

Reporting Results of Well Water Tests

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Kelsey Pieper, Virginia Tech



INSTITUTE FOR
THE ENVIRONMENT



If you have questions,
Text: **uncwells** to **22333**, or visit: **pollev.com/uncwells**

Our research goals

1. Measure contaminants in drinking water from private wells
2. Examine well water quality and recovery behaviors after Hurricanes Florence and Michael.

Funded by the US Environmental Protection Agency and the National Science Foundation.

Sample collection

**6+ hours no
water use**



**Flushed for
5 minutes**

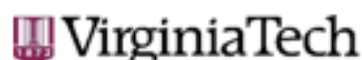


WATER SOURCE:

1. What household water supply source was drawn for sample? Check one:
☐ well ☐ spring ☐ cistern ☐ other → specify: _____
If well is checked above: (a) is it a: ☐ dug or bored well ☐ drilled well ☐ don't know;
(b) what is the well's depth, if known? _____ ft ☐ don't know
(c) what year was well constructed, if known? _____ ☐ don't know
2. What water treatment devices are currently installed? Check all that apply:
☐ none ☐ acid neutralizer
☐ ultraviolet (UV) light ☐ water softener (conditioner)



726 water samples
were collected from
242 residents



Department of Civil and Environmental Engineering
418 Durham Hall, 1145 Perry Street, Blacksburg, VA 24061

To: Name
Address
Address

Sample ID: I-#
Date: 2/28/2019

Sampling location: Address

Health-based water quality parameters

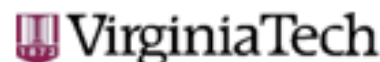
Parameter	Your Result	Units	US EPA standard ¹	NC groundwater standard ²	NC IMAC ³ and health screening level ⁴
Antimony	<0.1	µg/L	6	-	1
Arsenic	<0.1	µg/L	10	10	-
Barium	9.1	µg/L	2,000	700	-
Boron	8.5	µg/L	-	700	-
³ Chromium (Total)	0.40	µg/L	100	10	-
⁶ Hexavalent Chromium (Cr6)	0.10	µg/L	-	-	0.07
Cobalt	0.2	µg/L	-	-	1
Fluoride	0.1	mg/L	4	2	-
Selenium	1.9	µg/L	50	20	-
Thallium	<0.1	µg/L	2	-	0.2
Uranium	19.9	µg/L	30	-	-
Vanadium	1.1	µg/L	-	0.3	0.3
<i>First draw sample</i>					
Cadmium	<0.1	µg/L	5	2	-
Copper	435.0	µg/L	1,300	1,000	-
Lead	1.4	µg/L	15	15	-
Nickel	23.0	µg/L	-	100	-
<i>5-minute flush sample</i>					
Cadmium	0.1	µg/L	1,300	1,000	-
Copper	<1.0	µg/L	1,300	1,000	-
Lead	<0.1	µg/L	15	15	-
Nickel	<0.1	µg/L	-	100	-

¹The US EPA has set legally enforceable health-based Maximum Contaminant Levels and Action Levels for regulated municipal systems. These standards are used as a guide for private wells.

²The NC DEQ has set the 15A NCAC 02L 0202 Groundwater Quality Standards. These are the maximum allowable concentrations of contaminants in groundwater which may be tolerated without creating a threat to human health or which would otherwise render the groundwater unsuitable for use as a drinking water source.

³The NC DEQ sets interim maximum allowable concentrations (IMAC) for substances when a standard has not been established. These are developed based on toxicological and epidemiological data, study results, and calculations.

⁴The NC DHHS set a health screening level for hexavalent chromium at a concentration to be protective of people ingesting the water over a lifetime. An exceedance does not mean that negative health effects would be expected for persons ingesting the water, but it indicates a need to take a closer look.



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Sample ID: I-#
Date: 2/28/2019

Sampling location: Address

Nuisance-based water quality standards^{*}

Parameter	Your Result	Units	Nuisance-based standard [*]
Aluminum	<10.0	µg/L	200
Chloride	5.7	mg/L	250
Iron	2,566.7	µg/L	300
Manganese	21.7	µg/L	50
Sulfate	4	mg/L	250
Total dissolved solids	106.9	mg/L	500
<i>First draw sample</i>			
Zinc	3242.0	µg/L	5,000
<i>5-minute flush sample</i>			
Zinc	29.3	µg/L	5,000

^{*}The Environmental Protection Agency has set these voluntary Secondary Maximum Contaminant Level (SMCL) nuisance-based standards for regulated municipal systems. These standards are used as a guide for private wells.

Unregulated water quality parameters

Parameter	Your Result	Units	Recommended Limits
Calcium	1	mg/L	-
Hardness	6.6	mg/L	-
Magnesium	1.0	mg/L	-
Molybdenum	22.4	µg/L	-
Potassium	3567.82	µg/L	-
Sodium	8.5	mg/L	20
Strontium	172.9	µg/L	-

For more information, contact Kelsey Pieper at Virginia Tech or Andrew George at UNC:

Kelsey Pieper
Virginia Tech
kpieper@vt.edu
(518) 928-0177

Andrew George
UNC Institute for the Environment
andrewg@email.edu
(919) 966-7839

Water testing report

Health-based water quality parameters

Parameter	Your Result	Unit	US EPA standard ¹	NC groundwater standard ²	NC IMAC ³ and health screening level ⁴
Antimony	<0.1	µg/L	6	-	1
Arsenic	<0.1	µg/L	10	10	-
Barium	9.1	µg/L	2,000	700	-
Boron	8.5	µg/L	-	700	-
⁵ Chromium (Total)	0.40	µg/L	100	10	-
⁵ Hexavalent Chromium (Cr6)	0.10	µg/L	-	-	0.07
Cobalt	0.2	µg/L	-	-	1
Fluoride	0.1	mg/L	4	2	-
Selenium	1.9	µg/L	50	20	-
Thallium	<0.1	µg/L	2	-	0.2

Enforceable standards for municipal systems.

