



Abstract

Established in 1873, Columbia Public Schools has a proud history of serving the city of Columbia, Missouri. With a history spanning more than 143 years, the district has gained a reputation as an educational pioneer for developing best practices and innovative programs to support its mission to provide an excellent education for all students. More than 18,000 students now attend any one of the 33 schools in the district.

Due to the recent heightened awareness of lead in consumable water; Columbia Public Schools has elected to be proactive and conduct a water quality evaluation for all schools and support facilities in the district. The evaluation is believed to be the first of its kind by a school district in the State of Missouri. But more importantly, it provides a direction for students, parents, teachers and general public on issues where lead in water may be a concern at their school.

Ultimately keeping with the Columbia Public Schools Facility & Construction Services safety motto, *Remember, **Kids** Learn Best in Healthy Environments...*



1.0 Executive Summary

On June 1, 2016 (initial water quality evaluation) and July 7, 2016 (follow-up water quality evaluation) Columbia Public Schools (CPS) Facilities and Construction Services Department (FCS) provided assistance for a water quality evaluation of West Boulevard Elementary School, 319 West Boulevard, Columbia, Missouri 65203.

PDC Laboratories Inc., (PDC) was contracted by CPS to provide the following services for the water quality evaluation. PDC Laboratories, Inc. role included: (1) transporting the water samples from the FCS location to their laboratory location, (2) insuring the field data form(s) were signed, accurate, and true, (3) conducting the analysis of each water sample that was collected at the school, (4) providing an analytical laboratory report for each sample documented on the school's field data form; and (5) developing a summary report for each school.

The initial summary report is divided into three (3) parts or sections;

- (1) **PART A** of the report shows the total number of samples that were collected at the school. Also, a percentage is given for the total number of samples (lead and/or copper) that were below the lead and/or copper action limit(s). The passing requirement noted in the United States Environmental Protection Agency (USEPA) Lead and Copper Rule (LCR) for public water supplies is 90%.
- (2) **PART B** of the report shows the number of samples that have exceeded the lead and/or copper action limit. The USEPA lead and copper action level (lead action limit = 15 UG/L; copper action limit = 1,300 UG/L).
- (3) **Conclusions/Comments** of report discusses the findings of the school and how it is compared to the (recommended) guidelines of the USEPA-LCR and the Columbia Water & Light requirements. Additionally, it is in this section where PDC provides suggestions (options) for any laboratory sample that has exceeded the lead and/or copper level.



The follow up summary report is divided into three (3) parts or sections;

- (1) **Follow up Results** of the report shows the laboratory result(s) of the sample.
- (2) **Follow up samples passed action limits** of the report simply defines the sample as “yes” or “no”. The USEPA lead and copper action level (lead action limit = 15 UG/L; copper action limit = 1,300 UG/L).
- (3) **Conclusions/Comments** of report discusses the recommendations (typically noting that the location should be flushed for a minimum of 30 seconds prior to use) and how it is compared to the (recommended) guidelines of the USEPA-LCR and the Columbia Water & Light requirements.

Initial Water Quality Evaluation

On June 1, 2016, a total of 39 (potential) water consumable samples were collected at various water locations within the school.

The following data table contains the water sample number, description/location of the collected sample, and the response action performed by CPS Facilities & Construction Services (CPS-FCS), if needed.

West Boulevard Elementary

Sample No.	Description/Location	CPS-FCS Actions
1	Electrical Water Cooler outside restrooms in E side new wing	0
2	Classroom Faucet (cold) in room 40	0
3	Classroom Faucet (cold) in room 41	0
4	Classroom Faucet (cold) in room 43	0
5	Classroom Faucet (cold) in room 42	0
6	Drinking Water Faucet in room 31	0
7	Drinking Water Faucet in room 32	0
8	Drinking Water Faucet in room 30	0
9	Drinking Water Faucet in room 29	0
10	Drinking Water Faucet in room 28	0
11	Electrical Water Cooler in south of kitchen (3&4)	0
12	Classroom Faucet (cold) in room 45	0
13	Kitchen Faucet (cold) in kitchen	0
14	Drinking Water Faucet in room 22 (low flow)	0
15	Drinking Water Faucet in room 108	0
16	Drinking Water Faucet in room 109	0
17	Drinking Water Faucet in room 106 (low flow)	0



Sample No.	Description/Location	CPS-FCS Actions
18	Nurse's Sink Faucet (cold) in office restroom	0
19	Electrical Water Cooler across from room 200	0
20	Nurse's Sink Faucet (cold) in room 200	0
21	Teacher's Lounge Faucet (cold) in room 204	0
22	Classroom Faucet (cold) in room 25	1
23	Classroom Faucet (cold) in room 206	0
24	Classroom Faucet (cold) in room 207	0
25	Electrical Water Cooler across from room 209	0
26	Classroom Faucet (cold) in room 209	0
27	Classroom Faucet (cold) in room 214	0
28	Classroom Faucet (cold) in room 215	0
29	Classroom Faucet (cold) in room 216	0
30	Electrical Water Cooler across from room 217	0
31	Classroom Faucet (cold) in room 217	0
32	Electrical Water Cooler across from room 223	0
33	Electrical Water Cooler across from 223	0
34	Classroom Faucet (cold) in room 228	0
35	Classroom Faucet (cold) in room 232	0
36	Classroom Faucet (cold) in room 233	0
37	Classroom Faucet (cold) in room 234	0
38	Classroom Faucet (cold) in room 235	0
39	Electrical Water Cooler across from room 36	0

CPS-FCS Actions

0 = No actions are required. The laboratory results revealed that the samples have no concerns for lead and/or copper.

1 = CPS-FCS & PDC Laboratories recommend(s) the following actions:

- (1) An inspection of the water tap and associated water line by a CPS-FCS specialized maintenance plumber to help determine the cause, (2) CPS-FCS shall conduct a follow-up sample collection—a flush sample*, and (3) CPS-FCS shall post a sign saying “Notice” "work station sink, water not intended for drinking." (if needed)."

*Follow-up Sample(s)

This sample is representative of the water that is in the plumbing upstream from the faucet or drinking water fountain. This sample shall be collected before the facility opens and before any water was used at the water tap. The water from the faucet or drinking water fountain should run for 30 seconds before collecting the sample. This is called a flush sample.



Part A of the PDC summary report supports that 100% of all the water samples collected/analyzed were at a none detect and/or below the EPA copper action level (copper action limit = 1,300 UG/L). Additionally, the PDC summary report supports that 97.4% of all the water samples collected/analyzed were at a none detect and/or below the EPA lead action level (lead action limit = 15 UG/L).

Part B of the PDC summary report shows that none (0) number of the water samples collected/analyzed exceeded the EPA copper action level. Additionally, the PDC summary report shows that one (1) of the water samples collected/analyzed exceeded the EPA lead action level.

The PDC conclusions/comments section of the summary report suggest that if any of the laboratory analysis reveals that the sample has exceeded the action limit(s) then the options in the LCR might be considered. They include but are not limited to: flushing prior to use, repairing or replacing the fixture, repairing or replacing the piping, or by simply not using the water for consumption. All of these suggestions are recommended by the LCR.

Based on the PDC conclusions/comments and the CPS-FCS team approach to insure that the water quality evaluation had/has achieved its objective (***Kids Learn Best in Healthy Environments***) to provide safe drinking water in the Columbia Public Schools, CPS-FCS had decided to take these options:

1. Taking a second sample (as per EPA LCR and the Drinking Water Best Management Practices suggestive guidelines) of the water source,
2. Having a CPS-FCS specialized maintenance plumber inspect the water tap and pipe to make sure there are no leaks or outside indications of corrosion, and
3. Post a sign saying "Notice" "work station sink, water not intended for drinking." (if needed, and decided after the additional testing result and summary recommendation).



Follow-up Water Quality Evaluation

On July 7, 2016, CPS-FCS performed a flush sample (follow up water sample) of the classroom faucet in room 25. Additionally, a CPS-FCS specialized maintenance plumber inspected the water tap and associated pipe to make sure there were no leaks or outside indications of corrosion. It was determined that the sink is primarily used for hand washing, not for consuming water.

