

Our Creek & Well Water Filtration System

We use both mountain creek and well water (for redundancy when our mountain creek sometimes goes dry in late summer) for our remote southern Oregon homestead domestic, fire suppression and irrigation water use. An electrical switch located in our shop is used to select either the mountain creek water source or the well water source by providing power to either an electric submersible 1 HP pump located in a mountain creek water storage tank or to an electric submersible 1 HP pump located in a well water storage tank. This mountain creek water (one of three creeks on our property) is pristine except for potential biological risk. However, the water from our [45 GPM Well](#) contains naturally occurring high levels of arsenic, boron, chloride and sodium. Both our mountain creek water and our well water are brought into our shop water filtration system.

Our mountain creek water is first pumped from the creek at a slow flow rate of 1.06 GPM or 1531 GPD into three concrete underground storage tanks that are connected to each other providing a 7,500 gallon total capacity using a non-electric [Landis Hydraulic Ram Pump](#) that we helped initially design and now manufacture. Given this relatively slow flow rate used to fill these storage tanks, the total storage tank capacity was sized to provide a sufficient "bulge" in the system to enable having much larger flow rates from these storage tanks for short durations as needed for our remote southern Oregon domestic, fire suppression and irrigation water use. This mountain creek water is then pumped to the shop water filtration system using an electric 1 HP submersible pump located in one of these storage tanks as controlled by the shop water filtration system water source switch and large bladder tank pressure switch (which also protects and turns OFF this pump if the water level in tank gets low). The large bladder tank in our shop provides the water pressure for our remote southern Oregon homestead. The shop water filtration system downstream of this large bladder tank provides medium sediment (25 micron), medium carbon blocks (20 and 10 micron) and UV light treatment. For additional redundancy, all the drinking water faucets in our remote southern Oregon homestead also provide fine sediment (5 micron), fine carbon block (5 micron), domestic water pressure (40-60 PSI) reverse osmosis treatment and UV light treatment.

To address the aforementioned more problematic well water quality issues, our well water also receives dedicated treatment prior to going to the shop water filtration system. In simple terms and in the order of basic well water treatment steps, this treatment consists of coarse/medium sediment treatment (75/25 micron), aeration and venting to remove 120 PSI saturated hydrogen sulfide gas (produced by naturally occurring and harmless bacteria and having a rotten egg smell), medium sediment treatment (20 micron), fine sediment treatment (5 micron), high pressure (800 PSI) reverse osmosis treatment, additional fine sediment treatment (5 micron), and arsenic removal treatment.

The well water filtration system consists of an electric 1 HP submersible pump located 240 feet down the well; a 55 gallon plastic water aeration tank; [Sea Water Pro Reverse Osmosis System](#); a 2,500 gallon concrete underground well water storage tank; an electric 1 HP submersible pump in this 2,500 gallon well water storage tank; several sediment filters, float switches in the 55 gallon water aeration tank and in the 2,500 gallon well water storage tank; multiple low/high water level switches in the 55 gallon water aeration tank and 2,500 gallon well water storage tank; a small bladder tank; a water meter; various ball and globe valves used to isolate components or to control the flow rates and associated pressures within the system and an [Apex Whole House Arsenic Removal System](#). There is a control system that uses solid state relays to control the operation of the electric 1 HP submersible well pump and the low and high pressure reverse osmosis system pumps while providing triple fail-safe redundancy to ensure the tanks fed by these pumps won't ever over or under fill. There is an alarm system to provide security of the well pump house along with system status annunciation to our remote southern Oregon homestead security system via battery backed-up radio and underground fiber optic cable communication.

Well water is first pumped from the well through a coarse (75/25 micron) sediment filter at a globe valve controlled flow rate and pressure into the 55 gallon water aeration tank as controlled by a primary float switch and secondary low/high water level redundancy fail-safe switches located in the 55 gallon water aeration tank. A specially designed showerhead-like component in the 55 gallon water aeration tank accomplishes the actual aeration function to remove the 120 PSI saturated hydrogen sulfide gas which is then vented outside to the atmosphere. The 55 gallon water aeration tank then gravity feeds the well water to the high pressure (800

