	<0.16	<0.15
o-Chlorotoluene	ppb	--	--		<0.15	<0.15	<0.22	<0.15	<0.22	<0.22	<0.15	<0.22	<0.15	<0.15	<0.15	<0.22
p-Chlorotoluene	ppb	--	--		<0.13	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
Dibromochloromethane*	ppb	80*	60		[0.23]	<0.27	<0.17	<0.27	1.5	[0.26]	[0.59]	1.9	<0.27	<0.27	<0.27	[0.35]
Dibromomethane	ppb	--	--		<0.13	<0.24	<0.12	<0.24	<0.12	<0.12	<0.24	<0.12	<0.24	<0.24	<0.24	<0.12
m-Dichlorobenzene (1,3)	ppb	--	--		<0.17	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
o-Dichlorobenzene (1,2)	ppb	600	600		<0.15	<0.17	<0.13	<0.17	<0.13	<0.13	<0.17	<0.13	<0.17	<0.17	<0.17	<0.13
p-Dichlorobenzene (1,4)	ppb	75	75		<0.17	<0.12	<0.13	<0.12	<0.13	<0.13	<0.12	<0.13	<0.12	<0.12	<0.12	<0.13
Dichlorodifluoromethane	ppb	--	--		<0.16	<0.11	<0.17	<0.11	<0.17	<0.17	<0.11	<0.17	<0.11	<0.11	<0.11	<0.17
1,1-Dichloroethane	ppb	--	--		<0.25	<0.14	<0.27	<0.14	<0.27	<0.27	<0.14	<0.27	<0.14	<0.14	<0.14	<0.27
1,2-Dichloroethane	ppb	5	0		<0.15	<0.16	<0.12	<0.16	<0.12	<0.12	<0.16	<0.12	<0.16	<0.16	<0.16	<0.12
1,1-Dichloroethylene	ppb	7	7		<0.18	<0.11	<0.13	<0.11	<0.13	<0.13	<0.11	<0.13	<0.11	<0.11	<0.11	<0.13
1,2-Dichloroethylene (cis)	ppb	70	70		<0.10	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13
1,2-Dichloroethylene (trans)	ppb	100	100		<0.28	<0.11	<0.19	<0.11	<0.19	<0.19	<0.11	<0.19	<0.11	<0.11	<0.11	<0.19
Dichloromethane	ppb	5	0		<0.25	<0.34	<0.40	<0.34	<0.11	<0.11	<0.34	<0.40	<0.34	<0.34	<0.34	<0.11
1,2-Dichloropropane	ppb	5	0		<0.22	<0.16	<0.29	<0.16	<0.29	<0.29	<0.16	<0.29	<0.16	<0.16	<0.16	<0.29
1,3-Dichloropropane	ppb	--	--		<0.14	<0.26	<0.16	<0.26	<0.16	<0.16	<0.26	<0.16	<0.26	<0.26	<0.26	<0.16
2,2-Dichloropropane	ppb	--	--		<0.17	<0.13	<0.11	<0.13	<0.11	<0.11	<0.13	<0.11	<0.13	<0.13	<0.13	<0.11
1,1-Dichloropropene	ppb	--	--		<0.11	<0.11	<0.18	<0.11	<0.18	<0.18	<0.11	<0.18	<0.11	<0.11	<0.11	<0.18
1,3-Dichloropropene	ppb	--	--		<0.33	<0.40	<0.36	<0.40	<0.36	<0.36	<0.40	<0.36	<0.40	<0.40	<0.40	<0.36
Ethylbenzene	ppb	700	700		<0.24	<0.11	<0.16	<0.11	<0.16	<0.16	<0.11	<0.16	<0.11	<0.11	<0.11	<0.16
Hexachlorobutadiene	ppb	--	--		<0.18	<0.17	<0.20	<0.17	<0.20	<0.20	<0.17	<0.20	<0.17	<0.17	<0.17	<0.20