The following data table contains the laboratory reporting and summary:

Sample Code: WBE-FS-CF-6

Follow up Results:

Lead 5.2 ug/l
Copper 12 ug/l

Follow up samples passed action limits:

Lead (action limit 15 ug/l) YES
Copper (action limit 1300 ug/l) YES

PDC CONCLUSIONS/COMMENTS

This water tap can be used and should be flushed for a minimum of 30 seconds prior to use.

Part 1 of the PDC follow up sample-flush sample summary report supports that the water sample collected/analyzed was at a none detect and/or below the EPA copper and lead action level (copper action limit = 1,300 UG/L, lead action limit = 15 UG/L).

Part 2 of the PDC summary report shows the sample meets (passed) the EPA lead and copper action levels.

Part 3 of the PDC conclusions/comments section of the summary report suggests that the location be flushed for a minimum of 30 seconds prior to use.

The PDCs initial water quality summary report and the follow up water quality summary can be found in Appendix A of this report.



WATER QUALITY EVALUATION CONCLUSIONS

The conclusions of the water quality evaluation(s) are based herein and were formed from:

- The PDC Laboratories Inc., Summary (Appendix A);
- The PDC Laboratories Inc., Follow-up Summary Report (Appendix A);
- The PDC Laboratories Inc., Laboratory Analytical Results (Appendix B); and
- The most current guidelines of the USEPA-LCR, Drinking Water Best Management Practices and the Columbia Water & Light requirements (Appendix D).

Finally, individual drinking water taps should be flushed to rid stagnant water from the pipes. At the start of each day, before using any water for drinking or cooking, flush the cold water faucet by allowing the water to run for a period of time. Flushing times vary depending on the buildings pipes and outlets. Industry experts and CPS-FCS suggests a time of 30 seconds to 2 minutes be used to properly flush out the reservoir.

As of July 29, 2016, West Boulevard Elementary School meets the (recommended) requirements of the United States Environmental Protection Agency (USEPA) and the published Lead and Copper Rule (LCR) of 1991 (reference: 40 CFR Part 141 Subpart I). Public Run Water Suppliers must comply with the USEPA law and the LCR. Columbia Water & Light is the publicly run water utility that serves this school. Although the Lead and Copper Rule does not apply directly to Columbia Public Schools and each of its schools or support buildings that were part of the 2016 Water Quality evaluation; it is a common practice for experts in the industry to use the standard as guideline when conducting water assessment studies.

Appendix A

Appendix A of this report includes the PDC Laboratories Inc., summary and follow up summary of the school. The summaries provide the analytical results, interpretation of the results and recommended actions based on the LCR.

PDC Laboratories, Inc. role which involved: (1) transporting the water samples from the FCS location to their laboratory location, (2) insuring the field data form(s) were signed, accurate and true, (3) conducting the analysis of each water sample that was collected at the school, (4) providing an analytical laboratory



report for each sample documented on the school's field data form, and (5) developing a summary report for each school.

The Summary reports include:

- The date of the analysis and the report,
- The school and/or support facility name,
- Number of water samples received from the evaluation,
- Number of samples that are known to be below the copper & lead action levels,
- The action levels (copper & lead) that can be utilized for a comparison,
- The laboratory findings that included analytical results,
- Comparing the analytical results to the LCR (suggested) action levels.
- The number of samples that exceed the LCR (suggested) action levels.
- The percentage of samples (comparing the results to LCR (suggested),
- Conclusions and Recommendations

Noting: if the facility meets the (recommended) requirements of the LCR,
Providing response measures for any outlying sample(s) based on
the recommendations by the LCR.

Appendix B

Appendix B of this report contains the analytical report(s) and the chain of custody forms.

Appendix C

PDC Laboratories, Inc. is a State of Missouri–Department of Natural Resources approved Drinking Water Laboratory (1050). The PDC laboratory certifications are located in Appendix C.

Appendix D

The references are located in Appendix D. References for this evaluation include information from Columbia Water & Light, Columbia, Missouri, the United States Environmental Protection Agency (USEPA) – Lead and Copper Rule, Drinking Water Best Management Practices and the *Clarification of Recommended Tap Sampling Procedures for Purposes of the Lead and Copper Rule (February 29, 2016)*.

2.0 Limitations

The findings obtained and our recommendations were prepared in accordance with customary principles and practices in the field of environmental science and engineering. This statement is in lieu of other statements either expressed or implied. This report does not warrant against future operations or conditions, nor



does it warrant against operations or conditions present of a type or at a location not investigated. Additionally, the passage of time may result in a change in the environmental characteristics at this school. This report does not warrant against future operations or conditions that could affect the recommendations made.

Water sampling evaluations are limited in the sense that conclusions and recommendations are developed from the United States Environmental Protection Agency (USEPA) Lead and Copper Rule (LCR) of 1991 (reference: 40 CFR Part 141 Subpart I). The LCR requires that all public run water suppliers comply with the USEPA law. Columbia Water & Light is the publicly run water utility that serves this school.

This report is intended for the sole use of the Columbia Board of Education. The scope of services performed in execution of this evaluation may not be appropriate to satisfy the needs of other users, and use or re-use of this document or the findings, conclusions, or recommendations, is at risk of said user.

Respectfully submitted this 29th Day of July 2016.

CPS-Facilities & Construction Services

Facilities & Construction Services

Appendix A



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri

Facilities & Construction Services

PDC Laboratories Inc.

Summary Report Initial Water Quality Evaluation



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri



PDC Laboratories, Inc.
P.O. Box 9071 • Peoria, IL 61612-9071
(309) 692-9088 • (800) 752-6654 • FAX (309) 692-9089



COLUMBIA PUBLIC SCHOOLS
COLUMBIA, MO
LEAD AND COPPER MONITORING
SUMMARY REPORT

DATE: June 17, 2016

FACILITY NAME: **WEST BOULEVARD ELEMENTARY**

PART A

NUMBER OF SAMPLES COLLECTED AT THIS FACILITY:	39
PERCENTAGE OF SAMPLES BELOW COPPER ACTION LIMIT	100.0
COPPER ACTION LIMIT = 1,300 UG/L	
PERCENTAGE OF SAMPLES BELOW LEAD ACTION LIMIT	97.4
LEAD ACTION LIMIT = 15 UG/L	

(The requirement in the USEPA Lead and Copper Rule for public water supplies is 90% passing)

PART B

NUMBER OF SAMPLES EXCEEDING COPPER ACTION LIMIT	0
NUMBER OF SAMPLES EXCEEDING LEAD ACTION LIMIT	1

CONCLUSIONS/COMMENTS

This facility meets the (recommended) requirements of the United States Environmental Protection Agency (USEPA) and the published Lead and Copper Rule(LCR) of 1991 (reference: 40 CFR Part 141 Subpart I). Public Run Water Suppliers must comply with the USEPA law and the LCR. Columbia Water & Light is the publicly run water utility that serves this school.

Although the Lead and Copper Rule may not directly apply to Columbia Public Schools and each of its schools or support buildings that are part of the 2016 Water Quality Assessment Reporting; it is a common practice for experts in the field and members of the known industry to use the standard as a guideline for water assessment studies.

If any of the laboratory analysis reveals that the sample has exceeded the action limit, then you may want to consider the options as outlined in the LCR. They include but are not limited to: flushing prior to use (make it a practice to run the water at each tap before use), repairing and/or replacing fixtures and/or piping and by not using the water for consumption. All are recommended by the Lead and Copper Rule.

PREPARED BY

KURT C STEPPING
SENIOR PROJECT MANAGER
PDC LABORATORIES, INC.

Facilities & Construction Services

PDC Laboratories Inc.

Follow-up Sampling Summary Report



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri



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COLUMBIA PUBLIC SCHOOLS

SUMMARY REPORT-FOLLOW UP SAMPLE(FLUSH SAMPLE)

DATE: July 18, 2016
FACILITY NAME: **WEST BOULEVARD ELEMENTARY**

Sample Location: WBE-FS-CF-6

Followup Results:
Lead ug/l 5.2
Copper ug/l 12

Followup samples passed action limits:
Lead(action limit 15 ug/l) YES
Copper(action limit 1300 ug/l) YES

CONCLUSIONS/COMMENTS

This location should be flushed for a minimum of 30 seconds prior to use.