PSI) reverse osmosis system, which uses a medium (20 micron) sediment filter and a fine (5 micron) sediment filter prior to the reverse osmosis membranes, which then fills the 2,500 gallon well water storage tank at a slow 40 GPH (0.66 GPM) rate as controlled by a primary float switch and secondary high water level redundancy fail-safe switches located in the 2,500 gallon well water storage tank. Given this relatively slow flow rate used to fill these storage tanks, the total storage tank capacity was sized to provide a sufficient "bulge" in the system to enable having much larger flow rates from this tank for short durations as needed for our remote southern Oregon homestead domestic and irrigation water use. The high pressure (800 PSI) reverse osmosis system low pressure (15 PSI) boost pump is first turned ON by the control system and then the high pressure (800 PSI) reverse osmosis system high pressure (800 PSI) main pump is turned ON by the control system about 30 seconds later to ensure this main pump has sufficient water and sufficient pressure to prevent pump cavitation and potential failure.

An electric 1 HP submersible pump in the 2,500 gallon well water storage tank, as controlled by the shop water filtration system water source switch and large bladder tank pressure switch (which also protects and turns OFF this pump if the water level in tank gets low), then first provides water to a fine (5 micron) sediment filter, then provides water to the arsenic removal system at a globe valve controlled 12 GPM flow rate which is appropriate for its [Metsorb](#) arsenic removal media, then provides water to the small bladder tank located in the well pump house and then provides water to the large bladder tank located about 500 feet away in the shop. The small bladder tank in the well pump house is used to maintain and provide well pump house water pressure for backwashing the arsenic removal media and for backwashing the high pressure (800 PSI) reverse osmosis system membranes on a programmed schedule. The water meter in the well pump house is used to determine when the well pump house sediment filters and high pressure (800 PSI) reverse osmosis system high pressure (800 PSI) main pump oil (which is NSF approved) need to be changed.

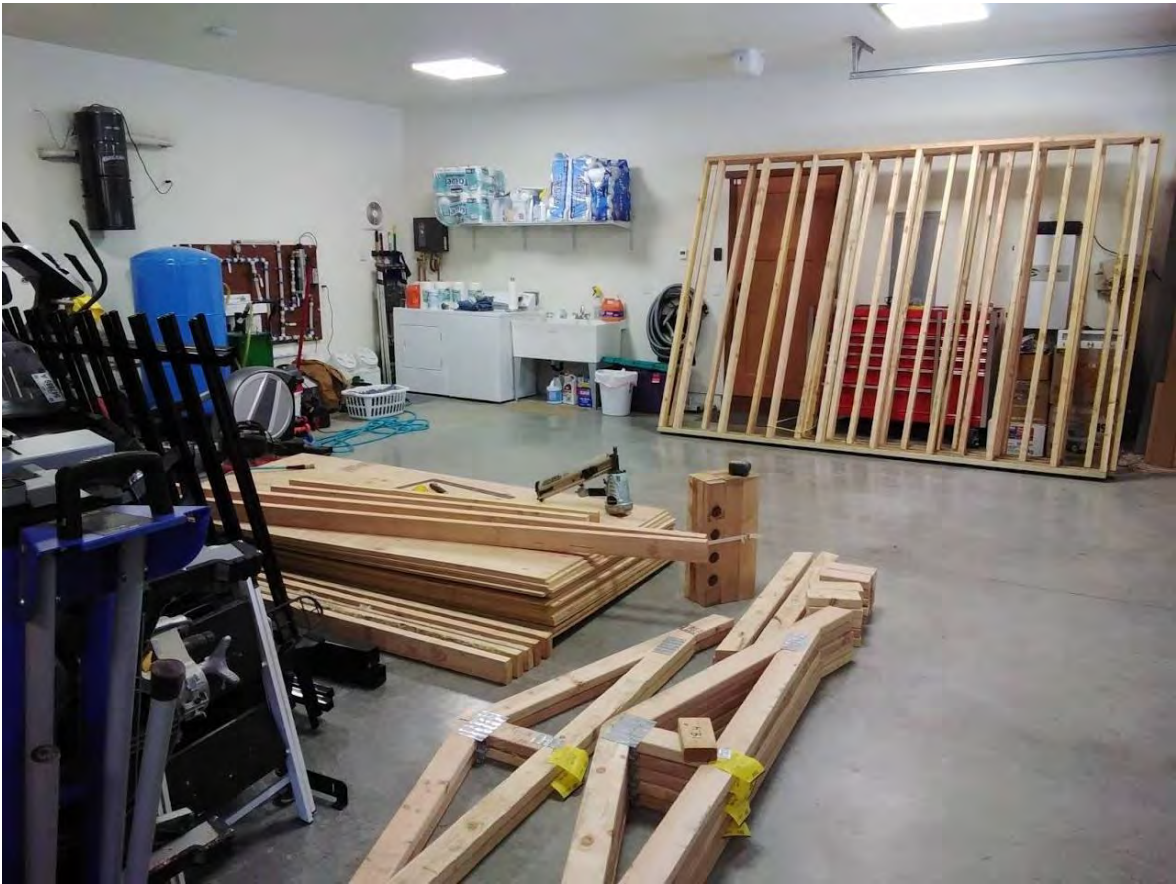
There are multiple check valves and back flow preventers to ensure the mountain creek water and well water can never be cross contaminated. There are multiple pressure relief valves to ensure that the system components and associated plumbing can never be damaged by experiencing an over-pressure event above design limits. There is a water leak detector in the well pump house to shut down ALL pumps if a water leak is detected. In addition to the triple fail-safe redundancy, there is a [Flood Vent](#) in the well pump house to ensure a flood failure can never raise the floor water high enough to reach the electrical system. Furthermore, the control system uses 12VDC for all the tank float switches and low/high water level redundancy fail-safe switches. The well pump house is well-constructed, well-insulated and well-sealed and uses a 500 watt heater to ensure system components and associated plumbing are not exposed to freezing temperatures. Our well water is now high quality that is typical of reverse osmosis filtered bottled water.

