Portland Water Bureau

Triannual Water Quality Analysis
August 2019

Portland's Drinking Water

The Portland Water Bureau supplies water to over 970,000 people in the Portland metropolitan area. The primary water source is the protected Bull Run Watershed, an unfiltered surface water source. The Portland Water Bureau also has a secondary source, groundwater from the Columbia South Shore Well Field. Portland's groundwater source is used to augment the Bull Run source during long dry summers, or temporarily as Portland's sole drinking water source when the Bull Run source is unavailable. At a minimum, groundwater is used annually for a maintenance operation to ensure the system is available when needed. The water from the Bull Run and Columbia South Shore Well Field sources meets or exceeds all drinking water quality standards as measured at the entry points to the distribution system.

About This Report

This report presents analytical results for Portland's water to those needing technical data on water quality. The report covers results for treated Bull Run water from September 1, 2018 to August 31, 2019, emphasizing results from **August 6, 2019**. Analytical results for treated groundwater from the Columbia South Shore Well Field are from the past three years, emphasizing results from **July 15, 2019**. Samples are tested for regulated and unregulated parameters, including physicals, solids, nutrients, anions, cations, metals, and organics.

Please feel free to provide feedback on the report; contact information is provided at the end of the report. Additional background information is available in the annual Water Quality Report, delivered to Portland customers in early June and posted at: www.portlandoregon.gov/water/waterqualityreport.

Most analytical results in this document are reported in parts per million (ppm), which is equivalent to milligrams per liter (mg/L). One part per million corresponds to one penny in $10,000. When other units are used, they are displayed adjacent to the analytical results.

Many substances were either present at levels below the reporting limits of the prescribed method or were not detected. These results are shown as less than the Method Reporting Limit (<MRL). The MRL is the lowest concentration that can be reliably reported for the test method.

A list of abbreviations used in this report can be found at the end of the report.

Water Quality Standards

The U.S. Environmental Protection Agency (EPA) and the Oregon Health Authority-Drinking Water Services (OHA-DWS) set water quality standards for public water supplies.

Primary standards are set by federal and state regulations to protect public health, and are usually given as Maximum Contaminant Levels (MCLs). Lead and copper have action levels which cannot be exceeded at selected water customers' taps.

Secondary standards are federal and state guidelines set to assure aesthetic water quality and are given as Secondary Maximum Contaminant Levels (SMCLs).

The secondary standards apply to substances that may affect water taste, odor, or color; may stain sinks, bathtubs, or laundry; or may interfere with treatment processes.

Water Treatment

Both sources use chlorine as the primary raw water disinfectant. The chlorine concentration entering the distribution system is adjusted seasonally to account for changes in water quality. Since September 2014, the target chlorine concentration has ranged from 2.2 to 2.5 parts per million (ppm). Once primary disinfection is complete, ammonium hydroxide (aqueous ammonia) is added to the chlorinated water. Ammonia reacts with chlorine to form a long-lasting chloramine disinfectant residual. At the end of the disinfection process, sodium hydroxide (NaOH) is added to the water to raise the pH of the water to approximately 8.2 pH units. The addition of NaOH helps prevent corrosion of system piping and household plumbing, which in turn reduces the amount of lead, copper and other metals that can leach into the water from pipes, solder joints and plumbing fixtures.

The Portland Water Bureau is currently working on two major treatment improvements for Bull Run drinking water. To learn more about the improved corrosion control and filtration projects, visit: www.portlandoregon.gov/water/BullRunTreatment

Treated Bull Run Water

Samples of treated water were collected at the outlet of the Lusted Hill Treatment Facility on **August 6, 2019.**

Physical Characteristics include temperature, pH, specific conductance, color, and solids. Results are reported in ppm unless otherwise noted.