Isopropylbenzene	ppb	--	--		<0.14	<0.14	<0.11	<0.14	<0.11	<0.11	<0.14	<0.11	<0.14	<0.14	<0.14	<0.11
p-Isopropyltoluene	ppb	--	--		<0.20	<0.12	<0.11	<0.12	<0.11	<0.11	<0.12	<0.11	<0.12	<0.12	<0.12	<0.11
Methyl t-butyl ether [MTBE]	ppb	--	--		<0.13	<0.32	<0.13	<0.32	<0.13	<0.13	<0.32	<0.13	<0.32	<0.32	<0.32	<0.13
Monochlorobenzene	ppb	100	100		<0.11	<0.13	<0.12	<0.13	<0.12	<0.12	<0.13	<0.12	<0.13	<0.13	<0.13	<0.12
Naphthalene	ppb	--	--		<0.23	<0.44	<0.28	<0.44	<0.28	<0.28	<0.44	<0.28	<0.44	<0.44	<0.44	<0.28
Styrene	ppb	100	100		<0.11	<0.14	<0.11	<0.14	<0.11	<0.11	<0.14	<0.11	<0.14	<0.14	<0.14	<0.11
1,1,1,2-Tetrachloroethane	ppb	--	--		<0.12	<0.18	<0.12	<0.18	<0.12	<0.12	<0.18	<0.12	<0.18	<0.18	<0.18	<0.12
1,1,2,2-Tetrachloroethane	ppb	--	--		<0.19	<0.33	<0.12	<0.33	<0.12	<0.12	<0.33	<0.12	<0.33	<0.33	<0.33	<0.12
Tetrachloroethylene [PCE]	ppb	5	0		1.9	0.90	1.0	1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Toluene	ppb	1000	1000		<0.12	<0.11	<0.10	<0.11	<0.10	<0.10	<0.11	<0.10	<0.11	[0.12]	<0.11	<0.10
1,2,4-Trichlorobenzene	ppb	70	70		<0.20	<0.36	<0.33	<0.36	<0.33	<0.33	<0.36	<0.33	<0.36	<0.36	<0.36	<0.33
1,1,1-Trichloroethane	ppb	200	200		[0.15]	<0.12	<0.17	<0.12	<0.17	<0.17	<0.12	<0.17	<0.12	<0.12	<0.12	<0.17
1,1,2-Trichloroethane	ppb	5	3		<0.13	<0.28	<0.26	<0.28	<0.26	<0.26	<0.28	<0.26	<0.28	<0.28	<0.28	<0.26
Trichloroethylene [TCE]	ppb	5	0		<0.25	[0.12]	[0.17]	[0.15]	<0.15	<0.15	<0.12	<0.15	<0.12	<0.12	<0.12	<0.15
Trichlorofluoromethane	ppb	--	--		<0.16	<0.12	<0.10	<0.12	<0.10	<0.10	<0.12	<0.10	<0.12	<0.12	<0.12	<0.10
1,2,3-Trichloropropane	ppb	--	--		<0.35	<0.46	<0.23	<0.46	<0.23	<0.23	<0.46	<0.23	<0.46	<0.46	<0.46	<0.23
Trichlortrifluoroethane	ppb	--	--		<0.18	<0.10	<0.14	<0.10	<0.14	<0.14	<0.10	<0.14	<0.10	<0.10	<0.10	<0.14
1,2,4-Trimethylbenzene	ppb	--	--		<0.15	<0.10	<0.19	<0.10	<0.19	<0.19	<0.10	<0.19	<0.10	<0.10	<0.10	<0.19
1,3,5-Trimethylbenzene	ppb	--	--		<0.14	<0.15	<0.20	<0.15	<0.20	<0.20	<0.15	<0.20	<0.15	<0.15	<0.15	<0.20
Vinyl Chloride	ppb	0.2	0		<0.19	<0.13	<0.15	<0.13	<0.15	<0.15	<0.13	<0.15	<0.13	<0.13	<0.13	<0.15
Xylene, Total	ppb	10000	10000		<0.63	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

