SaskWater

WATER QUALITY REPORT

2011

SaskWater is committed to ensuring a long-term, sustainable, quality water supply to our customers.

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SaskWater's potable customers and water sources

SaskWater owns and operates seven water treatment plants serving a number of municipalities and pipeline associations. Each treatment plant has a different source of water as described in the following table.

Our water treatment plant located in...	Draws water from this source...	And delivers potable water to these major users...
Melfort	Codette Lake on the North Saskatchewan River	Village of Beatty Star City Farming Co. Ltd. Town of Kinistino City of Melfort Town of Star City Village of Weldon Melfort Rural Pipeline Association
Edenwold	Local Reservoir	Village of Edenwold
Elbow	Lake Diefenbaker	Village of Elbow Line 19 Water Pipeline Utility (Loreburn, Strongfield)
Gravelbourg	Thomson Lake	Town of Gravelbourg Thomson Lake Regional Park Authority
Pierceland	Local Aquifer	Village of Pierceland
Wakaw	South Saskatchewan River	Village of Annaheim Town of Bruno Town of Cudworth Hamlet of Domremy Hillcrest Farms Ltd. Hamlet of Hoey City of Humboldt Village of Lake Lenore Village of Muenster Hamlet of St. Isidore-de-Bellevue Village of St. Louis Town of Wakaw SHL Rural Pipeline Association North Central Rural Pipeline Association
White City	Zehner Aquifer	Town of White City

SaskWater's potable customers and water sources

SaskWater also owns and operates nine water transmission systems. Our transmission business buys water from the City of Saskatoon, the City of Regina and the Buffalo Pound Water Administration Board and delivers it to customers.

This transmission system...	**Purchases water from this supplier...**	**And delivers potable water to these customers... (listed alphabetically)**
Buffalo Pound East	City of Regina	The Canadian Salt Company Ltd., Eastview Water Users Co-op, Village of Grand Coulee, Yara Belle Plaine Inc.
Buffalo Pound North	Buffalo Pound Water Administration Board	Arm River Farming Co. Ltd., Village of Bethune, Buffalo Plains Cattle Co., Village of Disley, Dufferin Water Association, Qu'Appelle Valley Water Users Association
Buffalo Pound West	Buffalo Pound Water Administration Board	Eight Mile Pipeline Association, Village of Marquis, Marquis Rural Water Users Inc., Parklane Waterline Inc., Parkview Water Users Inc., Village of Tuxford, Tuxford Rural Water Users Inc.
Saskatoon East	City of Saskatoon	Allan South Rural Water Utility, Town of Allan, R.M. of Blucher (Sunset Estates), Village of Bradwell, Village of Clavet, R.M. of Corman Park (Casa Rio/Wood Meadows/Grasswood), Cory Park Mobile City, Dundurn Rural Water Utility, Eighth Street Waterline Group Inc., Village of Elstow, Elstow North Rural Water Utility, Grasswood Shell & Confectionary, Southeast Corman Park Rural Water Corp., GNC Bioferm Inc., Canlan Ice Sports Jemini, Lost River Water Co. Ltd., Potash Corporation of Sask. Inc. – Allan Division, Potash Corporation of Sask. Inc. – Patience Lake Division, Saskatoon East School Division #41, Saskatoon Stadium Sports Ltd., South Yellowhead Water Corporation, University of Saskatchewan (Goodale Farms), East Floral Industrial Park Ltd.
Saskatoon North	City of Saskatoon	Akzo Nobel Chemicals Ltd., Viterra Food Processing, Chicks'R'Us Poultry Ltd., R.M. of Corman Park (North Corman Industrial Park), Town of Dalmeny, Dalmeny West Water System Ltd., ERCO Worldwide, Town of Hague, Intervalley Water Inc., City of Martensville, Town of Osler, Sask. Valley Rural Water Utility, Wanuskewin Heritage Park, Town of Warman
Saskatoon West	City of Saskatoon	Chemtrade West Limited Partnership, Perkins Ag Marketing Inc., Potash Corporation of Sask. Inc. – Cory Division, Prairie Pride Chick Sales Ltd.
Saskatoon Northeast	City of Saskatoon	Town of Aberdeen, Highway 41 Water Utility, University of Saskatchewan (Kernen Farm)
Saskatoon Northwest Thatcher Avenue	City of Saskatoon	Biz Hub Developments Ltd., Yellowhead Industrial Park Water Corp.
Saskatoon Northwest 33rd Street	City of Saskatoon	Corman Park (Battleford Trail), Ministry of Government Services (Yarrow Youth Farm)

Treatment

Water treatment processes

Water treatment removes natural and man-made contaminants from the source water so that it is safe and pleasant to drink. The treatment process from a surface water source (like a river or lake) differs from treatment for groundwater (that is, drawn from an aquifer).

Surface water

Generally, surface water treatment facilities consist of screening to remove debris, coagulation-flocculation, clarification or sedimentation, filtration and disinfection to remove physical, chemical, microbial and other contaminants from the water.

Our treatment plants in Melfort, Wakaw, Gravelbourg, Edenwold and Elbow use this type of process.

Groundwater

For groundwater, the treatment process generally consists of oxidation of iron, manganese and other minerals with aeration and/or other processes followed by detention, filtration and disinfection.

Our treatment plants in Pierceland and White City use groundwater sources with this kind of treatment process.

Monitoring requirements

SaskWater undertakes water quality testing as required by *The Water Regulations 2002* and by operating permits for our water treatment plants and distribution systems.

SaskWater monitors water quality in order to:

- assess and ensure the safety of the water for our customers;
- assess the need for any process adjustments; and,
- determine quality trends and identify potential concerns.

We employ 42 provincially certified operators who monitor and maintain the quality of water from the initial source to the final point of delivery.

Our highly trained, dedicated operators, technicians, technologists and professional engineers keep abreast of technological changes, water quality, and any upgrading needs of our waterworks systems to meet ever-changing water quality standards and monitoring requirements.

SaskWater also monitors most of our facilities and customer facilities remotely. We have remote monitoring equipment installed in 41 locations, which we either own or operate, allowing continuous facility surveillance.