This facility meets the (recommended) requirements of the United States Environmental Protection Agency (USEPA) and the published Lead and Copper Rule(LCR) of 1991 (reference: 40 CFR Part 141 Subpart I). Public Run Water Suppliers must comply with the USEPA law and the LCR. Columbia Water & Light is the publicly run water utility that serves this school.

Although the Lead and Copper Rule may not directly apply to Columbia Public Schools and each of its schools or support buildings that are part of the 2016 Water Quality Assessment Reporting; it is a common practice for experts in the field and members of the known industry to use the standard as a guideline for water assessment studies.

PREPARED BY

A handwritten signature in black ink, reading 'Kurt Stepping', is written over a light gray rectangular background.

KURT C STEPPING
SENIOR PROJECT MANAGER
PDC LABORATORIES, INC.

Facilities & Construction Services

Appendix B



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri

Facilities & Construction Services

PDC Laboratories Inc. Laboratory Results
Initial Water Quality Evaluation

Field Data & Chain-of-Custody Forms



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri



PDC Laboratories, Inc.

PROFESSIONAL • DEPENDABLE • COMMITTED

June 17, 2016

Randy Jackson
Columbia Public Schools
5909 Paris Road
Columbia, MO 65202

Dear Randy Jackson:

Please find enclosed the analytical results for the sample(s) the laboratory received on **6/7/16 8:00 am** and logged in under work order **6061465**. All testing is performed according to our current TNI certifications unless otherwise noted. This report cannot be reproduced, except in full, without the written permission of PDC Laboratories, Inc.

If you have any questions regarding your report, please contact your project manager. Quality and timely data is of the utmost importance to us.

PDC Laboratories, Inc. appreciates the opportunity to provide you with analytical expertise. We are always trying to improve our customer service and we welcome you to contact the Vice President, John LaPayne with any feedback you have about your experience with our laboratory.

Sincerely,

Kurt Stepping
Senior Project Manager
(309) 692-9688 x1719
kstepping@pdclab.com





ANALYTICAL RESULTS

Sample: 6061465-01
Name: WBE-EWC-1
Alias: Water Cooler Gang Restroom

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	470	ug/L		1300	06/16/16 10:35	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 10:35	KMC	EPA 200.8

Sample: 6061465-02
Name: WBE-CF-1
Alias: Classroom 40

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	510	ug/L		1300	06/16/16 10:36	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 10:36	KMC	EPA 200.8

Sample: 6061465-03
Name: WBE-CF-2
Alias: Classroom 41

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	810	ug/L		1300	06/16/16 10:46	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 10:46	KMC	EPA 200.8

Sample: 6061465-04
Name: WBE-CF-3
Alias: Classroom 43

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	700	ug/L		1300	06/16/16 10:47	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 10:47	KMC	EPA 200.8



ANALYTICAL RESULTS

Sample: 6061465-05
Name: WBE-CF-4
Alias: Classroom 42

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	1000	ug/L		1300	06/16/16 10:48	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 10:48	KMC	EPA 200.8

Sample: 6061465-06
Name: WBE-DWF-1
Alias: Classroom 31

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	< 3.0	ug/L		1300	06/16/16 10:50	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 10:50	KMC	EPA 200.8

Sample: 6061465-07
Name: WBE-DWF-2
Alias: Classroom 32

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	8.7	ug/L		1300	06/16/16 10:51	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 10:51	KMC	EPA 200.8

Sample: 6061465-08
Name: WBE-DWF-3
Alias: Classroom 30

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	11	ug/L		1300	06/16/16 10:52	KMC	EPA 200.8
Lead	1.3	ug/L		15	06/16/16 10:52	KMC	EPA 200.8



ANALYTICAL RESULTS

Sample: 6061465-09
Name: WBE-DWF-4
Alias: Classroom 29

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
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Total Metals - PIA

Copper	3.5	ug/L		1300	06/16/16 10:54	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 10:54	KMC	EPA 200.8

Sample: 6061465-10
Name: WBE-DWF-5
Alias: Classroom 28

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
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Total Metals - PIA

Copper	25	ug/L		1300	06/16/16 10:55	KMC	EPA 200.8
Lead	2.7	ug/L		15	06/16/16 10:55	KMC	EPA 200.8

Sample: 6061465-11
Name: WBE-EWC-3
Alias: Water Cooler South of Kitchen

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
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Total Metals - PIA

Copper	160	ug/L		1300	06/16/16 11:04	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:04	KMC	EPA 200.8

Sample: 6061465-12
Name: WBE-CF-5
Alias: Classroom 45

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
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Total Metals - PIA

Copper	760	ug/L		1300	06/16/16 11:06	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:06	KMC	EPA 200.8



ANALYTICAL RESULTS

Sample: 6061465-13
Name: WBE-KF-1
Alias: Kitchen Faucet

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	290	ug/L		1300	06/16/16 11:08	KMC	EPA 200.8
Lead	1.7	ug/L		15	06/16/16 11:08	KMC	EPA 200.8

Sample: 6061465-14
Name: WBE-DWF-6
Alias: Classroom 22

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	17	ug/L		1300	06/16/16 11:11	KMC	EPA 200.8
Lead	2.3	ug/L		15	06/16/16 11:11	KMC	EPA 200.8

Sample: 6061465-15
Name: WBE-DWF-7
Alias: Classroom 108

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	110	ug/L		1300	06/16/16 11:12	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:12	KMC	EPA 200.8

Sample: 6061465-16
Name: WBE-DWF-8
Alias: Classroom 109

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	130	ug/L		1300	06/16/16 11:13	KMC	EPA 200.8
Lead	2.0	ug/L		15	06/16/16 11:13	KMC	EPA 200.8



ANALYTICAL RESULTS

Sample: 6061465-17
Name: WBE-DWF-9
Alias: Classroom 106

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	7.9	ug/L		1300	06/16/16 11:15	KMC	EPA 200.8
Lead	1.7	ug/L		15	06/16/16 11:15	KMC	EPA 200.8

Sample: 6061465-18
Name: WBE-NSF-1
Alias: Office Restroom

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	18	ug/L		1300	06/16/16 11:16	KMC	EPA 200.8
Lead	1.0	ug/L		15	06/16/16 11:16	KMC	EPA 200.8

Sample: 6061465-19
Name: WBE-EWC-4
Alias: EWC 4/5

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	55	ug/L		1300	06/16/16 11:25	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:25	KMC	EPA 200.8

Sample: 6061465-20
Name: WBE-NSF-2
Alias: Nurse's Office

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	44	ug/L		1300	06/16/16 11:27	KMC	EPA 200.8
Lead	4.6	ug/L		15	06/16/16 11:27	KMC	EPA 200.8



ANALYTICAL RESULTS

Sample: 6061465-21
Name: WBE-TLF-1
Alias: Teachers Workroom

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	44	ug/L		1300	06/16/16 11:28	KMC	EPA 200.8
Lead	1.6	ug/L		15	06/16/16 11:28	KMC	EPA 200.8

Sample: 6061465-22
Name: WBE-CF-6
Alias: Classroom 25

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	59	ug/L		1300	06/16/16 11:29	KMC	EPA 200.8
Lead	62	ug/L		**15	06/16/16 11:29	KMC	EPA 200.8

Sample: 6061465-23
Name: WBE-CF-7
Alias: Classroom 206

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	43	ug/L		1300	06/16/16 11:31	KMC	EPA 200.8
Lead	2.0	ug/L		15	06/16/16 11:31	KMC	EPA 200.8

Sample: 6061465-24
Name: WBE-CF-8
Alias: Classroom 207

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	5.3	ug/L		1300	06/16/16 11:32	KMC	EPA 200.8
Lead	6.8	ug/L		15	06/16/16 11:32	KMC	EPA 200.8