Health-based groundwater standards

Health-based water quality parameters

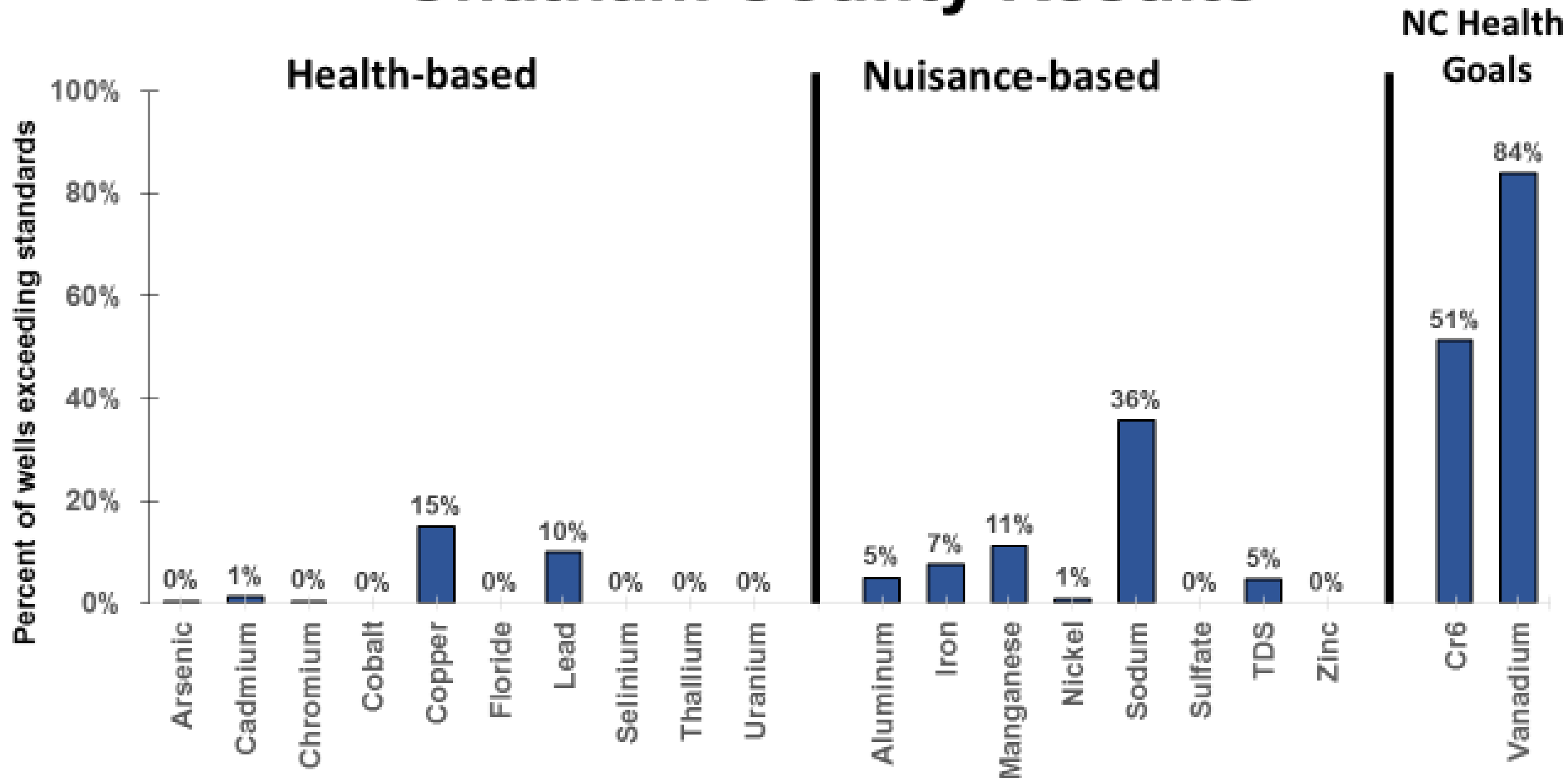
Parameter	Your Result	Units	US EPA standard ¹	NC groundwater standard ²	NC IMAC ³ and health screening level ⁴
Antimony	<0.1	µg/L		-	1
Arsenic	<0.1	µg/L	1	10	-
Barium	9.1	µg/L	2,000	700	-
Boron	8.5	µg/L		700	-
⁵ Chromium (Total)	0.40	µg/L	10	10	-
⁵ Hexavalent Chromium (Cr6)	0.10	µg/L		-	0.07
Cobalt	0.2	µg/L		-	1
Fluoride	0.1	mg/L		2	-
Selenium	1.9	µg/L	5	20	-
Thallium	<0.1	µg/L		-	0.2

Interim levels when standards have not been established.

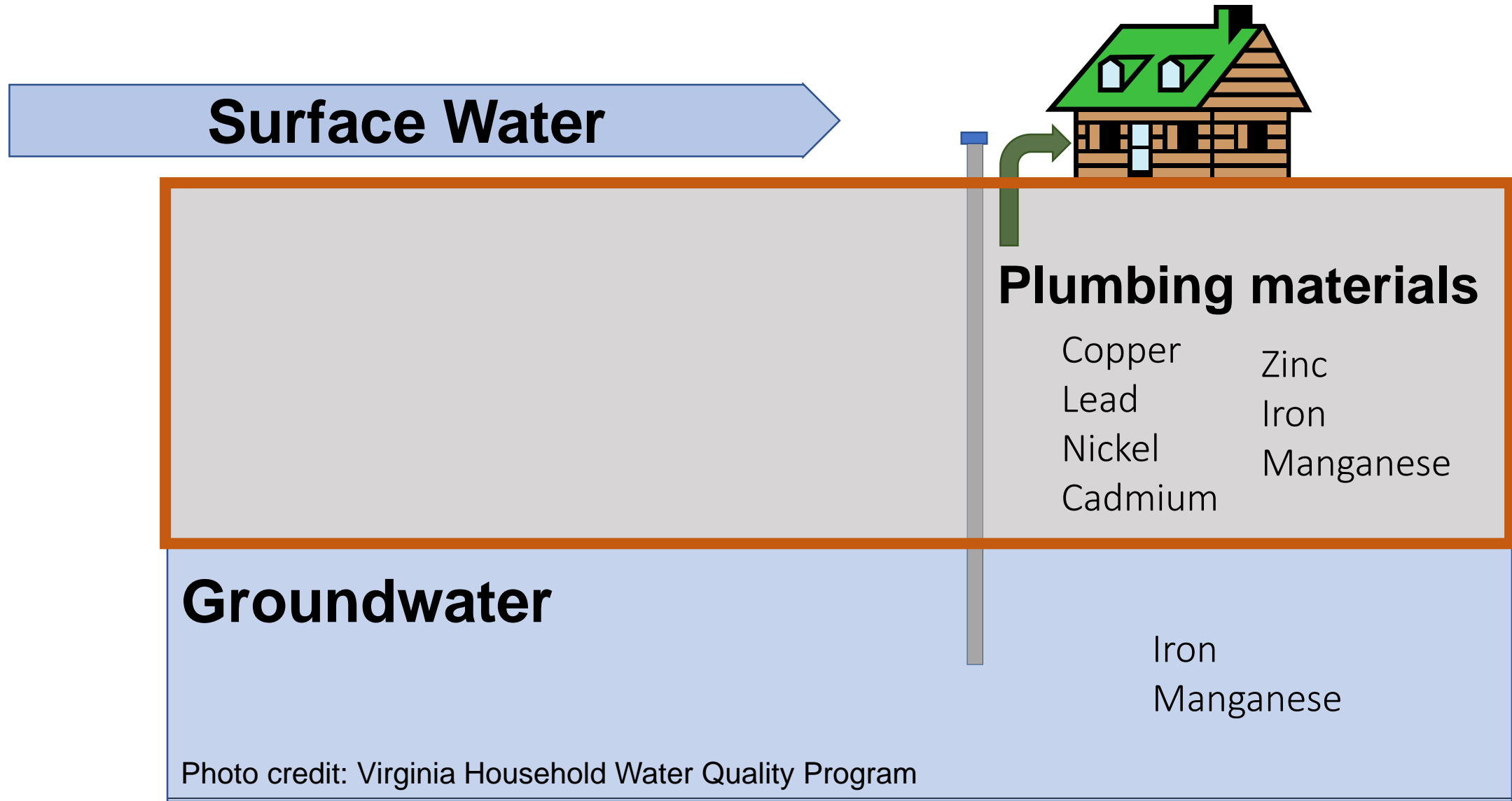
Health-based water quality parameters

Parameter	Your Result	Units	US EPA standard ¹	NC groundwater standard ²	NC IMAC ³ and health screening level ⁴
Antimony	<0.1	µg/L	6		1
Arsenic	<0.1	µg/L	10	10	-
Barium	9.1	µg/L	2,000	700	-
Boron	8.5	µg/L	-	700	-
⁵ Chromium (Total)	0.40	µg/L	100	10	-
⁵ Hexavalent Chromium (Cr6)	0.10	µg/L	-		0.07
Cobalt	0.2	µg/L	-		1
Fluoride	0.1	mg/L	4	2	-
Selenium	1.9	µg/L	50	20	-
Thallium	<0.1	µg/L	2		0.2