We monitor key water quality parameters, equipment operation and water levels, pressures and flows.

The following table summarizes the monitoring and testing requirements SaskWater must meet at its treatment plants for bacteriological parameters, chlorine residuals, turbidity, chemicals, and health and toxicity parameters.

SaskWater Owned Water Treatment System	Annual Volume in 2011 (m^3)	Water Source	BacT & Chlorine Residuals	Chlorine Residuals at the Treatment Plant	Turbidity	General Chemical	Health & Toxicity	THM*
Codette RWSS	977,135	Codette Lake	2 per week	1 per day	Continuous	1 every 3 months	1 every year	2 every 3 months in Jan, April, July, Oct
Wakaw-Humboldt RWSS	1,100,640	South Sask. River	3 per week	1 per day	Continuous	1 every 3 months	1 every year	3 every 3 months in Jan, April, July, Oct
Gravelbourg WTP	191,625	Thomson Lake	1 per week	1 per day	1 per day per filter	1 every 3 months every 2nd year	1 every 2 years	1 every 3 months in Jan, April, July, Oct
Pierceland WTP	60,759	Local Aquifer	2 per month	1 per day	1 per day per filter	1 every 2nd year	1 every 2 years	Not required for groundwater
Edenwold WTP	18,094	Local Reservoir	1 per week	1 per day	1 per day per filter	1 every 3 months every 2nd year	1 every 2 years	1 every 3 months in Jan, April, July, Oct
White City WTP	204,187	Zehner Aquifer	1 per week	1 per day	1 per day per filter	1 every 2nd year	1 every 2 years	Not required for groundwater
Elbow WTP	77,265	Lake Diefenbaker	1 per week	1 per day	1 per day per filter	1 every 3 months every 2nd year	1 every 2 years	1 every 3 months in Jan, April, July, Oct

** THM = Trihalomethanes*

2011 Drinking Water Quality – SaskWater-owned water treatment systems

Our governing standards combine the best of Saskatchewan's drinking water standards and the U.S. Environmental Protection Agency primary drinking water standards.

				SASKWATER-OWNED WATER TREATMENT SYSTEMS						
Parameters	**Units**	**SaskWater Standards & Objectives**		**Wakaw-Humboldt RWSS**	**Codette RWSS**	**Edenwold WTP**	**Gravelbourg WTP**	**Elbow WTP**	**Pierceland WTP**	**White City WTP**
		Regulatory	**Aesthetic**							
1. BACTERIOLOGICAL[1]:										
Total Coliform		0		1[3]	0	0	0	0	0	0
E. Coli		0		0	0	0	0	0	0	0
Background Bacteria				0	0	0	0	0	0	0
Number of Bacteriological Tests Required				156	104	0	52	52	26	0
Number of Bacteriological Tests Submitted				157	104	13[4]	52	52	27	15[4]
2. CHLORINE RESIDUALS:										
From samples submitted for bacteriological analysis										
Free Chlorine (Cl_2) Residuals:										
Minimum	mg/L	0.1[2]		0.10	0.57	0.51	0.33	0.51	0.65	0.46
Maximum	mg/L			1.95	2.44	1.25	1.15	1.39	1.25	1.30
Average	mg/L	Or		0.91	1.55	0.87	0.78	0.99	0.92	0.91
Total Chlorine (Cl_2) Residuals:										
Minimum	mg/L	0.5[2]		0.28	0.79	1.45	0.87	0.79	0.82	0.63
Maximum	mg/L			2.18	2.74	2.64	2.13	1.65	1.61	1.66
Average	mg/L			1.16	1.76	2.03	1.47	1.22	1.23	1.14
No. of Cl_2 Tests Required				156	104	0	52	52	26	0
No. of Cl_2 Tests Performed				157	104	13[4]	52	52	27	15[4]
From water entering distribution system										
Free Chlorine (Cl_2) Residuals:										
Minimum	mg/L	0.1		0.87	1.18	0.12	0.14	0.32	0.36	0.25
Maximum	mg/L			2.18	3.40	2.88	15.25[5]	2.04	2.11	1.80
Average	mg/L			1.43	1.95	0.83	0.79	0.98	0.92	0.91
Total Chlorine (Cl_2) Residuals:										
Minimum	mg/L	no standard		1.10	0.89	0.91	0.57	0.62	0.64	0.41
Maximum	mg/L			2.50	3.50	5.14	24.25[5]	2.78	2.06	2.17
Average	mg/L			1.67	2.16	1.86	1.50	1.21	1.23	1.13
No. of Free Cl_2 Tests Required				365	365	365	365	365	365	365
No. of Free Cl_2 Tests Performed				Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous
3. TURBIDITY:										
From samples submitted for bacteriological analysis										
Minimum	NTU			0.02	0.05	0.16	0.13	0.09	0.09	0.09
Maximum	NTU	no standard		0.14	0.14	2.27	2.74	0.50	0.23	0.42
Average	NTU			0.07	0.09	0.49	0.39	0.15	0.16	0.18
No. of Turbidity Tests Required				156	104	0	52	52	26	0
No. of Turbidity Tests Performed				157	104	13[4]	52	52	27	15[4]
From water leaving the filter										
Surface Water (Chem. Assisted Filtrn.):										
Minimum	NTU			0.010	0.021	0.012	0.08	0.032		
Maximum	NTU	1.0		0.289	0.230	0.860	0.95	0.306		
Average	NTU			0.060	0.057	0.137	0.19	0.084		
95th Percentile	NTU	0.3		0.095	0.089	0.206	0.32[6]	0.142		
Groundwater:										
Minimum	NTU								0.08	0.04
Maximum	NTU	no standard							0.31	0.41
Average	NTU								0.15	0.08
95th Percentile	NTU	1.0							0.18	0.19
No. of Turbidity Tests Required				Continuous	Continuous	730	730	365	365	365
No. of Turbidity Tests Performed				Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	Continuous

Summary of 2011 water quality data (continued)