ANALYTICAL RESULTS

Sample: 6061465-25
Name: WBE-EWC-5
Alias: EWC-5/6

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	69	ug/L		1300	06/16/16 11:33	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:33	KMC	EPA 200.8

Sample: 6061465-26
Name: WBE-CF-9
Alias: Classroom 209

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	5.2	ug/L		1300	06/16/16 11:35	KMC	EPA 200.8
Lead	1.7	ug/L		15	06/16/16 11:35	KMC	EPA 200.8

Sample: 6061465-27
Name: WBE-CF-10
Alias: Classroom 214

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	17	ug/L		1300	06/16/16 11:44	KMC	EPA 200.8
Lead	2.6	ug/L		15	06/16/16 11:44	KMC	EPA 200.8

Sample: 6061465-28
Name: WBE-CF-11
Alias: Classroom 215

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	22	ug/L		1300	06/16/16 11:45	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:45	KMC	EPA 200.8



ANALYTICAL RESULTS

Sample: 6061465-29
Name: WBE-CF-12
Alias: Classroom 216

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	38	ug/L		1300	06/16/16 11:47	KMC	EPA 200.8
Lead	1.2	ug/L		15	06/16/16 11:47	KMC	EPA 200.8

Sample: 6061465-30
Name: WBE-EWC-7
Alias: EWC-7/8

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	200	ug/L		1300	06/16/16 11:48	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:48	KMC	EPA 200.8

Sample: 6061465-31
Name: WBE-CF-13
Alias: 217

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	< 3.0	ug/L		1300	06/16/16 11:49	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:49	KMC	EPA 200.8

Sample: 6061465-32
Name: WBE-EWC-9
Alias: EWC-9/10

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	490	ug/L		1300	06/16/16 11:51	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:51	KMC	EPA 200.8



ANALYTICAL RESULTS

Sample: 6061465-33
Name: WBE-EWC-11
Alias: EWC-11/12

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	390	ug/L		1300	06/16/16 11:52	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:52	KMC	EPA 200.8

Sample: 6061465-34
Name: WBE-CF-14
Alias: Classroom 228

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	660	ug/L		1300	06/16/16 11:53	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 11:53	KMC	EPA 200.8

Sample: 6061465-35
Name: WBE-CF-15
Alias: Classroom 232

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	720	ug/L		1300	06/16/16 12:03	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 12:03	KMC	EPA 200.8

Sample: 6061465-36
Name: WBE-CF-16
Alias: Classroom 233

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	650	ug/L		1300	06/16/16 12:04	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 12:04	KMC	EPA 200.8



ANALYTICAL RESULTS

Sample: 6061465-37
Name: WBE-CF-17
Alias: Classroom 234

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	710	ug/L		1300	06/16/16 12:05	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 12:05	KMC	EPA 200.8

Sample: 6061465-38
Name: WBE-CF-18
Alias: Classroom 235

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	560	ug/L		1300	06/16/16 12:07	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 12:07	KMC	EPA 200.8

Sample: 6061465-39
Name: WBE-EWC-13
Alias: Water Cooler 13/14

Sampled: 06/01/16 08:00
Received: 06/07/16 08:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
Total Metals - PIA							
Copper	430	ug/L		1300	06/16/16 12:08	KMC	EPA 200.8
Lead	< 1.0	ug/L		15	06/16/16 12:08	KMC	EPA 200.8



NOTES

Specific method revisions used for analysis are available upon request.

** Indicates lab result exceeds a monitoring limit. Monitoring limits are either client permit limits or client requested action levels.

Certifications

PIA - Peoria, IL

TNI Accreditation for Drinking Water, Wastewater, Hazardous and Solid Wastes Fields of Testing through IL EPA Lab No. 100230

Illinois Department of Public Health Bacteriological Analysis in Drinking Water Approved Laboratory Registry No. 17553

Missouri Department of Natural Resources Certificate of Approval for Microbiological Laboratory Service No. 870

Drinking Water Certifications: Iowa (240); Kansas (E-10338); Missouri (870)

Wastewater Certifications: Arkansas (88-0677); Iowa (240); Kansas (E-10338)

Hazardous/Solid Waste Certifications: Arkansas (88-0677); Iowa (240); Kansas (E-10338)

SPMO - Springfield, MO

USEPA DMR-QA Program

STL - St. Louis, MO

TNI Accreditation for Wastewater, Hazardous and Solid Wastes Fields of Testing through KS Lab No. E-10389

Illinois Department of Public Health Bacteriological Analysis in Drinking Water Approved Laboratory Registry No. 171050

Drinking Water Certifications: Missouri (1050)

Missouri Department of Natural Resources

* Not a TNI accredited analyte

Certified by: Kurt Stepping, Senior Project Manager





SAMPLED ON 6.1 RFR

6061465-392 RFR

No.	Coding system	Description
1	WBE-ENC-1	Water cooler backside gang restrooms E side new wing
2	WBE-CF-1	classroom 40 twin w/bottle full (ENC-2 also)
3	WBE-CF-2	classroom 41
4	WBE-CF-3	classroom 43
5	WBE-CF-4	classroom 42
6	WBE-DWF-01	classroom 31
7	WBE-DWF-2	classroom 32 - water fountain in op sample from faucet
8	WBE-DWF-3	classroom 30 WF mop/sample from fountain
9	WBE-DWF-4	classroom 29
10	WBE-DWF-5	classroom 28
11	WBE-ENC-3	water cooler (twin ENC 3-4) South of kitchen
12	WBE-CF-5	classroom 45
Chain of Custody Section		
Sample Collector: (Print) KAREN SAPP / BAXTER		(Signature) <i>Karen Sapp</i> / <i>Baxter</i>
Relinquished by: <i>Randy</i>		Received by: <i>Joe Miller</i>
Relinquished by: <i>Randy</i>		Date/Time: 6/11/16
Relinquished by: <i>Randy</i>		Date/Time: 6-6-16 12:30
Relinquished by: <i>Randy</i>		Date/Time: 6-7-16 8:00

Please Note: A maximum of twelve (12) samples per box.



No.	Coding system	Description
13	WBE- KF-1	Kitchen faucet
14	WBE- DWF-6 DWF-6	classroom 22 (low pressure)
15	WBE- DWF-7	classroom 108
16	WBE- DWF-8	classroom 109
17	WBE- DWF-9 DWF-9	classroom 106 (low flow)
18	WBE- NSF-1	office restroom (nurse)
19	WBE- ENC-4 ENC-4	enc 4/5 twin across from 200
20	WBE- NSF-2	nurse's office 200
21	WBE- TLF-1	teachers workroom / lounge (200)
22	WBE- CF-6	classroom 25 (203)
23	WBE- CF-7	classroom 206
24	WBE- CF-8	classroom 207
Chain of Custody Section		
Sample Collector: (Print) Kaydell / Sapp / Baxter		
Relinquished by: Kaydell		(Signature) Kaydell / S. Sapp / D. Baxter
Relinquished by: Kaydell		Received by: Kaydell / S. Sapp / D. Baxter
Relinquished by: Kaydell		Date/Time: 6/11/16
Relinquished by: Kaydell		Date/Time: 6/16/16
Relinquished by: Kaydell		Date/Time: 6/16/16

Please Note: A maximum of twelve (12) samples per box.



No.	Coding system	Description
25	WBE- EWC 5	EWC-5/6 across room 209
26	WBE- CF-9	classroom 209
27	WBE- CF-10	classroom 214
28	WBE- CF-11	classroom 215
29	WBE- CF-12	classroom 216
30	WBE- EWC 7	EWC 7/8 across from 217
31	WBE- CF-13	217
32	WBE- EWC 9	EWC 9/10 across from 223 / by gangs in SE
33	WBE- EWC 11	EWC 11/12 " "
34	WBE- CF-14	classroom 228
35	WBE- CF-15	classroom 232
36	WBE- CF-16	classroom 233
Chain of Custody Section		
Sample Collector: (Print) Kadell / Supp / Burke		
Relinquished by: [Signature]		
Relinquished by: [Signature]		
Relinquished by: [Signature]		
Date/Time: 6-7-16		
Date/Time: 6-7-16		
Date/Time: 6-7-16		

Please Note: A maximum of twelve (12) samples per box.