Chatham County Results



Sources of Potential Contaminants



Metals in Water

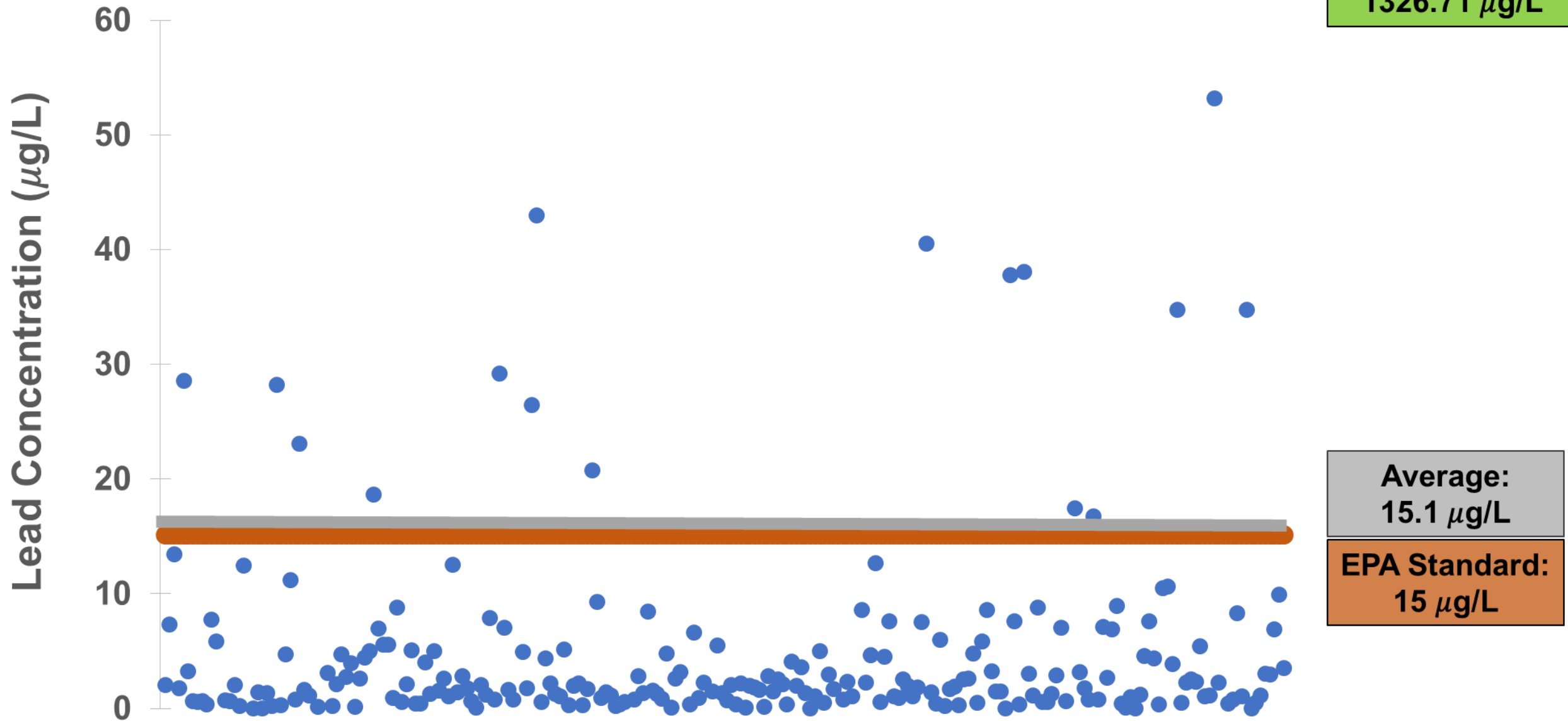
Water Quality Concerns



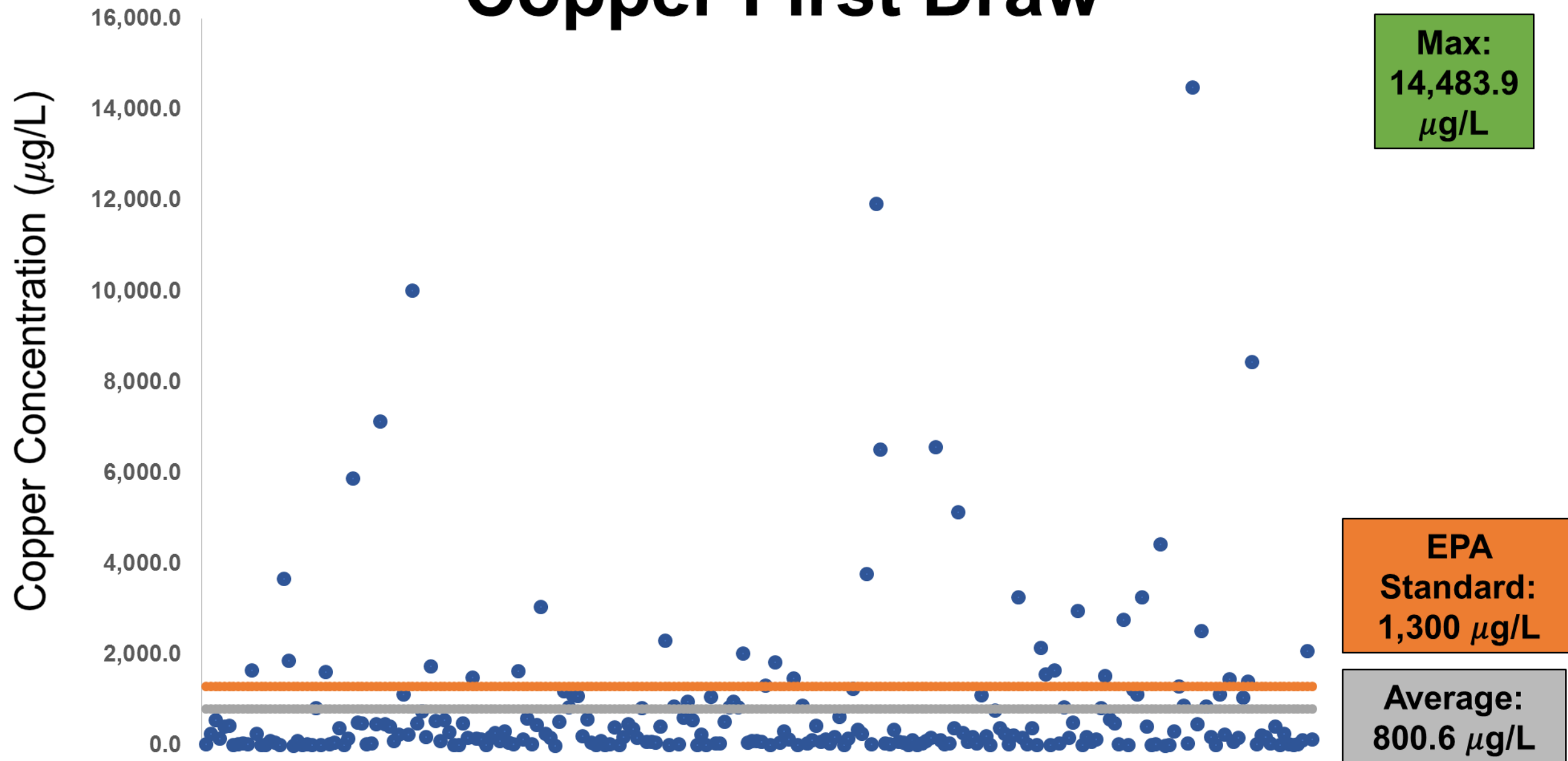
Plumbing & Appliance Concerns



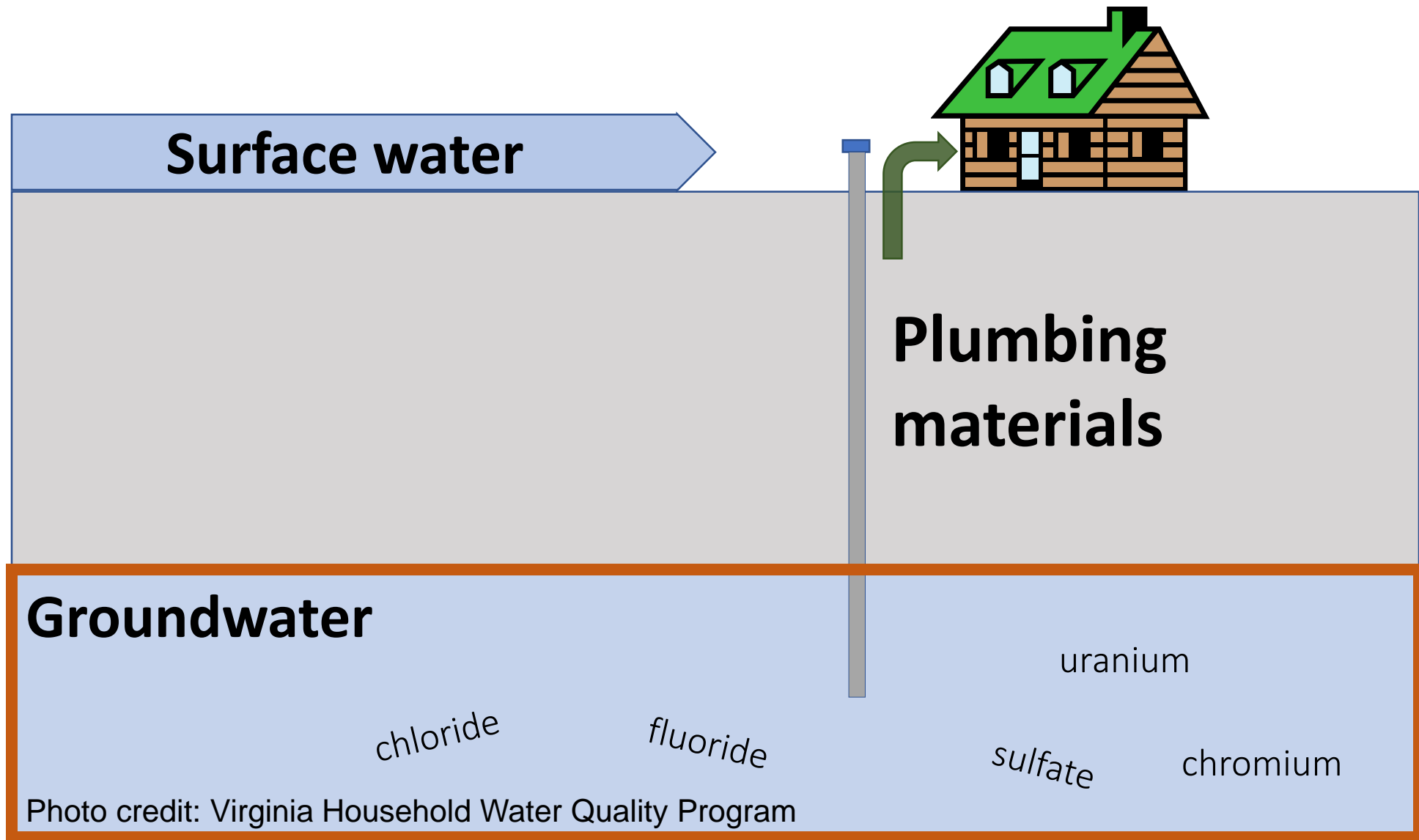
Lead First Draw



Copper First Draw



Sources of Potential Contaminants



Total Chromium & Hexavalent Chromium (Cr6)