SASKWATER-OWNED WATER TREATMENT SYSTEMS

Parameters	Units	SaskWater Standards & Objectives		Wakaw-Humboldt RWSS	Codette RWSS	Edenwold WTP	Gravelbourg WTP	Elbow WTP	Pierceland WTP	White City WTP
		Regulatory	Aesthetic							
4. CHEMICAL HEALTH:										
Aluminum	mg/L	0.1 – 0.2 OGV		0.024	0.019	0.013		0.18		<0.0005
Arsenic	mg/L	0.025		0.0003	0.003	0.002		0.001		0.0006
Barium	mg/L	1		0.075	0.078	0.070		0.076		0.0098
Boron	mg/L	5		0.03	0.03	0.03		0.03		0.14
Cadmium	mg/L	0.005		<0.00001	<0.00001	<0.00001		0.00002		<0.00001
Chromium	mg/L	0.05		<0.0005	<0.0005	<0.0005		<0.0005		<0.0005
Copper	mg/L		1	0.0018	0.013	0.012		0.0011		0.0087
Iron	mg/L		0.3	0.0027	0.0023	0.0033		0.0013		0.0016
Lead	mg/L	0.01		<0.0001	<0.0001	<0.0001		<0.0001		0.0001
Manganese	mg/L		0.05	<0.0005	0.0009	0.0096		<0.0005		0.0018
Selenium	mg/L	0.01		0.0006	0.0003	0.0004		0.0005		<0.0001
Trihalomethanes (THM)	mg/L	0.080[9]		0.064	0.038	0.219[7]	0.139[8]	0.088[7]		
Uranium	mg/L	0.02		0.0009	0.0002	0.0077		0.0013		0.0058
Zinc	mg/L		5	0.0026	0.0034	0.0026		0.0006		0.0017
5. CYANIDE and MERCURY:										
Cyanide	mg/L	0.2		<0.001						
Mercury	mg/L	0.001		<0.00002						
6. GENERAL CHEMICAL:										
Colour	ACU		15	0	0	18[10]	1	0	3	
Alkalinity	mg/L		500	140	132	279		158		303
Bicarbonate	mg/L	no standard		171	160	340		192		370
Calcium	mg/L	no standard		47	52	144		46		86
Carbonate	mg/L	no standard		<1	<1	<1		<1		<1
Chloride	mg/L		250	12	11	80		14		9
Fluoride	mg/L	1.5		0.64	0.90	0.07		0.11		0.28
Hardness (as $CaCO_3$)	mg/L		800	194	207	807		185		371
Hydroxide	mg/L	no standard		<1	<1	<1		<1		<1
Magnesium	mg/L		200	19	19	109		17		38
Nitrate (as NO_3)	mg/L	45		1.38	1.3	2.8		1.2		<0.04
pH	pH units		6.5 – 9.0	7.65	7.55	7.58		8.15		7.7
Potassium	mg/L	no standard		3.9	4.0	28		3.6		5.7
Sodium	mg/L		300	29	25	70		29		39
Specific Conductivity	µS/cm	no standard		503	518	1684		490		821
Sulphate	mg/L		500	102	114	589		81		160
Sum of Ions	mg/L		1500	383	384	1320		383		708
TDS	mg/L		1500	304	318	1328		297		549

Parameters	Units	SaskWater Standards & Objectives		Wakaw-Humboldt RWSS	Codette RWSS	Edenwold WTP	Gravelbourg WTP	Elbow WTP	Pierceland WTP	White City WTP
		Regulatory	Aesthetic							
7. CHEMICAL PESTICIDES:										
Atrazine	mg/L	0.003[9]		<0.001						
Bromoxynil (Buctril)	mg/L	0.005		<0.0005						
Carbofuran	mg/L	0.04[9]		<0.002						
Chlorpyrifos	mg/L	0.09		<0.002						
Dicamba (Banvel)	mg/L	0.12		<0.0005						
2, 4-D	mg/L	0.07[9]		<0.0005						
Diclofop-methyl (HoeGrass)	mg/L	0.009		<0.003						
Dimethoate	mg/L	0.02		<0.0005						
Lindane	mg/L	0.0002		<0.00001						
Malathion	mg/L	0.19		<0.002						
MCPA	mg/L	no standard		<0.001						
Pentachlorophenol (PCP)	mg/L	0.001[9]		<0.002						
Picloram (Tordon)	mg/L	0.19		<0.001						
Propanil	mg/L	no standard		<0.00005						
Triallate	mg/L	no standard		<0.001						
Trifluralin (Treflan)	mg/L	0.045		<0.001						
8. CHEMICAL ORGANICS:										
Benzene	mg/L	0.001		<0.0002						
Benzo(a)pyrene	mg/L	0.00001		<0.00001						
Carbon tetrachloride	mg/L	0.005		<0.002						
Dichlorobenzene 1,2	mg/L	0.2		<0.0005						
Dichlorobenzene 1,4	mg/L	0.005		<0.0005						
Dichloroethane 1,2	mg/L	0.005		<0.0005						
Dichloroethylene 1,1	mg/L	0.007[9]		<0.0005						
Dichloromethane	mg/L	0.05		<0.0005						
Dichlorophenol 2,4	mg/L	0.9		<0.001						
Ethylebenzene	mg/L		0.0024	<0.0002						
Monochlorobenzene	mg/L	0.08		<0.0005						
Nitrilotriacetic Acid (NTA)	mg/L	0.4								
Tetrachlorophenol 2,3,4,6	mg/L	0.1		<0.0005						
Tolunene	mg/L		0.024	<0.0002						
Trichloroethylene	mg/L	0.005[9]		<0.0005						
Trichlorophenol 2,4,6	mg/L	0.005		<0.001						
Vinyl Chloride	mg/L	0.002		<0.0005						
Xylene	mg/L		0.3	<0.0002						

Notes

ct/100 ml: Counts per 100 millilitres
MPN/100 mL: Most Probable Number per 100 millilitres
NT: Not Tested
SRC: Saskatchewan Research Council
mg/L: Milligrams per litre (equivalent to parts per million)
µS/cm: Microsiemens per centimetre
NTU: Nephelometric Turbidity Unit
ACU: Apparent Colour Unit
<: Below detection limits
OGV: Operational Guideline Value
RWSS: Regional Water Supply System
WTP: Water Treatment Plant
95th Percentile: Turbidity levels from each filter must not exceed this limit in at least 95% of the discrete measurements made for each calendar month; or if continuous turbidity monitoring is employed, at least 95% of the time for each calendar month.