Chain of Custody Section

Page 16 of 16

Facilities & Construction Services

PDC Laboratories Inc. Laboratory Results
Follow-up Water Quality Evaluation

Field Data & Chain-of-Custody Form



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri



PDC Laboratories, Inc.

PROFESSIONAL • DEPENDABLE • COMMITTED

July 18, 2016

Randy Jackson
Columbia Public Schools
5909 Paris Road
Columbia, MO 65202

Dear Randy Jackson:

Please find enclosed the analytical results for the sample(s) the laboratory received on **7/11/16 4:00 pm** and logged in under work order **6071518**. All testing is performed according to our current TNI certifications unless otherwise noted. This report cannot be reproduced, except in full, without the written permission of PDC Laboratories, Inc.

If you have any questions regarding your report, please contact your project manager. Quality and timely data is of the utmost importance to us.

PDC Laboratories, Inc. appreciates the opportunity to provide you with analytical expertise. We are always trying to improve our customer service and we welcome you to contact the Vice President, John LaPayne with any feedback you have about your experience with our laboratory.

Sincerely,

Kurt Stepping
Senior Project Manager
(309) 692-9688 x1719
kstepping@pdclab.com





ANALYTICAL RESULTS

Sample: 6071518-01
Name: WBE-FS-CF-6
Alias: CLASSROOM FAUCET (COLD) IN RM 25

Sampled: 07/07/16 00:00
Received: 07/11/16 16:00
Matrix: Drinking Water - Regular Sample

Parameter	Result	Unit	Qualifier	MCL	Analyzed	Analyst	Method
<u>Total Metals - PIA</u>							
Copper	12	ug/L		1300	07/15/16 13:45	KMC	EPA 200.8
Lead	5.2	ug/L		15	07/15/16 13:45	KMC	EPA 200.8



NOTES

Specific method revisions used for analysis are available upon request.

** Indicates lab result exceeds a monitoring limit. Monitoring limits are either client permit limits or client requested action levels.

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SPMO - Springfield, MO

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Illinois Department of Public Health Bacteriological Analysis in Drinking Water Approved Laboratory Registry No. 171050

Drinking Water Certifications: Missouri (1050)

Missouri Department of Natural Resources

* Not a TNI accredited analyte

Certified by: Kurt Stepping, Senior Project Manager



West Boulevard Elementary

SAMPLING METHOD

The water sample method was a "first-draw" sample. The first-draw sample was a sample collected first thing in the morning and is representative of the water that may be consumed at the beginning of the day or after infrequent use. Water samples were collected from cold water lines; the recommended procedure by the EPA – Reference: The Environmental Protection Agency (EPA) Lead and Copper Rule, 40 C.F.R. Sections 141.80 to 141.91, Revised Version: February 2016

The following sample revealed an elevated lead and/or copper lab report:

Sample No.	Description/Location	Tag	CPS-FCS Actions
22	Classroom Faucet (cold) in room 25	CF-6	1

Sample collected on June 1, 2016 and analyzed on June 16, 2016.

- 1 = CPS-FCS & PDC Laboratories recommend(s) the following actions:
- (Part A) An inspection of the water tap and associated water line by a CPS-FCS specialized maintenance plumber to help determine the cause,
 - (Part B) CPS-FCS shall conduct a follow-up sample collection—a flush sample*, and
 - (Part C) CPS-FCS shall post a “Notice” sign above the water tap instructed the user to do not use this water source for consumable purposes.

*Follow-up Sample(s)

This sample is representative of the water that is in the plumbing upstream from the faucet or drinking water fountain. This sample shall be collected before the facility opens and before any water was used at the water tap. The water from the faucet or drinking water fountain should run for 30 seconds before collecting the sample. This is called a flush sample.

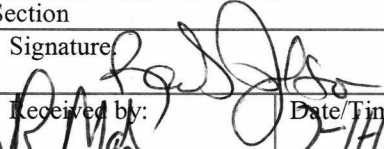
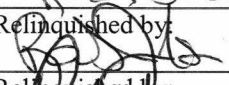
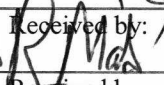
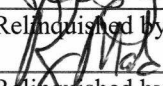
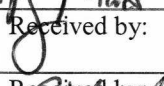
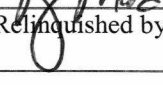
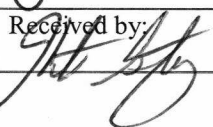
Part A: CPS-FCS on-site review of: Classroom Faucet (cold) in room 25

Date: 7-7-16	Name of Reviewer: Chris Willows
Actions taken: Inspected faucet	
Comments: Faucet is working fine, but the water lines supplying this faucet are old galvanized lines.	
Signature of Reviewer: Chris Willows	

6071518-1 AS

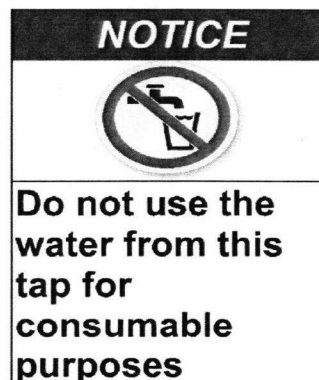
West Boulevard Elementary

(Part B) CPS-FCS shall conduct a follow-up sample collection-a flush sample*,

Sample No.	Description/Location	Tag
1	Classroom Faucet (cold) in room 25	FS-CF-6
Chain of Custody Section		
Sample Collector (Print): Ray Jackson		Signature: 
Relinquished by: 	Date/Time: 7-11-16 NOON	Received by:  Date/Time: 7-11-16 12:00
Relinquished by: 	Date/Time: 7-11-16 16:00	Received by:  Date/Time:
Relinquished by: 	Date/Time:	Received by:  Date/Time: 7-11-16 16:00

- EWC Electronic Water Cooler (chiller unit)
- DWF Drinking Water Faucet (bubbler/fountain)
- CF Classroom Faucet (cold)
- KF Kitchen Faucet (cold)
- FACSF Family and Consumer Science Faucet (cold)
- RRF Restroom Faucet (cold)
- NSF Nurse's Sink Faucet (cold)
- TLF Teacher's Lounge Faucet
- **FS Follow-up Sample

(Part C) CPS-FCS shall post a "Notice" sign above the water tap instructed the user to do not use this water source for consumable purposes.



Facilities & Construction Services

Appendix C



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri

Facilities & Construction Services

PDC Laboratory Certifications



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri

State of Missouri
Department of Natural Resources

Certificate of Approval
for Chemical Laboratory Service

This is to certify that

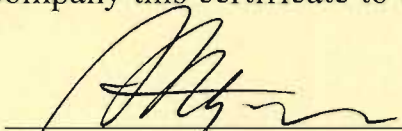
PDC Laboratories, Inc.

is hereby approved to perform the analysis of drinking water as specified on the
Certified Parameter List, which must accompany this certificate to be valid.

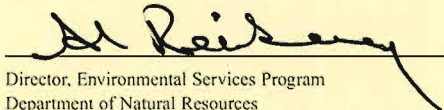
Certification No. 870

Date Issued September 16, 2015

Expiration Date June 30, 2016



Chief, Public Drinking Water Branch
Water Protection Program
Department of Natural Resources



Director, Environmental Services Program
Department of Natural Resources



Evaluation Officer, Environmental Services Program
Department of Natural Resources

MISSOURI DEPARTMENT OF NATURAL RESOURCES

DRINKING WATER LABORATORY

CERTIFIED PARAMETER LIST

This is to certify that

PDC Laboratories, Inc.

located at

2231 West Altorfer Drive, Peoria, Illinois

has been approved to perform the indicated procedures on drinking water under the Missouri Public Drinking Water Regulations (10 CSR 60-5.020). Specific method numbers or references are included in parenthesis when appropriate.