EPA

Total Chromium = 100 µg/L

Cr6 = No health based standards

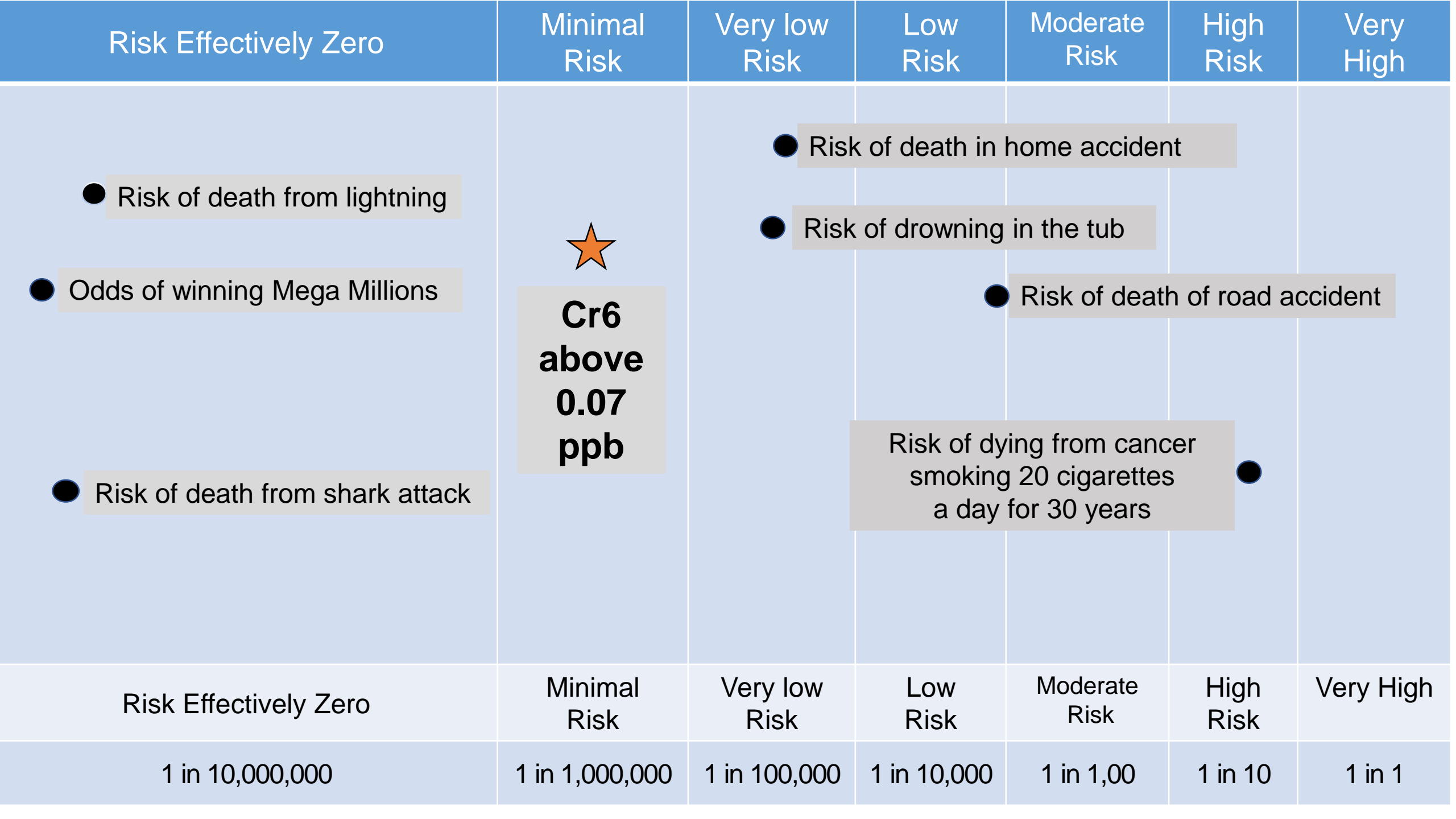
NC

Total Chromium = 10 µg/L

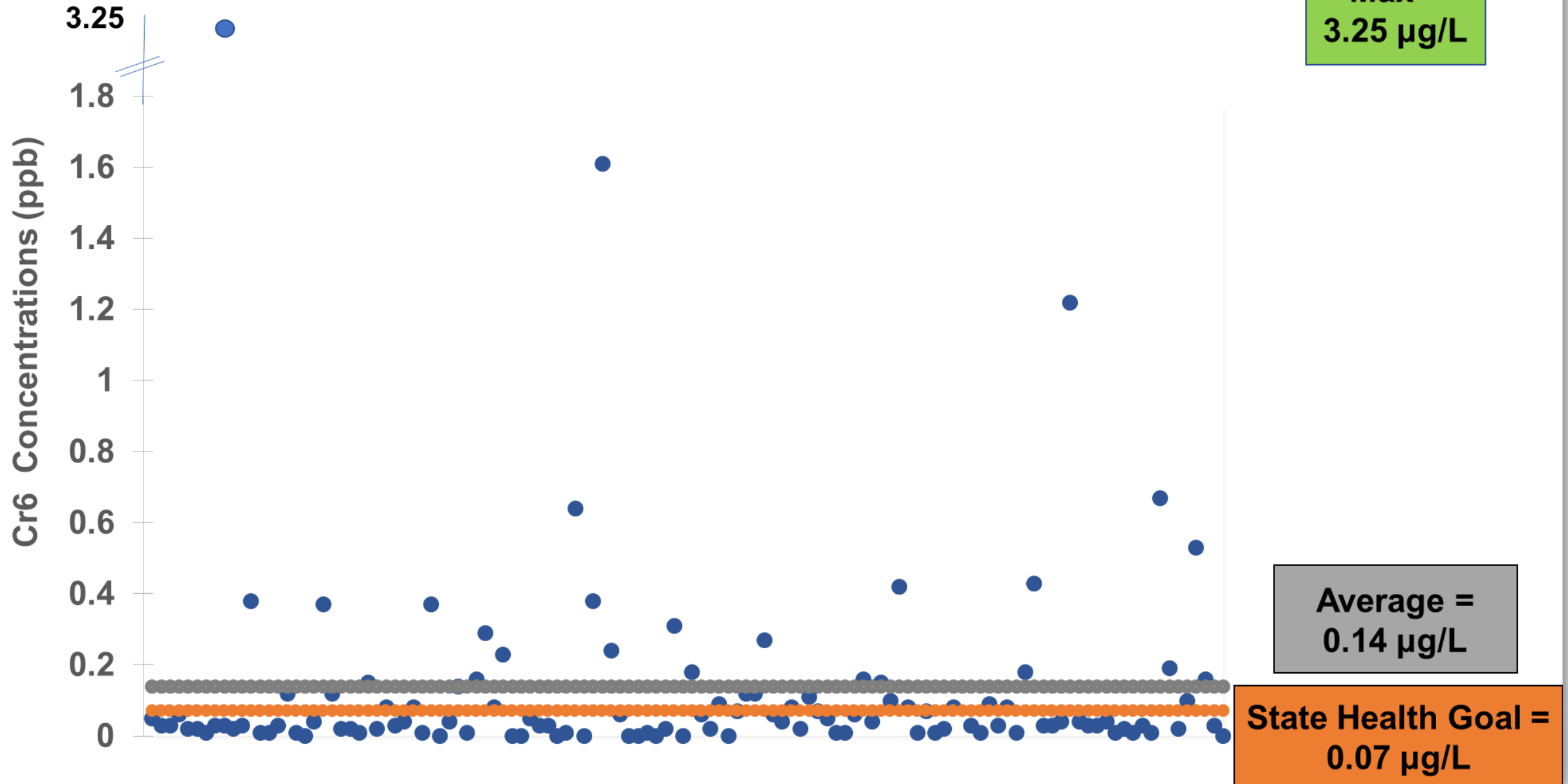
Cr6 = No regulatory standards