Not required to test (as per permit)
Due to be sampled again in 2012. For 2010 results please see SaskWater Annual Report 2010.

1. **Regulatory Limits**
   Total Coliform: zero organisms detectable per 100 mL
   E. Coli: zero organisms detectable per 100 mL
   Background Bacteria: less than 200 organisms per 100 mL
   Any organisms detected over these limits will result in one positive for that sample.
2. Chlorine residuals in the distribution system must be either 0.1 mg/L free or 0.5 mg/L total.
3. One positive Total Coliform count at Wakaw WTP. Follow up repeat sample was negative.
4. Additional testing carried by SaskWater but not required by the permit.
5. High residual due to equipment malfunction. Refer to PDWA section for details.
6. Exceeded standard as duration above 0.30 NTU was greater than 12 hours. Refer to PDWA section for details.
7. Readings were high due to source water deterioration. At Elbow the Saskatchewan regulatory limit was met.
8. WTP upgrades underway to ensure compliance with regulatory requirements.
9. Standard shown is USEPA. Sask Environment standards for these parameters are (mg/L):

THM	0.1	2, 4-D	0.1
Atrazine	0.005	Dichloroethylene 1,1	0.014
Carborfuran	0.09	Pentachlorophenol (PCP)	0.06
		Trichloroethylene	0.05

10. Reading high due to source water deterioration. This is an aesthetic parameter that is not a health issue.

Transmission

In addition to owning and operating our own water treatment facilities, SaskWater also owns and operates potable water transmission systems. Our transmission business buys water from the City of Saskatoon, the City of Regina and the Buffalo Pound Water Administration Board and delivers it to customers. There are no treatment facilities on any of these transmission systems.

Monitoring requirements

Depending on the population, each potable water transmission system must be monitored according to the Saskatchewan Ministry of Environment's (SMOE) *Municipal Drinking Quality Monitor Guidelines*. Permit requirements for a specific waterworks may require more sampling than outlined in SMOE's guidelines.

The following table summarizes the water quality monitoring and testing requirements for bacteriological, chlorine residuals, turbidity, chemicals and health and toxicity parameters for each of our facilities.

SaskWater Owned Water Transmission System	Annual Volume for 2011 (m^3)	Water Source	BacT & Chlorine Residuals in Distribution System	Chlorine Residuals Entering the Distribution System	Turbidity	General Chemical & Health & Toxicity	THM
Saskatoon North	2,269,668	City of Saskatoon	3 per week	1 per day	3 per week	n/a	1 every 3 months in Jan, April, July, Oct
Saskatoon West	81,765	City of Saskatoon	2 per week	1 per day	2 per week	n/a	1 every 3 months in Jan, April, July, Oct
Saskatoon East	662,231	City of Saskatoon	3 per week	1 per day	3 per week	n/a	1 every 3 months in Jan, April, July, Oct
Saskatoon Northeast	83,901	City of Saskatoon	1 per week	1 per day	1 per week	n/a	1 every 3 months in Jan, April, July, Oct
Saskatoon Northwest Thatcher Avenue	11,389	City of Saskatoon	1 per week	1 per day	1 per week	n/a	1 every 3 months in Jan, April, July, Oct
Saskatoon Northwest 33rd Street	12,664	City of Saskatoon	1 per month	1 per month	1 per week	n/a	n/a
Buffalo Pound North	134,364	Buffalo Pound WTP	1 per month	1 per day	n/a	n/a	1 every 3 months in Jan, April, July, Oct
Buffalo Pound West	55,529	Buffalo Pound WTP	1 per month	1 per day	n/a	n/a	1 every 3 months in Jan, April, July, Oct
Buffalo Pound East	86,346	City of Regina	1 per month	1 per day	n/a	n/a	1 every 3 months in Jan, April, July, Oct

2011 Drinking Water Quality – SaskWater-owned water transmission systems

SASKWATER-OWNED WATER TRANSMISSION SYSTEMS

Parameters	Units	SaskWater Standards & Objectives		Saskatoon North	Saskatoon West	Saskatoon East	Saskatoon Northeast	Saskatoon Northwest Thatcher Avenue	Saskatoon Northwest 33rd Street	Buffalo Pound North	Buffalo Pound East	Buffalo Pound West
		Regulatory	Aesthetic									
1. BACTERIOLOGICAL[1]:												
Total Coliform	ct/100 mL	0		0	1[3]	0	0	0	0	0	0	0
E. Coli	ct/100 mL	0		0	0	0	0	0	0	0	0	0
Background Bacteria	ct/100 mL			0	0	0	0	0	0	0	0	0
No. of Bacteriological Tests Required				156	104	156	52	52	12	12	12	12
No. of Bacteriological Tests Submitted				156	105	162	54	53	13	13	12	13
2. CHLORINE RESIDUALS:												
From samples submitted for bacteriological analysis												
Free Chlorine (Cl_2) Residuals:												
Minimum	mg/L	0.1[2]								0.13	0.14	0.10
Maximum	mg/L									0.83	0.90	1.25
Average	mg/L	Or								0.44	0.54	0.44
Total Chlorine (Cl_2) Residuals:												
Minimum	mg/L	0.5[2]		1.11	0.70	0.73	1.10	1.42	0.76	0.43	0.36	0.42
Maximum	mg/L			2.09	2.20	2.03	1.90	1.95	1.71	0.96	1.18	1.60
Average	mg/L			1.64	1.52	1.45	1.59	1.66	1.30	0.70	0.78	0.75
No. of Cl_2 Tests Required				156	104	156	52	52	12	13	13	12
No. of Cl_2 Tests Performed				156	105	162	54	53	13	13	13	13
From water entering distribution system												
Free Chlorine (Cl_2) Residuals:												
Minimum	mg/L	0.1[2]								0.11	0.57	0.07[7]
Maximum	mg/L									1.20	1.09	2.20
Average	mg/L	Or								0.42	0.83	0.53
Total Chlorine (Cl_2) Residuals:												
Minimum	mg/L	0.5[2]		0.92	0.98	1.07	1.06	0.94	0.76	0.29	0.84	0.26
Maximum	mg/L			3.28	4.75	1.99	3.36	3.00	1.71	1.20	1.62	2.20
Average	mg/L			1.73	1.82	1.60	1.54	1.56	1.30	0.65	1.08	0.78
No. of Free Cl_2 Tests Required				365	365	365	365	365	12	365	365	365
No. of Free Cl_2 Tests Performed				Continuous	Continuous	Continuous	Continuous	Continuous	Continuous	228[6]	255[6]	Continuous
3. TURBIDITY:												
From samples submitted for bacteriological analysis												
Minimum	NTU			0.09	0.09	0.13	0.07	0.09	0.14	0.07	0.17	0.12
Maximum	NTU		no standard	0.66	1.80	0.85	0.44	0.34	0.50	0.20	0.44	1.91
Average	NTU			0.21	0.53	0.38	0.20	0.20	0.27	0.14	0.25	0.33
No. of Turbidity Tests Required				156	104	156	52	52	12	0	0	0
No. of Turbidity Tests Performed				156	105	162	54	53	13	13[5]	12[5]	13[5]