[1] Maximum Contaminant Level Goal (MCLG) - the level below which there is no known or expected risk to health

[2] Bracketed numbers correspond to measurements above the detection limit but below the limit of quantification (LOQ)

* Disinfection By-Products - 80 ppb is the Maximum Contaminant Level (MCL) for the combined concentrations of these four contaminants

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Table A-5, continued. Volatile Organic Compound Test Results for Water Utility Facilities

VOLATILE ORGANIC COMPOUND	UNITS	MCL	MCLG[1]	Well #	27	28	29	30		106	128	225	225	229	315
				Date	6/7	6/9	4/27	4/27		1/25	1/25	10/20	11/1	1/26	1/26
Benzene	ppb	5	0		<0.13	<0.13	<0.12	<0.12		<0.24	<0.24	<0.12	<0.12	<0.24	<0.24
Bromobenzene	ppb	--	--		<0.16	<0.16	<0.21	<0.21		<0.14	<0.14	<0.21	<0.21	<0.14	<0.14
Bromodichloromethane*	ppb	80*	0		[0.18]	[0.32]	[0.31]	<0.21		1.5	[0.46]	[0.32]	[0.36]	2.2	1.1
Bromoform*	ppb	80*	0		<0.14	<0.14	<0.33	<0.33		2.0	[0.21]	<0.33	<0.33	[0.46]	0.69
Bromomethane	ppb	--	--		<0.20	<0.20	<0.26	<0.26		<0.26	<0.26	<0.26	<0.26	<0.26	<0.26
Carbon Tetrachloride	ppb	5	0		<0.13	<0.13	<0.19	<0.19		<0.27	<0.27	<0.19	<0.19	<0.27	<0.27
Chloroethane	ppb	--	--		<0.78	<0.78	<1.0	<1.0		<0.95	<0.95	<1.0	<1.0	<0.95	<0.95
Chloroform*	ppb	80*	--		<0.14	[0.18]	0.38	<0.11		0.87	[0.31]	[0.29]	[0.34]	1.8	0.77
Chloromethane (Methyl Chloride)	ppb	--	--		<0.15	<0.15	<0.16	<0.16		<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
o-Chlorotoluene	ppb	--	--		<0.22	<0.22	<0.15	<0.15		<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
p-Chlorotoluene	ppb	--	--		<0.11	<0.11	<0.11	<0.11		<0.13	<0.13	<0.11	<0.11	<0.13	<0.13
Dibromochloromethane*	ppb	80*	60		[0.22]	[0.32]	<0.27	<0.27		2.6	[0.51]	<0.27	[0.35]	1.9	1.4
Dibromomethane	ppb	--	--		<0.12	<0.12	<0.24	<0.24		<0.13	<0.13	<0.24	<0.24	<0.13	<0.13
m-Dichlorobenzene (1,3)	ppb	--	--		<0.11	<0.11	<0.11	<0.11		<0.17	<0.17	<0.11	<0.11	<0.17	<0.17
o-Dichlorobenzene (1,2)	ppb	600	600		<0.13	<0.13	<0.17	<0.17		<0.15	<0.15	<0.17	<0.17	<0.15	<0.15
p-Dichlorobenzene (1,4)	ppb	75	75		<0.13	<0.13	<0.12	<0.12		<0.17	<0.17	<0.12	<0.12	<0.17	<0.17
Dichlorodifluoromethane	ppb	--	--		<0.17	<0.17	<0.11	<0.11		<0.16	<0.16	<0.11	<0.11	<0.16	<0.16
1,1-Dichloroethane	ppb	--	--		<0.27	<0.27	<0.14	<0.14		<0.25	<0.25	<0.14	<0.14	<0.25	<0.25
1,2-Dichloroethane	ppb	5	0		<0.12	<0.12	<0.16	<0.16		<0.15	<0.15	<0.16	<0.16	<0.15	<0.15
1,1-Dichloroethylene	ppb	7	7		<0.13	<0.13	<0.11	<0.11		<0.18	<0.18	<0.11	<0.11	<0.18	<0.18
1,2-Dichloroethylene (cis)	ppb	70	70		<0.13	<0.13	<0.13	<0.13		<0.10	<0.10	<0.13	<0.13	<0.10	<0.10
1,2-Dichloroethylene (trans)	ppb	100	100		<0.19	<0.19	<0.11	<0.11		<0.28	<0.28	<0.11	<0.11	<0.28	<0.28