METALS

EPA 200.7 – Aluminum, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Hardness (calculated), Iron, Magnesium, Manganese, Nickel, Silica, Sodium, Silver, Zinc;
EPA 200.8 – Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Zinc;
EPA 245.1 – Mercury

INORGANIC NONMETALLIC CONSTITUENTS

SM 4500C-G – Chlorine (Free, Combined, Total); ***SM 4500F-C*** – Fluoride;
SM 4500H-B – Hydrogen Ion (pH); ***SM 4500NO3-F*** – Nitrate, Nitrite;
SM 4500P-E – Orthophosphate; ***EPA 150.1*** – Hydrogen Ion (pH);
EPA 300.0 – Chloride, Fluoride, Nitrate, Nitrite, Sulfate; ***EPA 335.4*** – Cyanide;
EPA 353.2 – Nitrate, Nitrite

PHYSICAL & AGGREGATE PROPERTIES

SM 2150B – Odor; ***SM 2320B*** – Alkalinity; ***SM 2330B*** – Corrosivity (Langlier Index);
SM 2510B – Conductivity; ***SM 2540C*** – Total Dissolved Solids (TDS);
EPA 180.1 – Turbidity

AGGREGATE ORGANIC CONSTITUENTS

SM 5310C – Total Organic Carbon (TOC); **SM 5540C** – Foaming Agents;
SM 5910B – UV254

ORGANIC COMPOUNDS

EPA 1613RB – Dioxin (2,3,7,8 TCDD); **EPA 504.1** – 1,2-Dibromo-3-chloropropane (DBCP), 1,2-Dibromoethane (EDB); **EPA 515.3** – 2,4,5-TP (Silvex), 2,4-D, Dalapon, Dicamba, Dinoseb, Pentachlorophenol, Picloram;
EPA 524.2 – 1,1,1,2-Tetrachloroethane, 1,1,1-Trichloroethane, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, 1,1-Dichloroethane, 1,1-Dichloroethene, 1,1-Dichloropropene, 1,2,3-Trichlorobenzene, 1,2,3-Trichloropropane, 1,2,4-Trichlorobenzene, 1,2,4-Trimethylbenzene, 1,2-Dichlorobenzene, 1,2-Dichloroethane, 1,2-Dichloropropane, 1,3-Dichlorobenzene, 1,3-Dichloropropane, 1,3,5-Trimethylbenzene, 1,4-Dichlorobenzene, 2-Chlorotoluene, 2,2-Dichloropropane, 4-Chlorotoluene, 4-Isopropyltoluene, Benzene, Bromobenzene, Bromochloromethane, Bromodichloromethane, Bromoform, Bromomethane, Carbon Tetrachloride, Chlorobenzene, Chloroethane, Chloroform, Chloromethane, cis-1,2-Dichloroethene, cis-1,3-Dichloropropene, Dibromochloromethane, Dibromomethane, Dichlorodifluoromethane, Dichloromethane (Methylene Chloride), Ethylbenzene, Trichlorofluoromethane, Hexachlorobutadiene, Isopropylbenzene, Methyl tert-butyl ether (MTBE), Naphthalene, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, Styrene, tert-Butylbenzene, Tetrachloroethene, Toluene, Total Trihalomethanes, trans-1,2-Dichloroethene, trans-1,3-Dichloropropene, Trichloroethylene (TCE), Vinyl Chloride, Xylenes (total); **EPA 525.2** – 4,4'-DDT, Alachlor, Aldrin, Atrazine, Benzo(a)pyrene, Butachlor, Chlorodane (total), Di(2-ethylhexyl)adipate, Di(2-ethylhexyl)phthalate, Dieldrin, Endrin, gamma-BHC (Lindane), Heptachlor, Heptachlor Epoxide, Hexachlorobenzene, Hexachlorocyclopentadiene, Methoxychlor, Metolachlor, Metribuzin, PCB as Aroclor, Propachlor, Simazine, Toxaphene;
EPA 531.1 – 3-Hydroxycarbofuran, Aldicarb (Temik), Aldicarb Sulfone, Aldicarb Sulfoxide, Carbaryl (Sevin), Carbofuran (Furaden), Methomyl (Lannate), Oxamyl; **EPA 547** – Glyphosate; **EPA 548.1** – Endothall; **EPA 549.2** – Diquat; **EPA 550** – Benzo(a)pyrene; **EPA 552.2** – Dibromoacetic acid, Dichloroacetic acid, Monobromoacetic acid, Monochloroacetic acid, Trichloroacetic acid

Missouri Certificate No.: 870
Expiration Date: June 30, 2016
Original Certifying State: Illinois

Facilities & Construction Services

Appendix D



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri

Facilities & Construction Services

Lead and Copper Rule



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri

Date Signed: February 29, 2016



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 29 2016

OFFICE OF
WATER**MEMORANDUM**

SUBJECT: Clarification of Recommended Tap Sampling Procedures for Purposes of the Lead and Copper Rule

FROM: Peter C. Grevatt, Director
Office of Ground Water & Drinking Water 

TO: Water Division Directors
Regions I - X

The Lead and Copper Rule, 40 C.F.R. Sections 141.80 to 141.91, requires monitoring at consumer taps to identify levels of lead in drinking water that may result from corrosion of lead-bearing components in a public water system's distribution system or in household plumbing. These samples help assess the need for, or the effectiveness of, corrosion control treatment. The purpose of this memorandum is to provide recommendations on how public water systems should address the removal and cleaning of aerators, pre-stagnation flushing, and bottle configuration for the purpose of Lead and Copper Rule sampling.

Removal and Cleaning of Aerators

EPA issued a memorandum on *Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule* on October 20, 2006. This memorandum stated that EPA recommends that homeowners regularly clean their aerators to remove particulate matter as a general practice, but states that public water systems should not recommend the removal or cleaning of aerators prior to or during the collection of tap samples gathered for purposes of the Lead and Copper Rule. EPA continues to recommend this approach. The removal or cleaning of aerators during collection of tap samples could mask the added contribution of lead at the tap, which may potentially lead to the public water system not taking additional actions needed to reduce exposure to lead in drinking water. EPA's recommendation about the removal and cleaning of aerators during sample collection applies only to monitoring for lead and copper conducted pursuant to 40 C.F.R. 141.86.

Pre-Stagnation Flushing

EPA is aware that some sampling instructions provided to residents include recommendations to flush the tap for a specified period of time prior to starting the minimum 6-hour stagnation time required for samples collected under the Lead and Copper Rule. This practice is called pre-stagnation flushing. Pre-stagnation flushing may potentially lower the lead levels as compared to when it is not practiced.

Flushing removes water that may have been in contact with the lead service line for extended periods, which is when lead typically leaches into drinking water. Therefore, EPA recommends that sampling instructions not contain a pre-stagnation flushing step.

Bottle Configuration

EPA recommends that wide-mouth bottles be used to collect Lead and Copper compliance samples. It has become apparent that wide-mouth bottles offer advantages over narrow-necked bottles because wide-mouth bottles allow for a higher flow rate during sample collection which is more representative of the flow that a consumer may use to fill up a glass of water. In addition, a higher flow rate can result in greater release of particulate and colloidal lead and therefore is more conservative in terms of identifying lead concentrations.

Conclusion

EPA is providing these recommendations for collection of Lead and Copper Rule tap samples to better reflect the state of knowledge about the fate and transport of lead in distribution systems. The three areas discussed above may potentially lead to samples that erroneously reflect lower levels of lead concentrations. The recommendations in this memorandum are also consistent with the recommendations provided by the EPA's Flint Task Force. For more information about the Task Force please view EPA's website at: <http://www.epa.gov/flint>.

To provide further information on this topic, EPA included an amended "Suggested Directions for Homeowner Tap Sample Collection Procedures" in Appendix D of the 2010 revision of *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (EPA 816-R-10-004). This document can be found at:

<http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100DP2P.txt>

Please share these recommendations with your state drinking water program directors. If you have any questions, please contact Anita Thompkins at thompkins.anita@epa.gov.