Parameters	Units	SaskWater Standards & Objectives		Saskatoon North	Saskatoon West	Saskatoon East	Saskatoon Northeast	Saskatoon Northwest Thatcher Avenue	Saskatoon Northwest 33rd Street West	Buffalo Pound North	Buffalo Pound East	Buffalo Pound West
		Regulatory	Aesthetic									
4. CHEMICAL HEALTH:												
Trihalomethanes (THM)	mg/L	0.080[4]		0.046	0.049	0.048	0.051	0.049		0.085[8]	0.069	0.086[8]
Sampling for parameters below this point is not required under permit.												
Aluminum	mg/L	0.1 – 0.2 OGV		0.052	0.025	0.041	0.025	0.050				
Arsenic	mg/L	0.01		0.0002	0.0002	0.0002	0.0002	0.0020				
Barium	mg/L	1		0.025	0.026	0.038	0.031	0.040				
Boron	mg/L	5		0.03	0.03	0.02	0.02	0.02				
Cadmium	mg/L	0.005		<0.00001	<0.00002	0.00003	0.00002	0.00002				
Chromium	mg/L	0.05		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005				
Copper	mg/L		1	0.0007	0.015	0.0012	0.0021	0.0040				
Iron	mg/L		0.3	0.0030	0.11	0.028	0.0058	0.011				
Lead	mg/L	0.01		0.0001	<0.0001	<0.0001	0.0002	0.0003				
Manganese	mg/L		0.05	<0.0005	0.0058	0.0008	<0.0005	0.0007				
Selenium	mg/L	0.01		0.0005	0.0005	0.0005	0.0005	0.0005				
Uranium	mg/L	0.02		0.0013	0.0013	0.0012	0.0012	0.0012				
Zinc	mg/L		5	<0.0005	0.0032	0.0016	0.0043	0.0054				
5. GENERAL CHEMICAL:												
Alkalinity	mg/L		500	94	90	118	100	118				
Bicarbonate	mg/L	no standard		115	110	144	122	144				
Calcium	mg/L	no standard		31	27	39	34	38				
Carbonate	mg/L	no standard		<1	<1	<1	<1	<1				
Chloride	mg/L		250	12	12	13	14	13				
Fluoride	mg/L	1.5		0.11	0.62	0.14	0.08	0.14				
Hardness (as $CaCO_3$)	mg/L		800	147	141	175	155	173				
Hydroxide	mg/L	no standard		<1	<1	<1	<1	<1				
Magnesium	mg/L		200	17	18	19	17	19				
Nitrate (as NO_3)	mg/L	45			1.1	0.62	1.4	0.18				
pH	pH units		6.5 – 9.0	8.07	8.12	8.28	8.16	8.24				
Potassium	mg/L	no standard		4.0	3.5	4.5	5.1	4.4				
Sodium	mg/L		300	27	29	32	29	32				
Specific Conductivity	µS/cm	no standard		434	429	498	451	498				
Sulphate	mg/L		500	110	110	120	110	120				
Sum of Ions	mg/L		1500	316	310	372	331	370				
TDS	mg/L		1500		251	314	291	308				

Notes

ct/100 mL: Counts per 100 millilitres
MPN/100 mL: Most Probable Number per 100 millilitres
NT: Not Tested (SRC does not test for E. coli if Total Coliforms are negative)
SRC: Saskatchewan Research Council
mg/L: Milligrams per litre (equivalent to parts per million)
µS/cm: Microsiemens per centimetre
NTU: Nephelometric Turbidity Unit
<: Below detection limits
OGV: Operational Guideline Value

Free chlorine residuals don't apply due to Saskatoon using chloramination.
Not required to test (as per permit).

1. **Regulatory Limits**
   Total Coliform: zero organisms detectable per 100 mL
   E. Coli: zero organisms detectable per 100 mL
   Background Bacteria: less than 200 organisms per 100 mL
   Any organisms detected over these limits will result in one positive for that sample.
2. Chlorine residuals in the distribution system must be either 0.1 mg/L free or 0.5 mg/L total.
3. One positive Total Coliform count. Follow up repeat sample was negative.
4. Standard shown is USEPA. Sask Environment standards for this parameter is 0.1 mg/L.
5. Additional testing carried out by SaskWater but not required by the permit.
6. Remote monitoring equipment failure. Issue has been remediated.
7. One occurance due to low use on system. Sask Environment notified, no PDWA issued
8. Below the Saskatchewan regulatory limit. Water is treated at the Buffalo Pound Water Treatment Plant.