NC

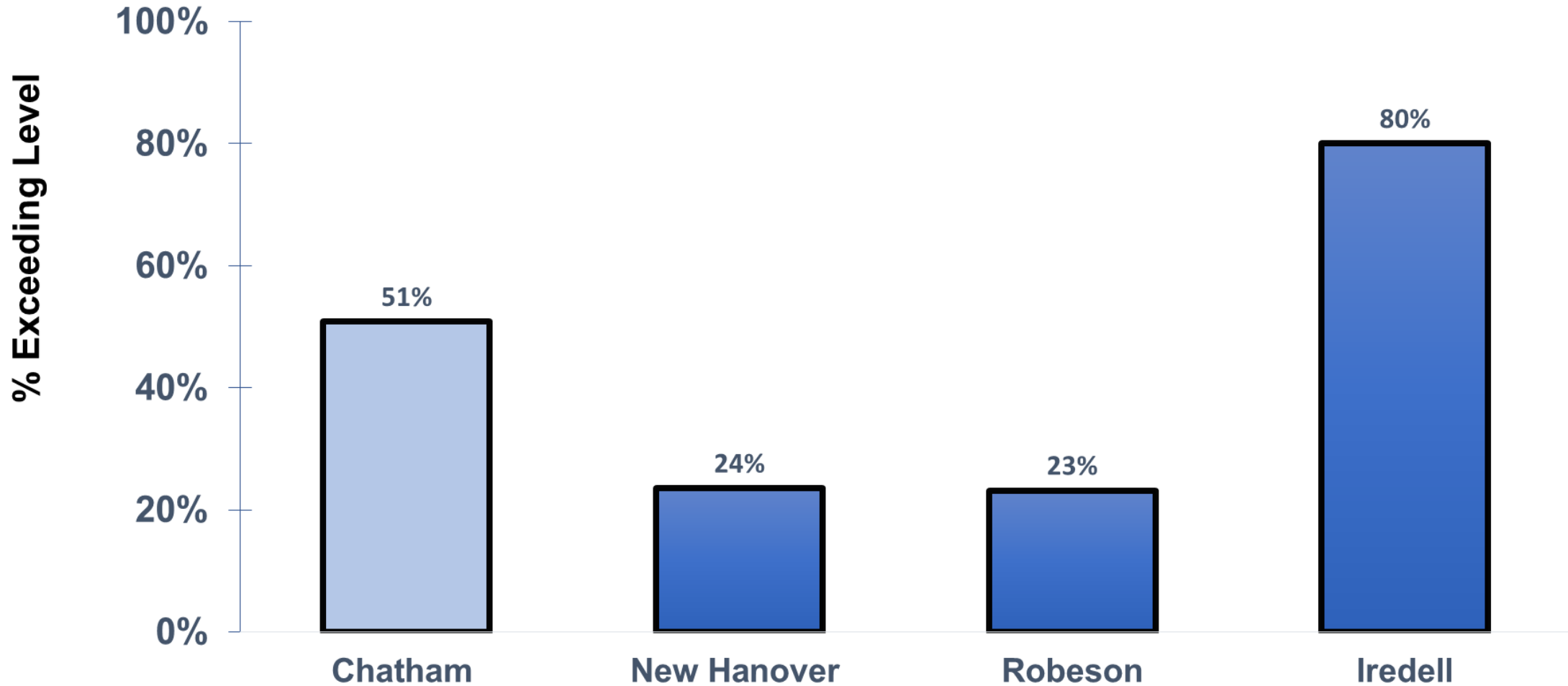
Cr6 Screening Level = 0.07 µg/L



Hexavalent Chromium (Cr6)



Percent of wells with Cr6 above Health Screening Level (0.07 ppb)



Hexavalent Chromium (Cr6)