Dichloromethane	ppb	5	0		<0.11	<0.11	<0.34	<0.34		<0.25	<0.25	<0.34	2.3#	<0.25	<0.25
1,2-Dichloropropane	ppb	5	0		<0.29	<0.29	<0.16	<0.16		<0.22	<0.22	<0.16	<0.16	<0.22	<0.22
1,3-Dichloropropane	ppb	--	--		<0.16	<0.16	<0.26	<0.26		<0.14	<0.14	<0.26	<0.26	<0.14	<0.14
2,2-Dichloropropane	ppb	--	--		<0.11	<0.11	<0.13	<0.13		<0.17	<0.17	<0.13	<0.13	<0.17	<0.17
1,1-Dichloropropene	ppb	--	--		<0.18	<0.18	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
1,3-Dichloropropene	ppb	--	--		<0.36	<0.36	<0.40	<0.40		<0.33	<0.33	<0.40	<0.40	<0.33	<0.33
Ethylbenzene	ppb	700	700		<0.16	<0.16	<0.11	<0.11		<0.24	<0.24	<0.11	<0.11	<0.24	<0.24
Hexachlorobutadiene	ppb	--	--		<0.20	<0.20	<0.17	<0.17		<0.18	<0.18	<0.17	<0.17	<0.18	<0.18
Isopropylbenzene	ppb	--	--		<0.11	<0.11	<0.14	<0.14		<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
p-Isopropyltoluene	ppb	--	--		<0.11	<0.11	<0.12	<0.12		<0.20	<0.20	<0.12	<0.12	<0.20	<0.20
Methyl t-butyl ether [MTBE]	ppb	--	--		<0.13	<0.13	<0.32	<0.32		<0.13	<0.13	<0.32	<0.32	<0.13	<0.13
Monochlorobenzene	ppb	100	100		<0.12	<0.12	<0.13	<0.13		<0.11	<0.11	<0.13	<0.13	<0.11	<0.11
Naphthalene	ppb	--	--		<0.28	<0.28	<0.44	<0.44		<0.23	<0.23	<0.44	<0.44	<0.23	<0.23
Styrene	ppb	100	100		<0.11	<0.11	<0.14	<0.14		<0.11	<0.11	<0.14	<0.14	<0.11	<0.11
1,1,1,2-Tetrachloroethane	ppb	--	--		<0.12	<0.12	<0.18	<0.18		<0.12	<0.12	<0.18	<0.18	<0.12	<0.12
1,1,2,2-Tetrachloroethane	ppb	--	--		<0.12	<0.12	<0.33	<0.33		<0.19	<0.19	<0.33	<0.33	<0.19	<0.19
Tetrachloroethylene [PCE]	ppb	5	0		[0.31]	<0.10	<0.10	<0.10		[0.44]	<0.20	<0.10	<0.10	<0.20	0.80
Toluene	ppb	1000	1000		<0.10	<0.10	<0.11	<0.11		<0.12	<0.12	<0.11	<0.11	<0.12	<0.12
1,2,4-Trichlorobenzene	ppb	70	70		<0.33	<0.33	<0.36	<0.36		<0.20	<0.20	<0.36	<0.36	<0.20	<0.20
1,1,1-Trichloroethane	ppb	200	200		<0.17	<0.17	<0.12	<0.12		<0.10	<0.10	<0.12	<0.12	<0.10	<0.10
1,1,2-Trichloroethane	ppb	5	3		<0.26	<0.26	<0.28	<0.28		<0.13	<0.13	<0.28	<0.28	<0.13	<0.13
Trichloroethylene [TCE]	ppb	5	0		[0.17]	<0.15	<0.12	<0.12		<0.25	<0.25	<0.12	<0.12	<0.25	<0.25
Trichlorofluoromethane	ppb	--	--		<0.10	<0.10	<0.12	<0.12		<0.16	<0.16	<0.12	<0.12	<0.16	<0.16
1,2,3-Trichloropropane	ppb	--	--		<0.23	<0.23	<0.46	<0.46		<0.35	<0.35	<0.46	<0.46	<0.35	<0.35
Trichlortrifluoroethane	ppb	--	--		<0.14	<0.14	<0.10	<0.10		<0.18	<0.18	<0.10	<0.10	<0.18	<0.18
1,2,4-Trimethylbenzene	ppb	--	--		<0.19	<0.19	<0.10	<0.10		<0.15	<0.15	<0.10	<0.10	<0.15	<0.15
1,3,5-Trimethylbenzene	ppb	--	--		<0.20	<0.20	<0.15	<0.15		<0.14	<0.14	<0.15	<0.15	<0.14	<0.14
Vinyl Chloride	ppb	0.2	0		<0.15	<0.15	<0.13	<0.13		<0.19	<0.19	<0.13	<0.13	<0.19	<0.19
Xylene, Total	ppb	10000	10000		<0.33	<0.33	<0.33	<0.33		<0.63	<0.63	[0.38]	[0.79]	<0.63	<0.63