Bob Borst

CEO & Principal Engineer

[**Borst Engineering & Construction LLC**](#)



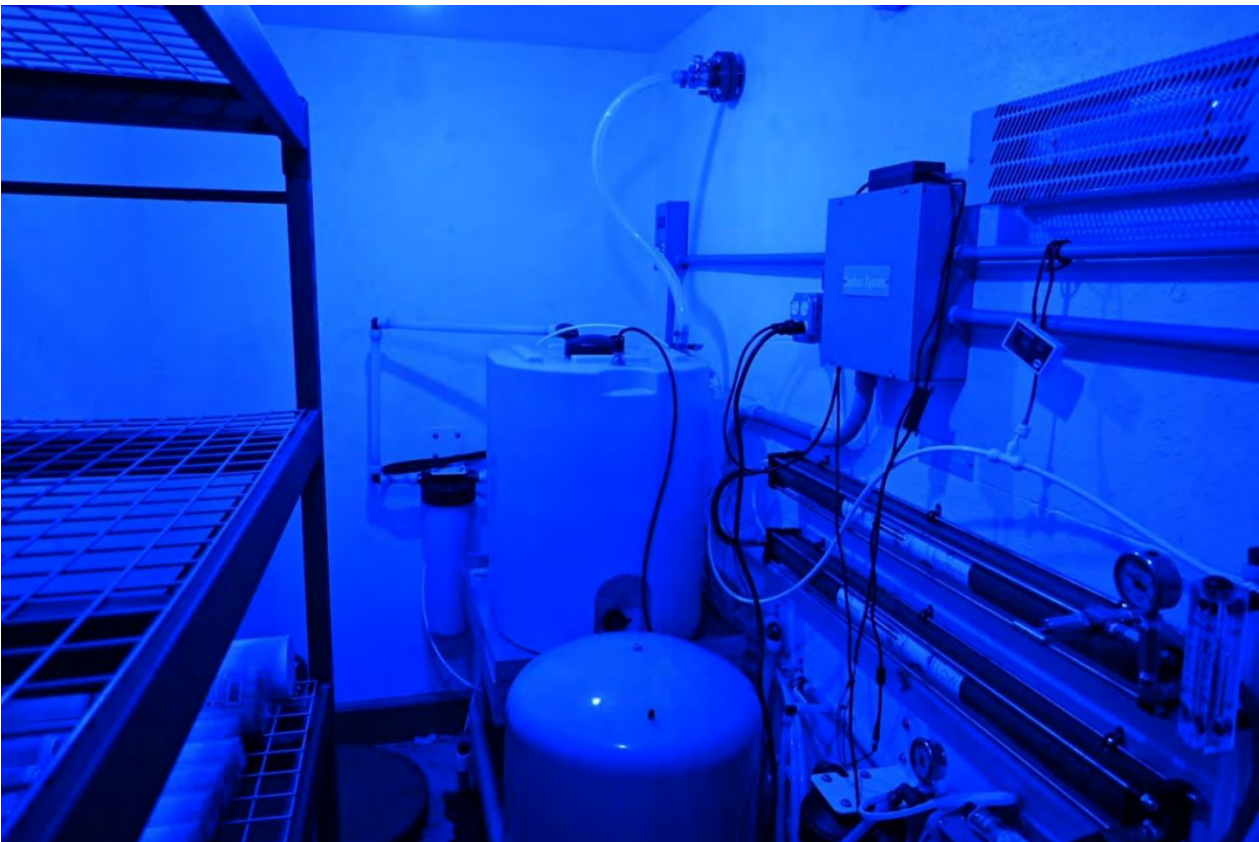
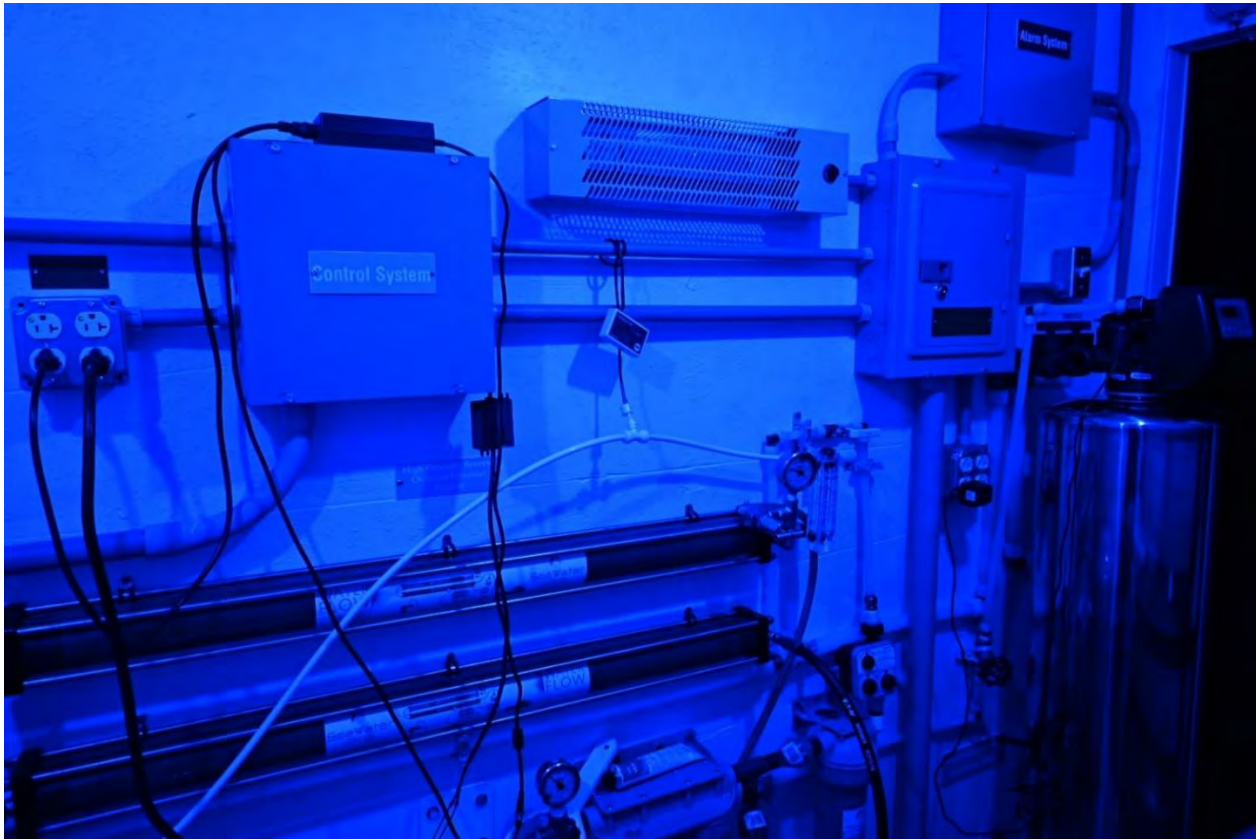


















Neilson Research Corporation
 245 S Grape St
 Medford, OR 97501
 TEL: (541) 770-5678 FAX: (541) 770-2901
 Website: www.nrclabs.com

Analytical Report

WO#: 22110584
 Date Reported: 11/18/2022

Borst Residence
 19000 E Evans Creek Rd
 Rogue River, OR 97537

Lab ID: 22110584-01
 Collection Date: 11/11/2022 10:00:00 AM
 Received Date: 11/11/2022 12:00:00 PM