**For more information and/or treatment assistance,
contact:**

Kennedy Holt, MSPH

Chemical Risk Assessor at NC DHHS

Phone: 919-707-5910

Email: kennedy.holt@dhhs.nc.gov

Vanadium

EPA

No regulatory standard

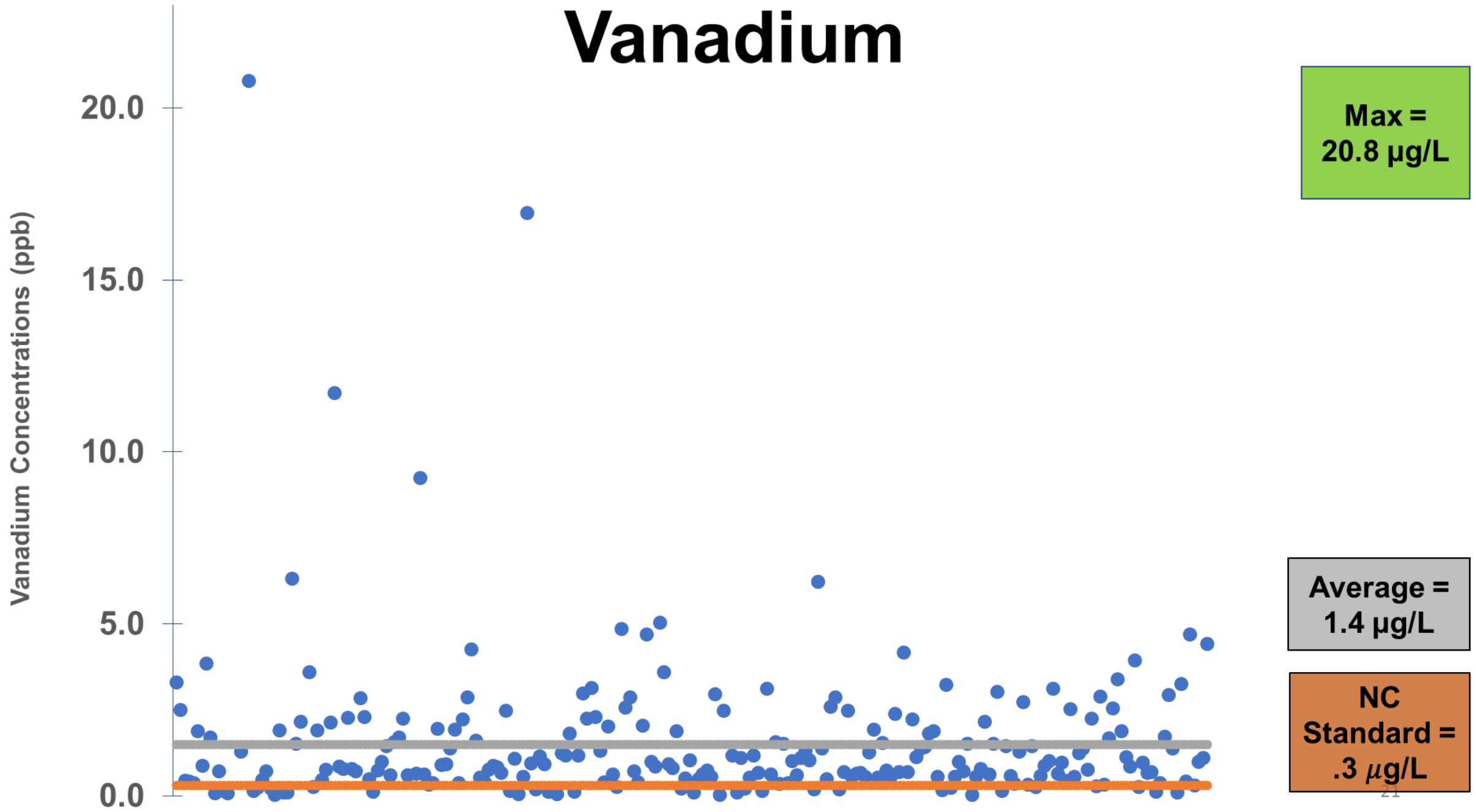
NC

No regulatory standard

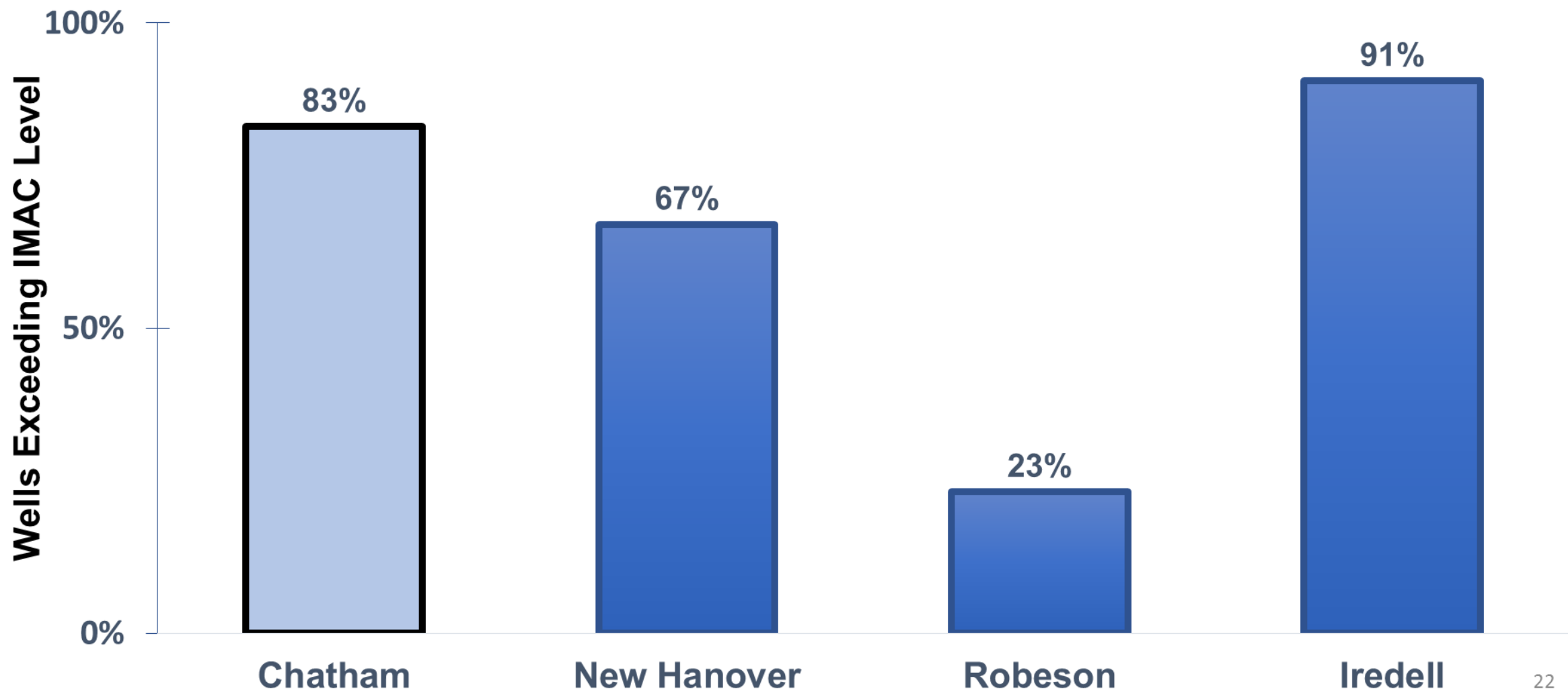
NC

Interim Maximum Allowable Level = 0.3 µg/L

Vanadium



Percent of wells with Vanadium above State Limit (0.3 ppb)