Attachment

cc: James Taft, Association of State Drinking Water Administrators

Suggested Directions for Homeowner Tap Sample Collection Procedures

Revised Version: February 2016

These samples are being collected to determine the lead and copper levels in your tap water. This sampling effort is required by the U.S. Environmental Protection Agency and your State under the Lead and Copper Rule, and is being accomplished through a collaboration between the public water system and their consumers (e.g. residents).

Collect samples from a tap that has not been used for at least 6 hours. To ensure the water has not been used for at least 6 hours, the best time to collect samples is either early in the morning or in the evening upon returning from work. Be sure to use a kitchen or bathroom cold water tap that has been used for drinking water consumption in the past few weeks. The collection procedure is described below.

1. Prior arrangements will be made with you, the customer, to coordinate the sample collection. Dates will be set for sample kit delivery and pick-up by water system staff.
2. There must be a minimum of 6 hours during which there is no water used from the tap where the sample will be collected and any taps adjacent or close to that tap. Either early mornings or evenings upon returning home are the best sampling times to ensure that the necessary stagnant water conditions exist. Do not intentionally flush the water line before the start of the 6 hour period.
3. Use a kitchen or bathroom cold-water faucet for sampling. If you have water softeners on your kitchen taps, collect your sample from the bathroom tap that is not attached to a water softener, or a point of use filter, if possible. Do not remove the aerator prior to sampling. Place the opened sample bottle below the faucet and open the cold water tap as you would do to fill a glass of water. Fill the sample bottle to the line marked "1000-mL" and turn off the water.
4. Tightly cap the sample bottle and place in the sample kit provided. Please review the sample kit label at this time to ensure that all information contained on the label is correct.
5. If any plumbing repairs or replacement has been done in the home since the previous sampling event, note this information on the label as provided. Also if your sample was collected from a tap with a water softener, note this as well.
6. Place the sample kit in the same location the kit was delivered to so that water system staff may pick up the sample kit.
7. Results from this monitoring effort and information about lead will be provided to you as soon as practical but no later than 30 days after the system learns of the tap monitoring results. However, if excessive lead and/or copper levels are found, immediate notification will be provided (usually 1-2 working days after the system learns of the tap monitoring results).

Call _____ at _____ if you have any questions regarding these instructions.

TO BE COMPLETED BY RESIDENT

Water was last used: Time _____ Date _____

Sample was collected: Time _____ Date _____

Sample Location & faucet (e.g. Bathroom sink): _____

I have read the above directions and have taken a tap sample in accordance with these directions.

Signature _____ Date _____

Facilities & Construction Services

Columbia Missouri Water and Light 2015 Water Testing Results



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri

Columbia Missouri Water and Light: 2015 Water Testing Results

WATER QUALITY CONTROL ANALYSIS OF TREATED WATER

QUALITY MEASURE	CONCENTRATION (milligrams per liter)
-----------------	---

pH	8.33 (pH units)
Alkalinity (Total)*	123
Phenolphthalein Alkalinity*	14
Total Hardness*	168
Calcium (as calcium carbonate)*	100
Magnesium (as calcium carbonate)*	71
Sulfate**	86.3
Total Dissolved Solids**	309
Fluoride**	0.58
Free Chlorine	3.10
Total Chlorine	3.80
Chloride**	29.9
Iron**	0.12
Manganese**	0.02
Silica	21.4

*State regulations require these tests to be run for operation information

**Secondary standards

<Means less than — Equipment used cannot measure the contaminant below this level.

CONTAMINANT	CONCENTRATION (milligrams per liter)	MAXIMUM CONTAMINANT LEVEL (milligrams per liter)
-------------	---	---

VOLATILE ORGANIC CHEMICALS:

Trichloroethylene	NONE DETECTED	0.005
Tetrachloroethylene	NONE DETECTED	0.005
Carbon tetrachloride	NONE DETECTED	0.005
1,1,1-trichloroethane	NONE DETECTED	0.20
1,2-dichloroethane	NONE DETECTED	0.005
Vinyl Chloride	NONE DETECTED	0.002
Benzene	NONE DETECTED	0.005
Dichloromethane	NONE DETECTED	0.005
Monochlorobenzene	NONE DETECTED	0.1
1,1-dichloroethylene	NONE DETECTED	0.007
Cis-1,2-dichloroethylene	NONE DETECTED	0.7
Trans-1,2-dichloroethylene	NONE DETECTED	0.1

INORGANIC CHEMICALS:

Asbestos	NONE DETECTED	7 million fibers per liter
Arsenic	NONE DETECTED	0.01
Barium	0.123	2
Cadmium	NONE DETECTED	0.005
Chromium	0.001	0.1
Lead	0.0026	Treatment technique, Action level = 0.015
Mercury	NONE DETECTED	0.002
Nitrate (as Nitrogen)	0.03	10
Selenium	NONE DETECTED	0.05
Nitrite (as Nitrogen)	NONE DETECTED	1.0
Fluoride	0.58	4.0
Aluminum**	NONE DETECTED	0.05
Antimony	NONE DETECTED	0.006
Sulfate	86.3	250
Copper**	0.040	Treatment technique, Action level = 1.3
Sodium**	29.3	No MCL, monitoring only

CONTAMINANT	CONCENTRATION (milligrams per liter)	MAXIMUM CONTAMINANT LEVEL (milligrams per liter)
INORGANIC CHEMICALS CONTINUED:		
Nickel	NONE DETECTED	0.1
Zinc**	1.95	5
Thallium	NONE DETECTED	0.002
Beryllium	NONE DETECTED	0.004
Cyanide	NONE DETECTED	0.2
SYNTHETIC ORGANIC CHEMICALS:		
TTHM	0.0499	0.080
Endrin	NONE DETECTED	0.002
Lindane	NONE DETECTED	0.0002
Methoxychlor	NONE DETECTED	0.04
Toxaphene	NONE DETECTED	0.003
2,4-D	NONE DETECTED	0.07
2,4,5-TP (silvex)	NONE DETECTED	0.05
Aldicarb	NONE DETECTED	0.003
Chlordane	NONE DETECTED	0.002
Dalapon	NONE DETECTED	0.2
Diquat	NONE DETECTED	0.02
Endothall	NONE DETECTED	0.1
Glyphosate	NONE DETECTED	0.7
Carbofuran	NONE DETECTED	0.04
Vydate	NONE DETECTED	0.1
Simazine	NONE DETECTED	0.004
PAHs	NONE DETECTED	0.0002
PCBs	NONE DETECTED	0.0005
Atrazine	NONE DETECTED	0.003
Heptachlor	NONE DETECTED	0.0004
Pentachlorophenol	NONE DETECTED	0.001
Picloram	NONE DETECTED	0.5
Dinoseb	NONE DETECTED	0.007
Alachlor	NONE DETECTED	0.002
Hexachlorocyclopentadiene	NONE DETECTED	0.05
2,3,7,8-TCDD	NONE DETECTED	0.00000003
HAA5	0.022	0.060
MICROBIOLOGICAL CONTAMINANTS:		
Total coliforms	NONE DETECTED	No more than 5% of Total Number of samples may be positive
RADIONUCLIDES: (Picocuries per Liter)		
Radium	NONE DETECTED	5 picocuries per liter
Gross alpha	NONE DETECTED	15 picocuries per liter
Beta particle	6.6	4 mrem/yr 50 picocuries per liter
Uranium	0.48	20 ug/L
Radon	50.4	300

Facilities & Construction Services

EPA Drinking Water Best Management Practices



2016 Water Quality Evaluation
Columbia Public Schools
Columbia, Missouri

Drinking Water Best Management Practices

For Schools and Child Care Facilities Served by
Municipal Water Systems



Drinking Water Best Management Practices

For Schools and Child Care Facilities Served by Municipal Water Systems

This guide is intended for use by school officials and child care providers responsible for the maintenance and/or safety of school and child care facilities including the drinking water. The purpose of this guide is to describe the importance of implementing best management practices for drinking water in schools and child care facilities and how a school or child care facility would go about implementing these practices. This guide is specifically for schools and child care facilities that receive water from water utilities or water suppliers such as cities, towns and water districts. This guide is not a regulation itself, nor does it change or substitute for those provisions and regulations. Thus, it does not impose legally binding requirements on EPA, states, municipal water systems, schools or child care facilities. This guide does not confer legal rights or impose legal obligations upon any member of the public. While EPA has made every effort to ensure the accuracy of the information in this guide the obligations of the regulated community are determined by statutes, regulations or other legally binding requirements. In the event of a conflict between the information in this guide and any statute or regulation, this document would not be controlling.