Information

Further water quality information on potable water that we purchase is available from our suppliers:

Buffalo Pound Water Treatment Plant

http://www.moosejaw.ca/wp-content/uploads/2011/11/BPAnnualReport2010.pdf

City of Saskatoon

saskatoon.ca/DEPARTMENTS and select › Utilities Services › Water and Wastewater Treatment › 2010 Annual Report

Key drinking water parameters and effects

In addition to meeting the water quality parameters set by the province of Saskatchewan, SaskWater's governing standards for new and upgraded treatment plants meet the most stringent guidelines for health-related parameters in North America.

Alkalinity

Alkalinity is water's acid-neutralizing capacity and is primarily a function of carbonate, bicarbonate and hydroxide content. Excessive alkalinity levels may cause scale formation. Low alkalinity waters tend to dissolve minerals and metals, while high alkalinity waters tend to precipitate minerals and metals. The Aesthetic Objective (AO) is set at a maximum of 500 mg/L.

Aluminum (Al)

Aluminum is the most abundant metal in the crust of the earth. Research has linked aluminum to Alzheimer's disease, but most mainstream health professionals believe, based on current knowledge, that exposure to aluminum is not a significant risk factor. No Saskatchewan or national guidelines have been established for the permissible level of aluminum in drinking water. Current operation guideline values of 0.1 to 0.2 mg/L are suggested.

Arsenic (As)

Arsenic occurs naturally in water and soil. It has been classified as carcinogenic to humans. High arsenic has been linked to many health problems including lung, bladder and skin cancer, heart disease, diabetes, and others. The Maximum Acceptable Concentration (MAC) of arsenic in drinking water is currently published as 0.025 mg/L; however, the Federal-Provincial-Territorial Committee on Drinking Water has recently adopted a revised standard at 0.01 mg/L (i.e., 10 µg/L), which is expected to be published in the near future. The US standard has been at this more stringent level for some time and this is the standard that SaskWater adopted for our internal governing standard.

Background Bacteria

Background bacteria levels are measured on a total coliform or fecal coliform membrane filtration plate. This is used to determine the variety of bacteria that are commonly found in water. Background bacteria levels must be less than 200 colonies/100 mL or no overgrowth.

Barium (Ba)

Ingestion of barium may result in serious effects to the heart, blood vessels, and nerves. In humans, a single dose of 125 mg/L of soluble barium can elicit an acute toxic response, but at very low levels the toxicological effects of barium are still uncertain. The MAC of barium in drinking water is 1.0 mg/L (US EPA 2.0 mg/L).

Bromodichloromethane (BDCM)

Bromodichloromethane is one of the four major chemical compounds contained in trihalomethanes (THMs). Preliminary studies indicate that BDCM and other trihalomethanes that contain bromine may be more toxic than chlorinated THMs such as chloroform. BDCM is considered to be a probable carcinogen in humans, with sufficient evidence in animal studies. The MAC for bromodichloromethane in drinking water is 0.016 mg/L (i.e. 16 µg/L).

Cadmium (Cd)

Cadmium is a metal found naturally in the earth's crust. Pure cadmium is a soft, silver-white metal. It's commonly found in combination with other elements such as oxygen (cadmium oxide) or sulphur (cadmium sulphate). Short-term exposure above recommended levels can cause nausea, vomiting, diarrhea, muscle cramps, salivation, sensory disturbances, liver injury, convulsions, shock and renal failure. In long-term exposures above guidelines, cadmium has the potential to cause effects such as emphysema, kidney, liver damage and softening of the bones. The MAC for cadmium in drinking water is 0.005 mg/L.

Calcium (Ca)

Calcium is an abundant natural element, entering the freshwater system through the weathering of rocks, and from the soil through seepage, leaching, and runoff. High levels of calcium salts can precipitate when heated to form scale in boilers, pipes and cooking utensils. Calcium contributes to the total hardness of water. There is no AO or MAC set for calcium.

Chloride (Cl)

Chloride is widely distributed in nature and is generally found in sodium and potassium salts. Underground salt deposits have been found in all Canadian provinces except British Columbia. At concentrations above the aesthetic objective, chloride imparts undesirable taste to water and may cause corrosion in distribution systems. Concentrations of chloride in excess of 250 mg/L may impart a salty taste to water. Therefore, the AO is set at a maximum of 250 mg/L.

Colour

Colour is aesthetically undesirable in water used for domestic supplies and is detrimental for various industrial processes. Colour in drinking water may be due to the presence of coloured organic matter or metals such as iron and manganese. The AO is 15 Apparent Colour Units (ACU). Levels above 15 ACU can be detected in a glass of water by most people.

Escherichia Coli (E. coli)

E. coli is a type of fecal coliform bacteria commonly found in the intestines of animals and humans. The presence of E. coli in water is a strong indication of recent sewage or animal waste contamination. Most strains of E. coli do not cause illness in healthy humans and are beneficial to the synthesis of vitamins. Some strains, however, cause cramps and diarrhea in humans. One particular strain named O157:H7 produces a powerful toxin that can cause severe illness. The standard for E. coli is no organisms detectable per 100 mL of water sample. A typical water treatment process with appropriate disinfection system would inactivate E. coli.

Hardness

Water hardness is mainly caused by the presence of calcium and magnesium, and is expressed as the equivalent quantity of calcium carbonate. Hardness consumes soap, forms scum, curds and scale, and is harmful to many industrial processes. Water with more than 200 mg/L (i.e. over 11.7 grains/gallon) of hardness is generally considered "hard", though the AO is 800 mg/L for municipal drinking water purposes. Because water softening may introduce undesirably high quantities of sodium into drinking water, it is recommended that a separate un-softened supply be used for drinking and cooking.

Iron (Fe)

At levels above 0.3 mg/L, iron stains laundry and plumbing fixtures, imparts taste and interferes with iron exchange units. The precipitation of excessive iron causes a reddish brown colour in the water. It may also promote the growth of iron bacteria, leaving slimy coating in the piping. The AO is 0.3 mg/L.

Magnesium (Mg)

Magnesium is present in all natural waters and high levels in groundwater are probably the result of contact with magnesium-containing rock formations. Magnesium is a major contributor to water hardness and may also contribute undesirable taste to drinking water. The AO is set at a maximum of 200 mg/L.