Physical Characteristics	12-Month Range	August 6, 2019	MRL*	EPA Standard
With Secondary Standards				**SMCL**
pH, Field (Standard pH Units)	7.9 – 8.5	8.1	0.1	6.5 – 8.5
Total Dissolved Solids (TDS)	26 – 35	35	5	500
Color (Color Units)	5 – 8	5	5	15
Hardness (as $CaCO_3$)	6.8 – 9.7	8.4	0.5	250**
Unregulated				
Specific Conductance (µmhos/cm @25°C)	29.9 – 40.5	34.5	1	Not regulated
Water Temperature, Field (°C)	4.2 – 17.4	15.0	0.1	Not regulated
Total Suspended Solids (TSS)	<0.5	<0.5	0.5	Not regulated
Total Solids (TS @180°C)	26 – 35	35	5	Not regulated
Turbidity (Nephelometric Turbidity Units; NTU)	0.18 – 0.97	0.24	0.05/0.30	Not regulated at this point in system

* Method Reporting Limits may vary over time; thus, for some analytes, more than one MRL is listed.
**The SMCL for hardness is a secondary standard set by the State of Oregon; there is no secondary standard set by the EPA.

Nutrients are chemicals that plants and bacteria need to grow. All results are reported in ppm.

Nutrients	12-Month Range	August 6, 2019	MRL	EPA Standard
With Primary Standards				**MCL**
Nitrate Nitrogen (NO_3^- as N)	<0.010 – 0.048	<0.010	0.010	10
Nitrite Nitrogen (NO_2^- as N)	<0.005	<0.005	0.005	1
Unregulated				
Ammonia Nitrogen, Total (NH_3 as N)	0.33 – 0.49	0.37	0.01	Not regulated
Ammonia Nitrogen, Free (NH_3 as N)	0.010 – 0.062	0.024	0.01	Not regulated
Nitrogen, Organic (N)	<0.05	<0.05	0.05	Not regulated
Nitrogen, Total (N)	0.30 – 0.41	0.30	0.05	Not regulated
Phosphorus, Reactive (PO_4^{3-} as P)	<0.003 – 0.003	0.003	0.003	Not regulated
Phosphorus, Total (P)	<0.01	<0.01	0.01	Not regulated
Silica (SiO_2 as Si)	4.2 – 5.0	4.4	1	Not regulated
Total Organic Carbon (TOC as C)	0.68 – 1.30	0.74	0.30	Not regulated

Anions and cations are negative and positive ions, respectively. When water flows over or through soil and rocks, minerals dissolve in the water where they form anions and cations. All results are reported in ppm.

Anions and Cations	12-Month Range	August 6, 2019	MRL	EPA Standard
With Primary Standards				**MCL**
Cyanide (CN^-)	<0.005	Not Tested	0.005	0.2
Fluoride (F^-)	<0.025	<0.025	0.025	4.0
With Secondary Standards				**SMCL**
Chloride (Cl^-)	2.9 – 3.5	3.1	0.25	250
Fluoride (F^-)	<0.025	<0.025	0.025	2.0
Sulfate (SO_4^{2-})	0.38 – 0.42	0.38	0.25	250
Unregulated				
Total Alkalinity (as $CaCO_3$)	5.6 – 15	11	1.0	Not regulated
Hydroxide Alkalinity (OH^- as $CaCO_3$)	<0.1	<0.1	0.1	Not regulated
Carbonate Alkalinity (CO_3^{2-} as $CaCO_3$)	<0.1	<0.1	0.1	Not regulated
Bicarbonate Alkalinity (HCO_3^- as $CaCO_3$)	9.7 – 13	11	0.1	Not regulated
Carbon Dioxide, Total (CO_2)	8.9 – 12	10	0.1	Not regulated
Carbon Dioxide, Free (CO_2)	0.31 – 0.55	0.55	0.1	Not regulated
Bromide (Br^-)	Not Tested	Not Tested	0.005	Not regulated
Calcium (Ca^{2+})	1.7 – 2.3	2.0	0.050	Not regulated
Magnesium (Mg^{2+})	0.65 – 0.99	0.81	0.050	Not regulated
Potassium (K^+)	0.18 – 0.28	0.23	0.10	Not regulated
Sodium (Na^+)	3.2 – 4.3	3.6	1.0	Not regulated

Treated Bull Run Water (cont.)

Metals are a group of similar elements that occur naturally in the earth's crust. Many have potential health effects at low levels and are considered primary contaminants by the EPA. Other metals, such as iron, are not generally considered harmful to health at low concentrations but can cause nuisance effects, such as discolored water. These are considered secondary contaminants. All results are reported in ppm.