Treat water at the kitchen tap



Treat water in the whole house



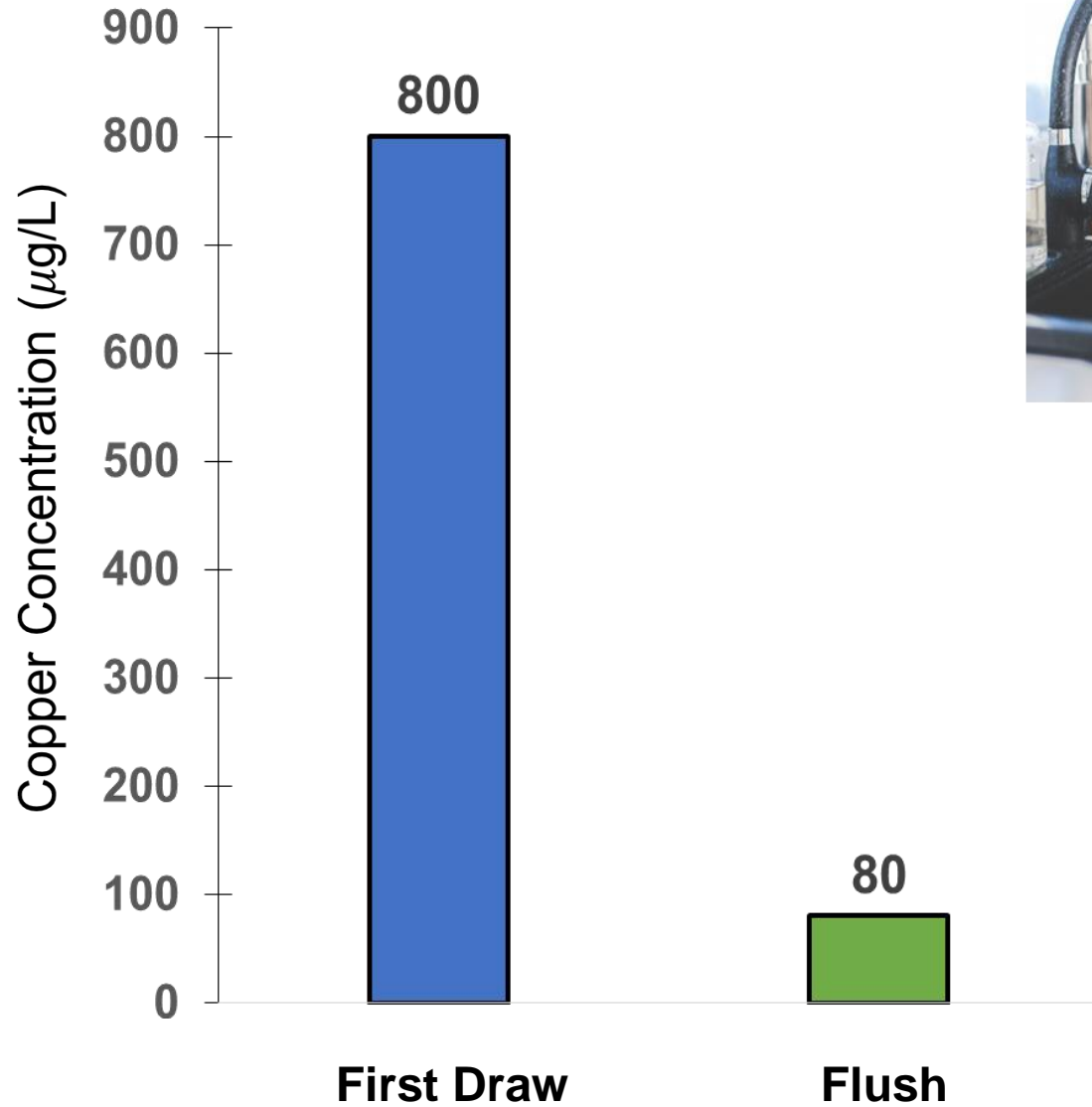
How to Treat Metals in Water



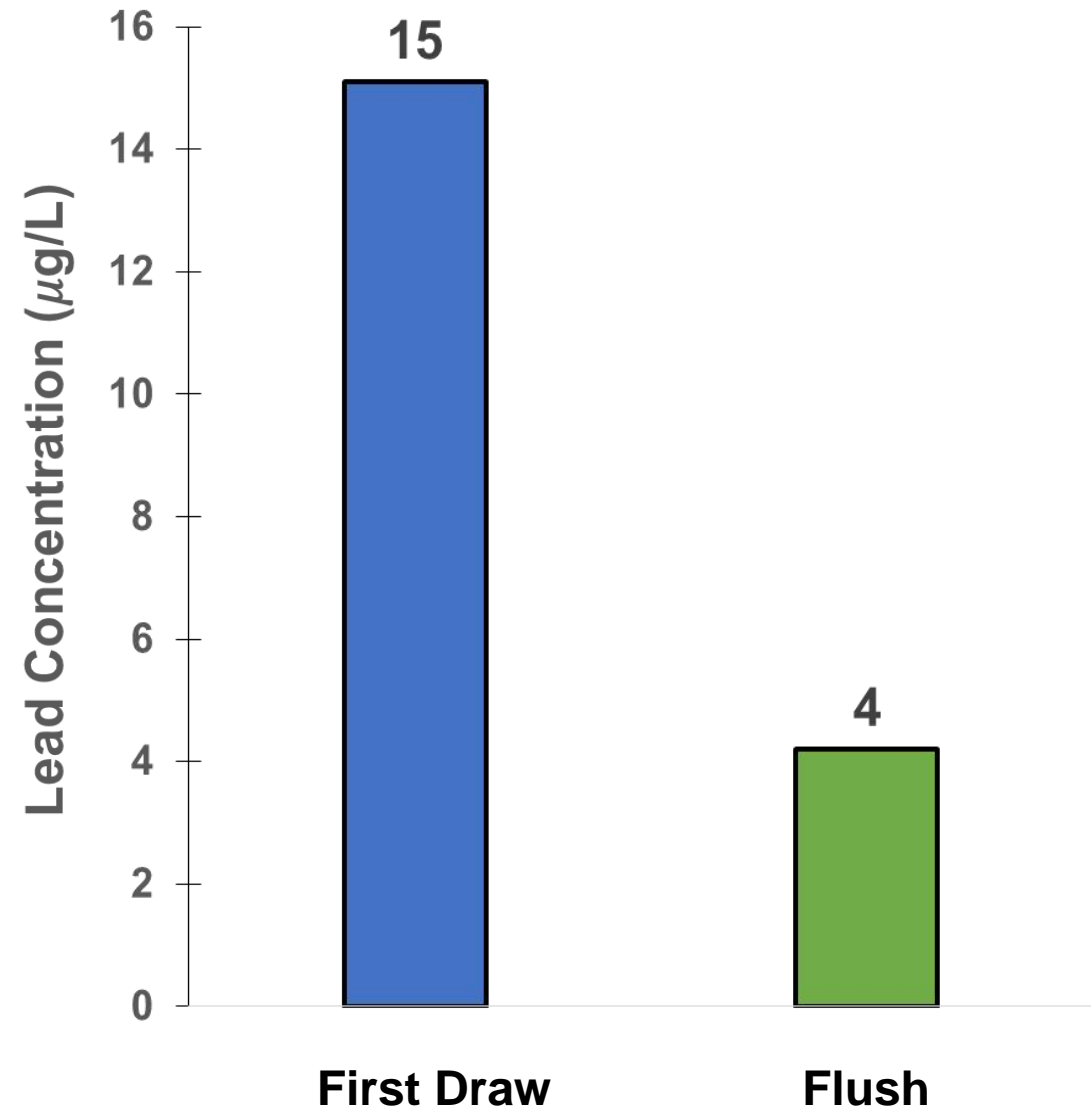
*NSF 53 Certified

Flushing


Copper



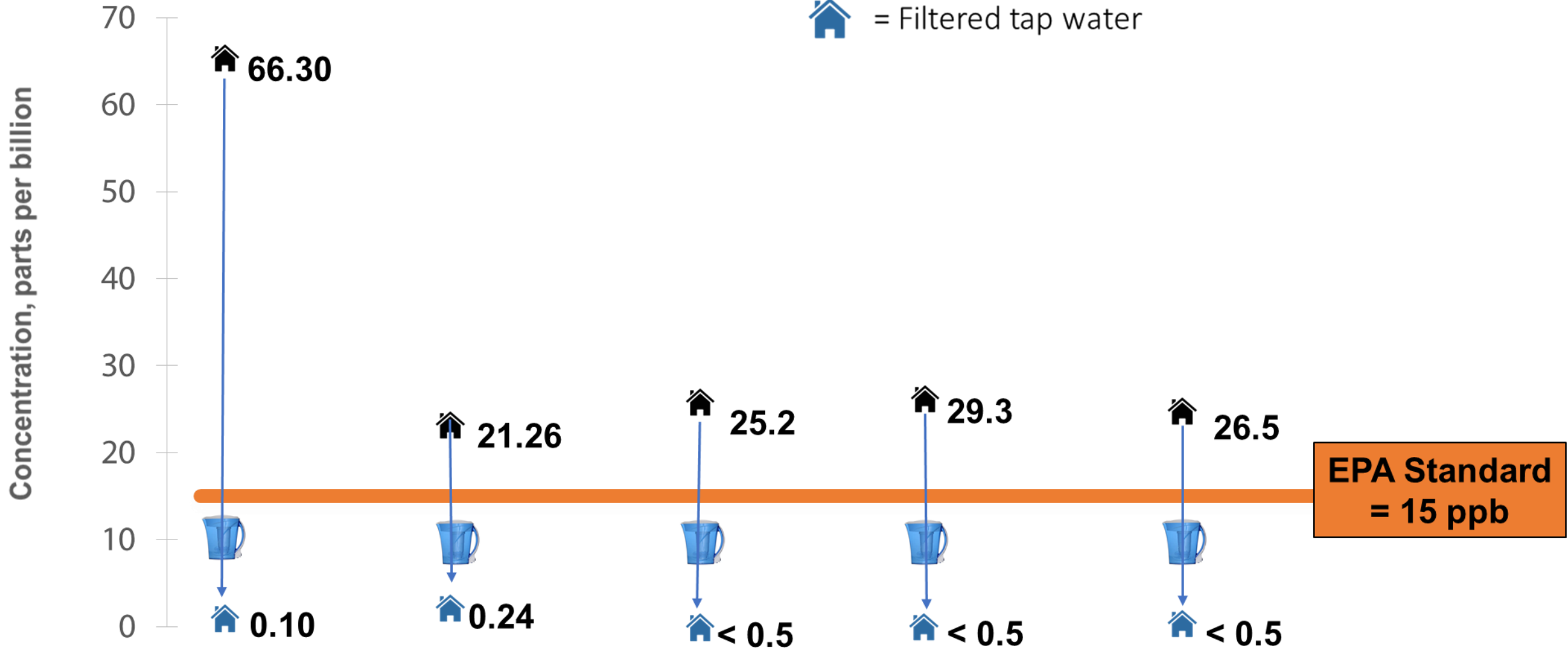
Lead



Lead Filter Summary

 = Kitchen tap water before filtering

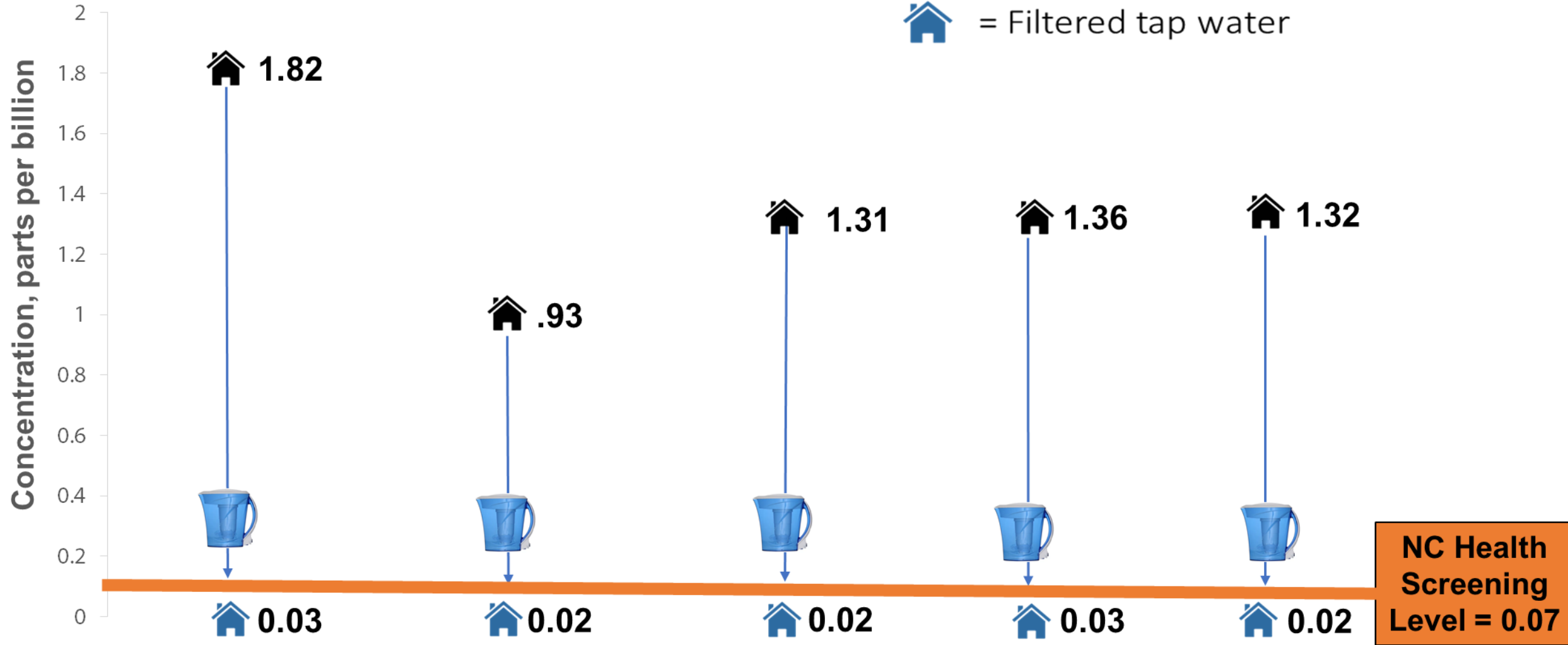
 = Filtered tap water



Chromium 6 Filter Summary

 = Kitchen tap water before filtering

 = Filtered tap water



Recommendations:

- Contact a minimum of 3 water treatment specialists/companies
- Explain or provide water sample results
- Compare pricing and recommended systems!

Drinking Water Treatment

Wilson Mize, R.E.H.S.

Regional Environmental Health Specialist

Division of Public Health, On-site Water Protection

North Carolina Department of Health and Human Services

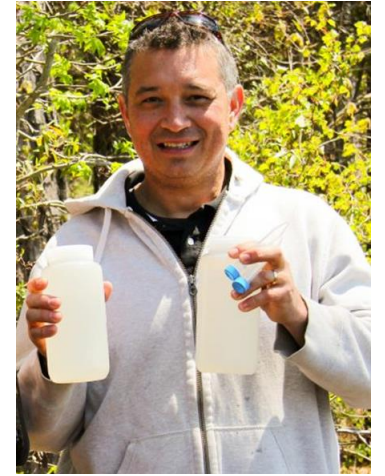
919-270-9665 Work Cell

Wilson.Mize@dhhs.nc.gov

Special thanks to

Wesley Samuels Annex

Central Carolina Community College



Study participants & community mentors

Our research team:

- UNC-Chapel Hill: Kathleen Gray, PhD; Neasha Graves
- Virginia Tech: Kelsey Pieper, PhD; Mark Edwards, PhD, Kory Wait
- Therese Vick, Blue Ridge Environmental Defense League
- Judy Hogan
- Rhonda Whitley

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