Sample Information:
 19000 E Evans Creek Rd
 Rogue River, OR 97537

Client Sample ID: Top 35
 Sample Collector: RGB
 Matrix: DRINKING WATER
 Source: Well-Treated
 Sample Location: Kitchen

Top 35 Analysis TM

Analyses	Method	NELAP Status	Result	Qual	DF	RL	Units	EPA Limit	Date Analyzed	Analyst
Aluminum	E200.7	A	ND		1	0.0200	mg/L	0.0500-0.200	11/14/22 20:59	CSB
Antimony	E200.8	A	ND		1	0.000500	mg/L	0.00600	11/15/22 20:34	KMF
Arsenic	E200.8	A	ND		1	0.00100	mg/L	0.0100	11/15/22 20:34	KMF
Barium	E200.8	A	ND		1	0.00200	mg/L	2.00	11/15/22 20:34	KMF
Beryllium	E200.7	A	ND		1	0.00200	mg/L	0.00400	11/14/22 20:59	CSB
Boron	E200.7	A	2.08		1	0.0500	mg/L		11/14/22 20:59	CSB
Cadmium	E200.8	A	ND		1	0.000500	mg/L	0.00500	11/15/22 20:34	KMF
Calcium	E200.7	A	ND		1	1.00	mg/L		11/14/22 20:59	CSB
Chloride	E300.0	A	ND		1	0.500	mg/L	250	11/11/22 17:55	KN
Chromium	E200.8	A	ND		1	0.00200	mg/L	0.100	11/15/22 20:34	KMF
Copper	E200.8	A	ND		1	0.00200	mg/L	1.30	11/15/22 20:34	KMF
Fluoride	E300.0	A	ND		1	0.200	mg/L	4.00	11/11/22 17:55	KN
Hardness, Total (As CaCO3)	A2340B	A	ND		1	6.62	mg/L	250	11/14/22 20:59	CSB
Iron	E200.7	A	ND		1	0.0150	mg/L	0.300	11/14/22 20:59	CSB
Lead	E200.8	A	ND		1	0.000500	mg/L	0.0150	11/15/22 20:34	KMF
Lithium	E200.7	A	ND		1	0.100	mg/L		11/16/22 18:19	KHG
Magnesium	E200.7	A	ND		1	1.00	mg/L		11/14/22 20:59	CSB
Manganese	E200.8	A	ND		1	0.00500	mg/L	0.0500	11/15/22 20:34	KMF
Molybdenum	E200.8	A	ND		1	0.00100	mg/L		11/15/22 20:34	KMF
Nickel	E200.8	A	ND		1	0.00100	mg/L	0.100	11/15/22 20:34	KMF

QUALIFIERS

- * Value exceeds Maximum Contaminant Level.
- E Value above quantitation range
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- C1 Sample container temperature is out of limit as specified at testcode
- H Holding times for preparation or analysis exceeded
- MI Recovery outside control limits due to Matrix Interference
- PL Permit Limit

NELAP

NELAP A Accredited in accordance with NELAP ORELAP 100016, OR-028

Original



Neilson Research Corporation
 245 S Grape St
 Medford, OR 97501
 TEL: (541) 770-5678 FAX: (541) 770-2901
 Website: www.nrclabs.com

Analytical Report

WO#: 22110584

Date Reported: 11/18/2022

Borst Residence
 19000 E Evans Creek Rd
 Rogue River, OR 97537

Lab ID: 22110584-01

Collection Date: 11/11/2022 10:00:00 AM

Received Date: 11/11/2022 12:00:00 PM

Sample Information:

Client Sample ID: Top 35

Sample Collector: RGB

19000 E Evans Creek Rd
 Rogue River, OR 97537

Matrix: DRINKING WATER

Source: Well-Treated

Sample Location: Kitchen

Top 35 AnalysisTM

Analyses	Method	NELAP Status	Result	Qual	DF	RL	Units	EPA Limit	Date Analyzed	Analyst
Nitrogen, Nitrate	E300.0	A	ND	C1	1	0.200	mg/L	10.0	11/11/22 17:55	KN
Nitrogen, Nitrite	E300.0	A	ND	C1	1	0.0500	mg/L	1.00	11/11/22 17:55	KN
pH	A4500-H+B	A	6.45		1	0.10	pH Units	6.50-8.50	11/11/22 17:26	JRL
Potassium	E200.7	A	ND		1	1.00	mg/L		11/14/22 20:59	CSB
Selenium	E200.8	A	ND		1	0.00100	mg/L	0.0500	11/15/22 20:34	KMF
Silica	E200.7	A	ND		1	2.14	mg/L		11/14/22 20:59	CSB
Silver	E200.8	A	ND		1	0.00100	mg/L	0.100	11/15/22 20:34	KMF
Sodium	E200.7	A	ND		1	1.00	mg/L	200	11/14/22 20:59	CSB
Specific Conductance	A2510B	A	7.12	C1	1	1.00	µmhos/cm		11/11/22 17:26	JRL
Sulfate	E300.0	A	ND	C1	1	0.500	mg/L	250	11/11/22 17:55	KN
Thallium	E200.8	A	ND		1	0.000500	mg/L	0.00200	11/15/22 20:34	KMF
Turbidity	A2130	A	ND	C1	1	0.100	NTU	1.00-5.00	11/11/22 17:29	JRL
Uranium	E200.8	A	ND		1	0.000100	mg/L	0.0300	11/15/22 20:34	KMF
Vanadium	E200.8	A	ND		1	0.00500	mg/L		11/15/22 20:34	KMF
Zinc	E200.7	A	ND		1	0.0500	mg/L	5.00	11/14/22 20:59	CSB

QUALIFIERS

- * Value exceeds Maximum Contaminant Level
- E Value above quantitation range
- J Analyte detected below quantitation limits
- ND Not Detected at the Reporting Limit
- R RPD outside accepted recovery limits
- C1 Sample container temperature is out of limit as specified at testcode
- H Holding times for preparation or analysis exceeded
- MI Recovery outside control limits due to Matrix Interference
- PL Permit Limit

NELAP

NELAP A Accredited in accordance with NELAP ORELAP 100016, OR-028

Original

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Robert and Gayle Borst
14748 SE 185th Place
Renton, WA 98058

Lab Order: 1207005
NRC Sample ID: 1207005-01A
Collection Date: 7/2/2012 7:30:00 AM
Received Date: 7/2/2012 8:35:00 AM
Reported Date: 10/2/2014 9:10:01 AM

Sample Information:

19000 E Evans Creek Rd

Rogue River, OR 97537

Client Sample ID: Well
Collectors Name: R. Borst
Sample Location: Well
Source: Well

TOP 35 ANALYSIS TM

Analyses	Method	NELAC		Qual	MRL	Units	EPA Limit	Date Analyzed
		Accredited	Result					
Aluminum	EPA 200.7	A	0.0318		0.01	mg/L	0.05 - 0.2	7/8/2012
Antimony	EPA 200.8	A	ND		0.00204	mg/L	0.006	7/5/2012
Arsenic	EPA 200.8	A	0.0474	*	0.00102	mg/L	0.010	7/5/2012
Barium	EPA 200.8	A	0.0249		0.00051	mg/L	2.0	7/5/2012
Beryllium	EPA 200.7	A	ND		0.0002	mg/L	0.004	7/8/2012
Boron	EPA 200.7	A	10.8		0.05	mg/L	N.L.	7/8/2012
Cadmium	EPA 200.8	A	ND		0.000102	mg/L	0.005	7/5/2012
Calcium	EPA 200.7	A	52.0		1	mg/L	N.L.	7/8/2012
Chloride	EPA 300.0	A	1620	*	200	mg/L	250	7/5/2012
Chromium	EPA 200.8	A	ND		0.00102	mg/L	0.1	4:43:40 PM 7/5/2012
Copper	EPA 200.8	A	0.0144		0.00051	mg/L	1.3 AL	7/5/2012
Fluoride	EPA 300.0	A	1.36		0.2	mg/L	4	7/3/2012 5:48:43 PM
Hardness, Total (As CaCO3)	EPA 200.7		140		6.62	mg/L	250	7/8/2012
Iron	EPA 200.7	A	0.0316		0.015	mg/L	0.3	7/8/2012
Lead	EPA 200.8	A	0.00823		0.000102	mg/L	0.015 AL	7/5/2012
Lithium	EPA 200.7	A	1.07		0.1	mg/L	N.L.	7/8/2012
Magnesium	EPA 200.7	A	2.43		1	mg/L	N.L.	7/8/2012
Manganese	EPA 200.7	A	ND		0.02	mg/L	0.05	7/8/2012
Molybdenum	EPA 200.8	A	0.00105		0.00102	mg/L	N.L.	7/5/2012
Nickel	EPA 200.8	A	0.0188		0.00051	mg/L	0.1	7/5/2012
Nitrate Nitrogen	EPA 300.0	A	ND		0.2	mg/L	10	7/3/2012 5:48:43 PM
Nitrate Nitrogen	EPA 300.0	A	ND		0.2	mg/L	10	7/2/2012 5:47:03 PM
Nitrite Nitrogen	EPA 300.0	A	ND		0.05	mg/L	1	7/3/2012 5:48:43 PM
pH	SM 4500H-B	A	8.11		0.1	pH Units	6.5 - 8.5	6:00:00 PM 7/2/2012
Potassium	EPA 200.7	A	4.68		1	mg/L	N.L.	7/8/2012
Selenium	EPA 200.8	A	0.00521		0.00051	mg/L	0.05	7/5/2012