Metals*	12-Month Range	August 6, 2019	MRL**	EPA Standard
With Primary Standards				**MCL**
Antimony (Sb)	<0.00050	<0.00050	0.00050	0.006
Arsenic (As)	<0.00050	<0.00050	0.00050	0.010
Barium (Ba)	0.00082 – 0.00108	0.00108	0.00050	2
Beryllium (Be)	<0.00050	<0.00050	0.00050	0.004
Cadmium (Cd)	<0.00050	<0.00050	0.00050	0.005
Chromium (Cr)	<0.00050	<0.00050	0.00050	0.1
Copper (Cu)	<0.00050 – 0.00071	<0.00050	0.00050	Treatment technique***
Lead (Pb)	<0.000050	<0.000050	0.000050	Treatment technique***
Mercury (Hg)	<0.00010	<0.00010	0.00010	0.002
Selenium (Se)	<0.0025	<0.0025	0.0025	0.05
Thallium (Tl)	<0.00050	<0.00050	0.00050	0.002
With Secondary Standards				**SMCL**
Aluminum (Al)	0.01260 – 0.02700	0.01260	0.0020	0.05 – 0.2
Copper (Cu)	<0.00050 – 0.00071	<0.00050	0.00050	1
Iron (Fe)	0.0183 – 0.0915	0.0406	0.0050	0.3
Manganese (Mn)	0.00170 – 0.01450	0.00669	0.00050	0.05
Silver (Ag)	<0.00050	<0.00050	0.00050	0.1
Zinc (Zn)	<0.0010 – <0.0020	<0.0020	0.0010/0.0020	5
Unregulated				
Nickel (Ni)	<0.00050	<0.00050	0.00050	Not regulated

*All metals results represent the total concentration rather than constituent parts, such as the dissolved fraction or components with specific valences.

** Method Reporting Limits may vary over time; thus, for some analytes, more than one MRL is listed.

***Instead of an MCL, EPA requires a treatment technique to address copper and lead above their respective action levels of 1.3 and 0.015 mg/L in drinking water, as measured at the point of use.

Volatile Organic Chemicals (VOCs) include solvents, disinfection by-products, and industrial and commercial products. The test measures the concentration of 60 VOCs, of which 23 are regulated and have state and federal MCLs. All results are reported in ppm.

VOCs	12-Month Range	August 2019	MRL	EPA Standard
With Primary Standards				**MCL**
21 Volatile Organic Chemicals	All <MRL	Not Tested	0.00050 – 0.002*	Various*
Bromodichloromethane**	<0.00050 – 0.00106	0.00081	0.00050	0.080 mg/L for Total Trihalomethanes (TTHM)
Chloroform**	0.00720 – 0.01550	0.01250	0.00050	0.080 mg/L for Total Trihalomethanes (TTHM)
Unregulated				
37 Volatile Organic Chemicals	All <MRL	Not Tested	0.00050 – 0.002*	Not regulated

*Each individual chemical compound has its own MRL and/or MCL values.

**Bromodichloromethane and chloroform are the most commonly occurring trihalomethane disinfection by-products. Disinfection by-products are formed when naturally occurring organic and inorganic materials in the water react with chlorine and other disinfectants.

Groundwater Operations

The Columbia South Shore Well Field was operated from July 10 to August 27, 2019 to augment the Bull Run supply. Groundwater provided about 30 to 35% of PWB's water supply during this time period. Groundwater is drawn from 25 active wells located in three aquifers: Blue Lake Aquifer (BLA), Sand and Gravel Aquifer (SGA), and Troutdale Sandstone Aquifer (TSA). Historical use of the Columbia South Shore Well Field can be found at www.portlandoregon.gov/water/groundwateruse.

When groundwater is operated, water quality is monitored at the Groundwater Pump Station (GWPS) outlet (Treated Groundwater). In the following tables, results represent blended water from all wells in operation at the time of sampling; blended groundwater quality is dependent upon the quality and volume of water contributed by each individual well in operation at the time of sampling, and may vary depending on which wells are in operation. The range of results at the entry point over the past three years are in the 3-Year Range column. The **July 15, 2019** column shows treated groundwater quality at the GWPS outlet based on results from a sample collected on that date, which is representative of blended water from all three supply aquifers.

Treated Groundwater

Physical characteristics include temperature, pH, specific conductance, color, and solids. Results are reported in ppm unless otherwise noted.