Manganese (Mn)

At levels exceeding 0.15 mg/L, manganese stains laundry and plumbing fixtures and is undesirable in many industrial processes even in low concentrations. Also, it may lead to the accumulation of bacterial growth in pipelines. Elevated concentrations of manganese will form coatings on piping that may fall off as black flakes. The AO is set at a maximum of 0.05 mg/L.

Nitrate (NO_3)

The MAC of nitrate in drinking water is 45 mg/L as NO_3. In excessive amounts, it interferes with the oxygen-carrying capacity of the blood and contributes to an illness known as methemoglobinemia in infants, or "blue baby syndrome." Sources of nitrate in water include decaying plant or animal material, agricultural fertilizers, manure, domestic sewage or geological formations containing soluble nitrogen compounds. Since they are very soluble and do not bind to soils, nitrates have a high potential to migrate to groundwater.

Pesticides

Pesticides in drinking water may occur as a result of the use of these substances by humans. These substances may represent a long-term health risk if the MAC or Interim Maximum Acceptable Concentration (IMAC) is exceeded. Mandatory sampling requirements depend on the population served by the waterworks. For details, please refer to Saskatchewan's Drinking Water Quality Standards and Objectives.

pH

Natural waters usually have pH values in the range of 4 to 9 and most are slightly basic (i.e. greater than 7) because of the presence of bicarbonates and carbonates. Corrosion effects may become significant at a pH below 6.5 and scaling may become a problem at a pH above 8.5. For this reason the AO is a range from 6.5 to 9.0.

Sodium (Na)

High sodium concentration is undesirable for people on salt-free diets; causes foaming in boilers; has a laxative effect when combined with sulphate; and is detrimental to irrigation. The AO is 300 mg/L, but people with high blood pressure, hypertension or heart conditions should not exceed a level of 20 mg/L in drinking water or as directed by a physician.

Sum of Ions

Sum of ions indicates the concentration of ions in the water (i.e. dissolved solids). The AO for total dissolved solids is a maximum of 1,500 mg/L. See Total Dissolved Solids.

Sulphate (SO_4)

Sulphate occurs naturally in water and may be present in natural waters in concentrations ranging from a few to several thousand mg/L. Concentrations in excess of 500 mg/L, especially if the magnesium content is also high, may have a laxative effect or cause gastrointestinal irritation, and may also have a noticeable taste at this concentration. The AO is set at a maximum of 500 mg/L.

Total Coliforms

The presence of coliform organisms is an indication of pollution. The MAC for total coliforms is no organisms detectable per 100 mL of water sample. If any coliform organisms are detected, the site should be resampled, and if the presence of coliforms is confirmed, the appropriate corrective action should be taken. A typical water treatment process with appropriate disinfection system would inactivate coliforms.

Total Dissolved Solids (TDS)

TDS is a measure of the sum of individual dissolved minerals in water. Highly mineralized water is detrimental to agriculture (irrigation) and industry and may have negative health effects, although research is inconclusive and contradictory on this point. Waters with high dissolved solids are less palatable and also may leave a white film on dishes, etc. A water softener will not reduce TDS. The AO is 1,500 mg/L.

Trihalomethanes (THM)

Trihalomethanes are a group of compounds that can form when the chlorine used to disinfect drinking water reacts with naturally occurring organic matter (e.g., decaying leaves and vegetation). The use of chlorine in the treatment of drinking water has virtually eliminated waterborne diseases, because chlorine can kill or inactivate most microorganisms commonly found in water. THM are probable carcinogenic compounds and there is a link between long term exposure to THM and colorectal cancers. The four THM compounds are: chloroform, dibromochloromethane, bromodichloromethane (BDCM) and bromoform. The long-term objective for trihalomethanes is 0.1 mg/L (i.e. 100 µg/L) based on an annual average of seasonal sample.

Turbidity

Turbidity is a measure of the cloudiness of the water. High levels of turbidity can mask the presence of bacteria in the water and decrease the effectiveness of treatment processes such as filtration and chlorination. Higher turbidity levels are also often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and headaches. Saskatchewan Environment has created different regulatory standards for turbidity depending on the source of the raw water and the filtration process used during treatment.

Typically, for surface water with a chemically assisted filtration plant, the turbidity level must be less than 0.30 NTU 95% of the time and for a groundwater filtration plant the turbidity level must be less than 1.0 NTU 95% of the time. For details, please refer to *Saskatchewan's Drinking Water Quality Standards and Objectives*.

Explanation of terms

Potable water
Treated water that is suitable for human consumption in accordance with applicable regulations

Non-potable water
Water that is *not* suitable for human consumption in accordance with applicable regulations

Precautionary Drinking Water Advisory (PDWA)
An advisory issued under the authority of Subsection 32(1) of *The Environmental Management and Protection Act, 2002* by Saskatchewan Ministry of Environment Field Offices (SMOEFO) when the SMOEFO and Health Region determine that drinking water quality concerns exist but immediate public health threats have not been identified. As an example, it is standard protocol to issue a PDWA when a water main is depressurized to undertake repairs.

ACU
Apparent Colour Unit

AO
Aesthetic Objective

Bq/L
Becquerels per litre

<
Below lab detection levels

ct/100 ml
Counts per 100 millilitres

IMAC
Interim Maximum Acceptable Concentration

MAC
Maximum Acceptable Concentration

mg/L
Milligrams per Litre (equivalent to parts per million)

NTU
Nephelometric Turbidity Unit

n/a
Not required by Minister's permit/Not applicable

OGV
Operational Guideline Value

RWSS
Regional Water Supply System

SMOE
Saskatchewan Ministry of Environment

µg/L
Micrograms per Litre

µS/cm
Microsiemens per centimetre

WTP
Water Treatment Plant

Water quality issues

Emergency boil water orders

There were no emergency boil water orders (EBWO) issued on any SaskWater owned or operated facilities in 2011.

Precautionary drinking water advisories

A Precautionary Drinking Water Advisory (PDWA) is issued when drinking water quality concerns exist but immediate public health threats have not been identified. They are commonly issued as a result of power outages or maintenance that may result in depressurization of the distribution system.