Notes: MRL -Minimum Reporting Limit ND - Not Detected at the MRL N.L. - No Limit
 TM - Top 35 is a registered trade mark of Neilson Research Corporation, Oregon Accredited Laboratory: ORELAP 100016, OR-028
 Please Note: If the test results indicate a need for water treatment or conditioning, additional testing may be required.

Neilson Research Corporation

245 South Grape Street, Medford, Oregon 97501 541-770-5678 Fax 541-770-2901

Analysis Report

ORELAP 100016
EPA OR00028

Robert and Gayle Borst
14748 SE 185th Place
Renton, WA 98058

Lab Order: 1207005
NRC Sample ID: 1207005-01A
Collection Date: 7/2/2012 7:30:00 AM
Received Date: 7/2/2012 8:35:00 AM
Reported Date: 10/2/2014 9:10:01 AM

Sample Information:

19000 E Evans Creek Rd

Rogue River, OR 97537

Client Sample ID: Well
Collectors Name: R. Borst
Sample Location: Well
Source: Well

TOP 35 ANALYSIS TM

Analyses	Method	NELAC		Qual	MRL	Units	EPA Limit	Date Analyzed
		Accredited	Result					
Silica	EPA 200.7	A	40.1		1	mg/L	N.L.	7/8/2012
Silver	EPA 200.8	A	ND		0.000102	mg/L	0.1	7/5/2012
Sodium	EPA 200.7	A	965		20	mg/L	N.L.	7/8/2012
Specific Conductance	SM 2510B	A	5010		1	µmhos/cm		7/2/2012
Sulfate	EPA 300.0	A	52.8		5	mg/L	250	7/3/2012 5:22:17 PM
Thallium	EPA 200.8	A	ND		0.00051	mg/L	0.002	7/5/2012
Turbidity	SM 2130B	A	0.762		0.1	NTU	1	7/2/2012 4:50:00 PM
Uranium	EPA 200.8		ND		0.000102	mg/L	0.03	7/5/2012
Vanadium	EPA 200.8	A	ND		0.00051	mg/L	N.L.	7/5/2012
Zinc	EPA 200.7	A	0.0809		0.05	mg/L	5.0	7/8/2012

Notes: MRL - Minimum Reporting Limit ND - Not Detected at the MRL N.L. - No Limit
 TM - Top 35 is a registered trade mark of Neilson Research Corporation, Oregon Accredited Laboratory: ORELAP 100016, OR-028
 Please Note: If the test results indicate a need for water treatment or conditioning, additional testing may be required.

Informational Water Quality Report

Watercheck

Client:

Ordered By:
Weiser, Erik
P.O. Box 105
Ross, CA 94957
ATTN: Erik Weiser



Quality Water Analysis

6571 Wilson Mills Rd
Cleveland, Ohio 44143
1-800-458-3330

Sample Number: 806168

Location:

Type of Water:

Collection Date and Time:

Received Date and Time: 5/14/2009 10:00

Date Completed:

Definition and Legend

This informational water quality report compares the actual test result to national standards as defined in the EPA's Primary and Secondary Drinking Water Regulations.

Primary Standards: Are expressed as the maximum contaminant level (MCL) which is the highest level of contaminant that is allowed in drinking water. MCLs are enforceable standards.

Secondary standards: Are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. Individual states may choose to adopt them as enforceable standards.


Action levels: Are defined in treatment techniques which are required processes intended to reduce the level of a contaminant in drinking water.


mg/L (ppm): Unless otherwise indicated, results and standards are expressed as an amount in milligrams per liter or parts per million.