Physical Characteristics	3-Year Range	July 15, 2019	MRL*	EPA Standard
With Secondary Standards				**SMCL**
pH, Field (Standard pH Units)	7.44 – 9.20	8.17	0.1/1.0	6.5 – 8.5
Total Dissolved Solids (TDS)	120 – 150	140	5	500
Color (Color Units)	<5 – 7	7	5	15
Hardness (as $CaCO_3$)	50 – 110	72	0.1/0.5	250**
Unregulated				
Specific Conductance (µmhos/cm @25°C)	171.3 – 217.2	192.3	0.1	Not regulated
Water Temperature, Field (°C)	13.3 – 17.9	17.1	0.1	Not regulated
Total Suspended Solids (TSS)	<0.5 – 0.6	<0.5	0.5	Not regulated
Total Solids (TS @180°C)	120 – 150	140	5	Not regulated
Turbidity (Nephelometric Turbidity Units; NTU)	0.06 – 0.98	0.35	0.05/0.30	Not regulated at this point in system

* Method Reporting Limits may vary over time; thus, for some analytes, more than one MRL is listed.
** The SMCL for hardness is a secondary standard set by the State of Oregon; there is no secondary standard set by the EPA.

Nutrients are chemicals that plants and bacteria need to grow. All results are reported in ppm.

Nutrients	3-Year Range	July 15, 2019	MRL*	EPA Standard
With Primary Standards				**MCL**
Nitrate Nitrogen (NO_3^- as N)	0.034 – 0.45	0.034	0.010	10
Nitrite Nitrogen (NO_2^- as N)	<0.005	<0.005	0.005	1
Unregulated				
Ammonia Nitrogen, Total (NH_3 as N)	0.44 – 0.53	0.53	0.01	Not regulated
Ammonia Nitrogen, Free (NH_3 as N)	<0.01 – 0.085	0.035	0.01	Not regulated
Phosphorus, Reactive (PO_4^{3-} as P)	0.086 – 0.13	0.13	0.003/0.006	Not regulated
Phosphorus, Total (P)	0.080 – 0.13	0.13	0.01	Not regulated
Silica (SiO_2 as Si)	17.4 – 20.3	19.9	1.0/4.0/5.0	Not regulated
Total Organic Carbon (TOC as C)	<0.30 – 0.76	<0.30	0.30	Not regulated

* Method Reporting Limits may vary over time; thus, for some analytes, more than one MRL is listed.

Treated Groundwater (cont.)

Anions and cations are negative and positive ions. When water flows over or through soil and rocks, minerals dissolve in the water where they form anions and cations. All results are reported in ppm.

Anions and Cations	3-Year Range	July 15, 2019	MRL*	EPA Standard
With Primary Standards				**MCL**
Cyanide (CN^-)	<0.005	<0.005	0.005	0.2
Fluoride (F^-)	0.13 – 0.16	0.14	0.025	4.0
With Secondary Standards				**SMCL**
Chloride (Cl^-)	3.0 – 6.8	4.2	0.25	250
Fluoride (F^-)	0.13 – 0.16	0.14	0.025	2.0
Sulfate (SO_4^{2-})	2.9 – 8.6	4.2	0.25	250
Unregulated				
Total Alkalinity (as $CaCO_3$)	40 - 150	89	1.0	Not regulated
Hydroxide Alkalinity (OH^- as $CaCO_3$)	<0.1	<0.1	0.1	Not regulated
Carbonate Alkalinity (CO_3^{2-} as $CaCO_3$)	0.7 – 1.3	1.3	0.1	Not regulated
Bicarbonate Alkalinity (HCO_3^- as $CaCO_3$)	74 - 97	87	0.1	Not regulated
Calcium (Ca^{2+})	14 - 19	16	0.05	Not regulated
Magnesium (Mg^{2+})	6.7 – 8.8	7.5	0.05	Not regulated
Potassium (K^+)	2.3 – 2.7	2.4	0.10	Not regulated
Sodium (Na^+)	12 – 16	13	0.01/1.0	Not regulated

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Metals are a group of similar elements that occur naturally in the earth's crust. Many have potential health effects at low levels and are considered primary contaminants by the EPA. Other metals, such as iron, are not generally considered harmful to health at low concentrations but can cause nuisance effects, such as discolored water. These are considered secondary contaminants. All results are reported in ppm.