There were thirteen (13) PDWA and one (1) Do Not Use Advisory issued on SaskWater owned potable water systems in 2011:

- The Saskatoon West Potable Water Supply System had two PDWA due to pipeline depressurization as a result of interruptions to the potable water supplied from the City of Saskatoon. Both instances were due to water main repairs within the City.
- The Saskatoon East Potable Water Supply System had one PDWA due to pipeline depressurization as well as high turbidity as a result of planned system upgrades. Several SaskWater customers also had PDWA issued as a result of this work.
- The Buffalo Pound North and West Potable Water Supply System had six PDWA;
    - Three were due to pipeline depressurization as a result of interruptions to the potable water supplied from the Buffalo Pound Water Treatment Plant. All three were due to electrical failures that left the plant without power for extended periods. Several SaskWater customers also had PDWA issued as a result of each of these incidents.
    - One was due to pipeline depressurization as a result of an interruption to the potable water supplied from the Buffalo Pound Water Treatment Plant due to planned maintenance at the Treatment Plant. Several SaskWater customers also had PDWA issued as a result of this work.
    - One was due to pipeline depressurization resulting from planned system upgrades. One SaskWater customer also had PDWA issued as a result of this work.
    - One was due to a leak repair that resulted in depressurization of the pipeline system. One SaskWater customer also had PDWA issued as a result of this incident.
- The Buffalo Pound East Potable Water Supply System had two PDWA due to pipeline depressurization as a result of interruptions to the potable water supplied from the Buffalo Pound Water Treatment Plant. Both were due to electrical failures that left the plant without power for extended periods. One SaskWater customer also had PDWA issued as a result of both of these incidents.
- The Elbow Water Supply System had a PDWA due to elevated turbidity in the treated water as a result of high organic levels in the Lake Diefenbaker raw water supply. The treatment plant process was unable to handle the high turbidity in the raw water resulting in high turbidity in the treated water. Several SaskWater customers also had PDWA issued as a result of this incident.
- The Gravelbourg Water Supply System had a PDWA due to elevated turbidity in the treated water as a result of flood conditions at the Thomson Reservoir raw water supply. The treatment plant process was unable to handle the high turbidity in the raw water resulting in high turbidity in the treated water.
- The Gravelbourg Water Supply System also had one Do Not Use Advisory due to highly chlorinated water. A malfunction of the chlorine feed system was the cause of the high chlorine levels. The chlorine feed system has been upgraded to ensure these same circumstances do not recur.

Where SaskWater provides operation and maintenance services to community or rural pipeline association-owned systems, there were twenty-two (22) PDWA issued in 2011 and the following provides details of each:

- The Village of Halbrite was issued eight PDWA. Four were due to power outages causing a depressurization of the distribution system, three were due to leak repairs resulting in depressurization of the distribution system and one was due to equipment failure that resulted in a low chlorine residual in the treated water reservoir.
- The Town of White City was issued two PDWA, one due to a leak repair that resulted in depressurization in a portion of the distribution system and one due to pipeline depressurization resulting from planned system maintenance.
- The Village of Vanscoy was issued a PDWA due to a leak repair that resulted in depressurization in a portion of the distribution system.

- Wakaw Lake Regional Park was issued a PDWA due to the start up of a seasonal system.
- The Village of Air Ronge was issued three PDWA, one due to planned water main replacement, one due to a power outage and one due to a valve failure during planned system maintenance. All three instances resulted in depressurization of all or a portion of the distribution system.
- The Lac La Ronge Regional Water Supply System was issued two PDWA, one due to a power outage and one due to a valve failure during planned system maintenance. Both instances resulted in depressurization of all or a portion of the distribution system.
- The Village of Edenwold was issued two PDWA, one due to a leak repair that resulted in depressurization in a portion of the distribution system and one due to planned system upgrades that required a depressurization of the distribution system.
- Jackfish Lake West Water Utility was issued a PDWA due to a power outage causing a depressurization of the distribution system.
- The Interlake Regional Water Utility was issued two PDWA, one due to a power outage causing a depressurization of the distribution system and one due to a leak repair that resulted in depressurization of the distribution system.

There were some instances of SaskWater customers (potable water customers) who had PDWA issued on their own distribution systems in 2011. Other than the instances noted above, all these advisories were due to issues with the customers' facilities and not due to the water supplied by SaskWater.

There were some instances of SaskWater non-potable water customers who had PDWA issued and one instance of an EBWO on a customer owned treatment and distribution system in 2011. In these instances, customers are aware that the water SaskWater supplies is non-potable, and if they wish to use non-potable water for domestic purposes, the customers are responsible for providing their own water treatment.

There is an ongoing PDWA issued by the Ministry of Environment in 2008 on SaskWater's Saskatoon Non-Potable Water Supply System – East and West. This is a situation where the Ministry of Environment has decided that these systems need to be permitted under *The Environmental Management and Protection Act 2002* and *The Water Regulations 2002*. This is a non-potable water supply system developed to supply industrial customers. However, household users are also supplied and the water is unsuitable for drinking unless treated. There is a plan in place to discontinue the supply of non-potable water to these customers and they will convert to alternative potable water sources.

Water quality issues

As reported in the 2010 Water Quality Report, SaskWater's Gravelbourg Water Treatment Plant does not meet the water quality standard for trihalomethanes (THMs). Samples regularly exceed the regulatory limit. SaskWater was using chlorine dioxide to reduce the THM levels on an interim basis, however, major upgrades to the plant are required to fully address this and other issues. Work is currently underway on these water treatment plant upgrades, with completion scheduled for early 2012.

Edenwold Water Treatment Plant did not meet the water quality standard for THMs in 2011. It failed to meet the standard in 2010 due to the depletion of the carbon filtration material. This was corrected in 2010 by replacing the carbon in the filter, however, with the high runoff in 2011, significant deterioration of the source water has again led to high THM readings. It now appears that carbon replacement alone is not sufficient and various other process improvements have been investigated. Currently, SaskWater is planning to pilot test chlorine dioxide to reduce the THM levels. A return to more normal moisture conditions may influence water quality and help reduce THM levels, in addition to the methods employed by SaskWater.

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