Minimum Detection Level (MDL): The lowest level that the laboratory can detect a contaminant.


ND: The contaminant was not detected above the minimum detection level.

























NA: The contaminant was not analyzed.

 The contaminant was not detected in the sample above the minimum detection level.

 The contaminant was detected at or above the minimum detection level, but below the standard.

 The contaminant was detected above the standard, which is not an EPA enforceable MCL.

 The contaminant was detected above the EPA enforceable MCL.

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
Microbiologicals					
	Total Coliform by P/A	Total Coliform bacteria was ABSENT, however bacteria results may be invalid due to lack of collection information or because the sample has exceeded the 30-hour holding time.			
Inorganic Analytes - Metals					
	Aluminum	0.3	mg/L	0.2 EPA Secondary	0.1
	Arsenic	0.200	mg/L	0.01 EPA Primary	0.005
	Barium	ND	mg/L	2 EPA Primary	0.30
	Cadmium	ND	mg/L	0.005 EPA Primary	0.002
	Calcium	5.8	mg/L	--	2.0
	Chromium	ND	mg/L	0.1 EPA Primary	0.010
	Copper	0.009	mg/L	1.3 EPA Action Level	0.004
	Iron	0.419	mg/L	0.3 EPA Secondary	0.020
	Lead	ND	mg/L	0.015 EPA Action Level	0.002
	Magnesium	0.60	mg/L	--	0.10
	Manganese	ND	mg/L	0.05 EPA Secondary	0.004
	Mercury	ND	mg/L	0.002 EPA Primary	0.001
	Nickel	ND	mg/L	--	0.02
	Potassium	ND	mg/L	--	1.0
	Selenium	ND	mg/L	0.05 EPA Primary	0.020
	Silica	34.30	mg/L	--	0.05
	Silver	ND	mg/L	0.1 EPA Secondary	0.002
	Sodium	273	mg/L	--	1
	Zinc	ND	mg/L	5 EPA Secondary	0.004
Physical Factors					
	Alkalinity (Total)	330	mg/L	--	20
	Hardness	17	mg/L	100 NTL Internal	10
	pH	8.2	pH Units	6.5 to 8.5 EPA Secondary	
	Total Dissolved Solids	840	mg/L	500 EPA Secondary	20

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
	Turbidity	8.8	NTU	1	EPA Action Level 0.1
Inorganic Analytes - Other					
	Chloride	260.0	mg/L	250	EPA Secondary 5.0
	Fluoride	1.4	mg/L	4	EPA Primary 0.5
	Nitrate as N	ND	mg/L	10	EPA Primary 0.5
	Nitrite as N	ND	mg/L	1	EPA Primary 0.5
	Ortho Phosphate	ND	mg/L	--	2.0
	Sulfate	100.0	mg/L	250	EPA Secondary 5.0
Organic Analytes - Trihalomethanes					
	Bromodichloromethane	ND	mg/L	--	0.002
	Bromoform	ND	mg/L	--	0.004
	Chloroform	ND	mg/L	--	0.002
	Dibromochloromethane	ND	mg/L	--	0.004
	Total THMs	ND	mg/L	0.08	EPA Primary 0.002
Organic Analytes - Volatiles					
	1,1,1,2-Tetrachloroethane	ND	mg/L	--	0.002
	1,1,1-Trichloroethane	ND	mg/L	0.2	EPA Primary 0.001
	1,1,2,2-Tetrachloroethane	ND	mg/L	--	0.002
	1,1,2-Trichloroethane	ND	mg/L	0.005	EPA Primary 0.002
	1,1-Dichloroethane	ND	mg/L	--	0.002
	1,1-Dichloroethene	ND	mg/L	0.007	EPA Primary 0.001
	1,1-Dichloropropene	ND	mg/L	--	0.002
	1,2,3-Trichlorobenzene	ND	mg/L	--	0.002
	1,2,3-Trichloropropane	ND	mg/L	--	0.002
	1,2,4-Trichlorobenzene	ND	mg/L	0.07	EPA Primary 0.002
	1,2-Dichlorobenzene	ND	mg/L	0.6	EPA Primary 0.001
	1,2-Dichloroethane	ND	mg/L	0.005	EPA Primary 0.001
	1,2-Dichloropropane	ND	mg/L	0.005	EPA Primary 0.002