[1] Maximum Contaminant Level Goal (MCLG) - the level below which there is no known or expected risk to health

[2] Bracketed numbers correspond to measurements above the detection limit but below the limit of quantification (LOQ)

* Disinfection By-Products - 80 ppb is the Maximum Contaminant Level (MCL) for the combined concentrations of these four contaminants

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Table A-6. Disinfection By-Products Measured at Water Utility Facilities and Distribution System Locations

				Water Utility Towers, Reservoirs, and Pump Stations												Distribution System Locations						
DISINFECTION BY-PRODUCTS	UNITS	MCL	MCLG	#106	#106	#128	#128	#225	#225	#229	#229	#229	#315	#315	#315	FS-5	HLG	IEM	LS	MDS	SH	TRUAX
				1/25	7/21	1/25	7/21	7/20	8/26	1/26	7/20	8/26	1/26	7/20	8/26	7/20	7/21	7/21	7/21	7/20	7/21	7/20
Bromodichloromethane	ppb	--	--	1.5	1.5	[0.46]	[0.18]	2.5	[1.0]	2.2	3.0	3.1	1.1	2.2	1.5	0.59	1.0	1.7	0.71	[0.47]	[0.15]	0.97
Bromoform	ppb	--	0	2.0	2.7	[0.21]	<0.14	[0.44]	[0.26]	[0.46]	1.4	0.64	0.69	1.3	1.1	1.1	[0.28]	0.88	0.73	<0.33	0.53	[0.36]
Chloroform	ppb	--	0	0.87	0.82	[0.31]	<0.14	6.0	1.1	1.8	1.7	2.6	0.77	1.4	0.96	[0.25]	1.1	1.1	0.52	[0.33]	[0.25]	0.71
Dibromochloromethane	ppb	--	60	2.6	2.9	[0.51]	[0.19]	1.6	[0.81]	1.9	3.8	2.5	1.4	2.8	2.2	1.3	0.88	1.9	1.1	[0.51]	[0.45]	[0.90]
Total Trihalomethanes (TTHM)	**ppb**	**80***	**--**	**7.0**	**7.9**	**1.5**	**0.4**	**10.5**	**3.2**	**6.4**	**9.9**	**8.8**	**4.0**	**7.7**	**5.8**	**3.2**	**3.3**	**5.6**	**3.1**	**1.3**	**1.4**	**2.9**
Dibromoacetic acid	ppb	--	--	NS	0.83	NS	<0.092	0.42	[0.23]	NS	0.85	0.86	NS	0.81	NS	0.54	<0.092	0.51	<0.092	<0.092	0.40	<0.092
Dichloroacetic acid	ppb	--	0	NS	<0.51	NS	<0.51	6.8	<0.51	NS	[0.53]	<0.51	NS	<0.51	NS	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51
Monobromoacetic acid	ppb	--	--	NS	<0.27	NS	<0.27	<0.27	<0.27	NS	<0.27	<0.27	NS	<0.27	NS	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27
Monochloroacetic acid	ppb	--	--	NS	<0.40	NS	<0.40	<0.40	<0.40	NS	<0.40	<0.40	NS	<0.40	NS	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Trichloroacetic acid	ppb	--	0.3	NS	<0.15	NS	<0.15	<0.15	<0.15	NS	[0.25]	<0.15	NS	<0.15	NS	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Total Haloacetic Acid (HAA5)	**ppb**	**60***	**--**	**NS**	**0.83**	**NS**	**ND**	**7.2**	**0.23**	**NS**	**1.6**	**0.86**	**NS**	**0.81**	**NS**	**0.54**	**ND**	**0.51**	**ND**	**ND**	**0.40**	**ND**

[ ] = below level of quantification
ND = not detected
NS = not sampled
ppb = parts per billion [equals ug/L]

MCL - maximum contaminant level, the highest level that is allowed in drinking water
MCLG - maximum contaminant level goal, the level of a contaminant in drinking water below which there is no known or expected risk to human health
* MCL for Total Trihalomethanes (TTHM) and Total Haloacetic Acids (HAA5) are cumulative; levels of individual trihalomethanes or haloacetic acids must not add up to more than the collective MCL

KEY:

FS-5 = Fire Station #5
HLG = Hawk's Landing Golf Course
IEM = Isthmus Engineering & Manufacturing
LS = Leopold School
MDS = Mendota School
SH = Shorewood Hills Fire Dept
TRUAX = Dane County Airport Terminal