Metals*	3-Year Range	July 15, 2019	MRL**	EPA Standard
With Primary Standards				**MCL**
Antimony (Sb)	<0.00050	<0.00050	0.00050	0.006
Arsenic (As)	<0.00050 – 0.00131	0.00093	0.00050	0.010
Barium (Ba)	0.00739 – 0.01350	0.01350	0.00050	2
Beryllium (Be)	<0.00050	<0.00050	0.00050	0.004
Cadmium (Cd)	<0.00050	<0.00050	0.00050	0.005
Chromium (Cr)	<0.00050	<0.00050	0.00050	0.1
Copper (Cu)	<0.00050 – 0.00059	<0.00050	0.00050	Treatment technique***
Lead (Pb)	<0.000050	<0.000050	0.000050	Treatment technique***
Mercury (Hg)	<0.00010	<0.00010	0.00010	0.002
Selenium (Se)	<0.0025	<0.0025	0.0025	0.05
Thallium (Tl)	<0.00050	<0.00050	0.00050	0.002
With Secondary Standards				**SMCL**
Aluminum (Al)	<0.0020 – 0.00468	0.00313	0.0010/0.0020	0.05 – 0.2
Copper (Cu)	<0.00050 – 0.00059	<0.00050	0.00050	1
Iron (Fe)	0.0090 – 0.1700	0.0545	0.0050	0.3
Manganese (Mn)	0.0155 – 0.0593	0.0593	0.00050/0.0010	0.05
Silver (Ag)	<0.00050	<0.00050	0.00050	0.1
Zinc (Zn)	<0.00050 – <0.0020	<0.0020	0.00050/0.0010/0.0020	5
Unregulated				
Nickel (Ni)	<0.00050	<0.00050	0.00050	Not regulated
Vanadium (V)	0.00145 – 0.00361	0.00317	0.00050	Not regulated

*All metals results represent the total concentration rather than constituent parts, such as the dissolved fraction or components with specific valences.

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*** Instead of an MCL, EPA requires a treatment technique to address copper and lead above their respective action levels of 1.3 and 0.015 mg/L in drinking water, as measured at the point of use.

Treated Groundwater (cont.)

Volatile Organic Chemicals (VOCs) include solvents, disinfection by-products, and industrial and commercial products. The test measures the concentration of 60 VOCs, of which 23 are regulated and have state and federal MCLs.

VOCs	3-Year Range	July 15, 2019	MRL	EPA Standard
With Primary Standards				**MCL**
21 Volatile Organic Chemicals	All <MRL	All <MRL	0.00050 – 0.002*	Various*
Bromodichloromethane**	<0.00050 – 0.00086	<0.00050	0.00050	0.080 mg/L for Total Trihalomethanes
Chloroform**	<0.00050 – 0.00139	0.00077	0.00050	0.080 mg/L for Total Trihalomethanes
Unregulated				
37 Volatile Organic Chemicals	All <MRL	All <MRL	0.00050 – 0.002*	Not regulated

*Each individual chemical compound has its own MRL and/or MCL values.

**Bromodichloromethane and chloroform are the most commonly occurring trihalomethane disinfection by-products. Disinfection by-products are formed when naturally-occurring organic and inorganic materials in the water react with chlorine and other disinfectants.

Abbreviations:

<	Less Than
MRL	Method Reporting Limit
ppm	Parts Per Million (equivalent to Milligrams per Liter [mg/L])
MCL	Maximum Contaminant Level
SMCL	Secondary Maximum Contaminant Level
--	No Sample Result
N/A	Not Applicable

Would you like to access the Triannual Water Quality Report electronically?

Contact Randy Albright by email at randy.albright@portlandoregon.gov to be added to the electronic mailing list for the Triannual Water Quality report, which is compiled three times a year. The Portland Water Bureau's general web address is www.portlandoregon.gov/water. The web site includes a wealth of historical information, reference material, and updates on current issues. Click the What We Do link for information on water quality reports, state and federal drinking water regulations, source waters, water treatment and more. The past year's Triannual Water Quality Reports can be found at: www.portlandoregon.gov/water/triannual, and additional water quality information can be found at: www.portlandoregon.gov/water/waterquality.