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What Decision Makers Should Know

On any given day in America nearly 50 million public school students spend a significant portion of their day in school buildings. Exposure to environmental hazards in schools can negatively impact the health of children and school staff. Moreover, studies have shown that poor indoor environments in schools have negative impacts on teacher productivity and student performance.^{1,2,3}

Schools and child care facilities receive their drinking water from nearby municipal water systems or their own on-site water system. Facilities that receive their water from a water provider can be assured that the water is regularly tested to ensure it meets federal and state drinking water standards, such as for bacteria and chemicals.

Even if the water meets federal and state standards at the municipal water supply, the water pipes and plumbing fixtures in your facility can affect the quality of water. Therefore, it is important to perform routine measures to limit bacteria or lead contamination and to implement other best management practices for drinking water to ensure your school or child care facility is providing safe drinking water to students and staff.

¹ Vinciullo F. The relationship between multi-component school health programs and school achievement. Paper presented at: Annual Conference of the National Association of School Nurses, 2008; Albuquerque, NM.

² Stolz A, Knickelbein, A., Coburn, S. Linking coordinated school health to student success. Paper presented at: Annual Conference of the National Association of School Nurses, 2008; Albuquerque, NM.

³ NRC (National Research Council). Green Schools: Attributes for Health and Learning. Washington D.C.: The National Academies; 2006.

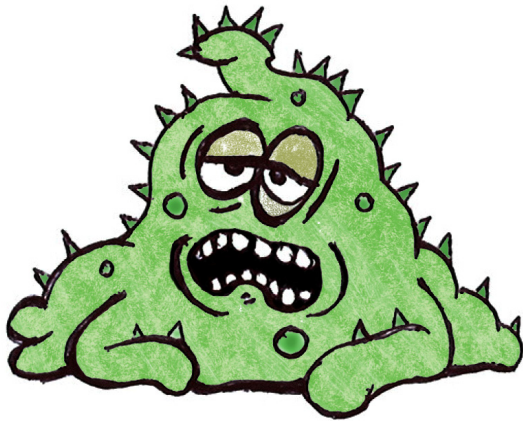
This guide identifies best management practices for drinking water in schools and child care facilities that are served by municipal drinking water systems to address the following issues:

- Bacteria that may grow within the plumbing system and hot water tanks, on water fountains and faucets, or enter the facility's distribution system (the building's pipes and plumbing) through cross connections;
- Elevated lead levels as a result of contamination from the facility's plumbing and drinking water fixtures; and
- Additional measures such as water conservation and educating students about drinking water.

Top Five Actions to Protect Drinking Water at Schools and Child Care Facilities

1. Clean drinking water fountains daily using procedures found in this guide.
2. Clean debris out of all outlet screens or aerators on a regular basis using the procedures found in this guide.
3. Test the facility's drinking water for lead. If lead is present, follow the actions for addressing lead contamination outlined in this guide.
4. Evaluate your facility for the presence of cross-connections and address any issues related to cross-connections by following the recommendations found in this guide.
5. If elevated lead levels are found, regularly flush all water outlets used for drinking or food preparation and install point-of-use devices, to provide additional treatment of drinking water at the outlet.

Bacteria



Bacteria are present throughout our environment. They have adapted to live and reproduce in a variety of environments, including inside animals and humans, and in water, soil and food. If harmful bacteria are present in drinking water sources, most are removed during the disinfection process. However, some may survive and enter the distribution system (the building's pipes and plumbing). Bacteria can also grow within the plumbing system, water fountains and faucets. Therefore, it is important to regularly clean your facility's water fountains, faucets and hot water tanks.

Lead

Understanding Lead Exposure

School officials and child care providers need to know whether the students, teachers and staff consume elevated levels of lead when drinking water in their facility, because exposure to lead can cause serious health problems, particularly for young children.

Lead in drinking water is primarily from materials and components associated with service lines and facility plumbing. Your municipal water supplier is responsible for providing high quality drinking water, but cannot control the variety of materials contained in the plumbing components used within your facility.

Health Effects of Lead

Lead can cause serious health problems if too much enters your body from drinking water or other sources. Some facts about lead exposure include:

- Infants, young children and pregnant women are at greatest risk to lead exposure;
- Increased lead levels have been shown to cause damage to the brain and kidneys;
- Increased lead levels interfere with the production of red blood cells that carry oxygen to all parts of your body;

Reduction of Lead in Drinking Water Act

A new requirement, signed into law by President Obama in January 2011, will further reduce lead in pipes, pipe fittings, plumbing fittings and fixtures to a weighted average of 0.25 percent. The Reduction of Lead in Drinking Water Act redefines "lead free" under the Safe Drinking Water Act to mean: not containing more than 0.2 percent lead when used with respect to solder and flux, the material used to join pipes and fixtures together (current law) and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings and fixtures. The new requirements will become effective in January 2014.

- Scientists have linked the effects of lead on the brain with lowered intelligence quotient (IQ) in children;
- Adults with kidney problems and high blood pressure can be affected by lower levels of lead more than healthy adults;
- Lead is stored in the bones and it can be released later in life; and
- During pregnancy, the fetus receives lead from the mother's bones which may affect brain development.



Example of lead pipes in a plumbing system.

How Lead Gets into Drinking Water

Soft water has a low pH, which is corrosive. Other factors however also contribute to the corrosion potential of the water and include water velocity, temperature, alkalinity, the type of disinfectant, the age and condition of plumbing and the amount of time water is in contact with plumbing. Of note, recent construction work on your facility's plumbing system (e.g., pipe replacement and utility lead service line replacement with copper components) may result in corrosion of remaining lead pipes or disturbance of settled debris within larger pipes in the system which may create new sources of contamination. The occurrence and rate of corrosion depend on the complex interaction between a number of these and other chemical, physical and biological factors.

Municipal water systems take steps to reduce the corrosiveness of the water. However, if the plumbing in your facility is made of lead or contains lead parts, corrosion may occur as the water moves through your facility's plumbing.

Potential Sources of Lead in Drinking Water

- Lead pipes in plumbing:
 - Dull gray in color and will appear shiny when scratched
 - Banned since 1986 and not widely used since the 1930s
- Copper pipes joined by lead solder:
 - Solder will be dull gray in color and will appear shiny when scratched
 - Banned since 1986 and many communities banned prior to 1986
- Brass pipes, faucets, fittings and valves:
 - May contain alloys of lead
- Sediments in screens on faucets:
 - Debris from plumbing can collect on screens and may contain lead
- Water service line to facility is made of lead:
 - Pipes that carry water from the municipal water system main to the facility may contain lead
- Water fountains in the facility may contain lead parts:
 - Specific brands of water fountains contain lead parts or have lead lined water tanks
 - Since 1988 it has been mandated that water fountains be lead free but older facilities may have outdated models



Copper pipes joined by lead solder.

Copper

Copper is widely used in household plumbing, sometimes without proper consideration of water quality. Excess copper exposure can cause stomach and intestinal distress, liver or kidney damage and complications of Wilson's disease. Children's bodies absorb more lead

and copper than the average adult because of their rapid development. Copper leaches into water through corrosion of the plumbing system – primarily from pipes, but fixtures, faucets and fittings made of brass can also be a source. The amount of copper in your water strongly depends on the acidity and types and amounts of minerals in the water, whether or not it is oxygenated or disinfected, how long the water stays in the pipes, the length of time the pipes have been in use and the water's temperature. Especially when the water pH is below neutral (7) and when the alkalinity of the water (bicarbonate content) is high, very high concentrations of copper can persist for many years in copper pipes and fittings found in new construction and remodeled or renovated buildings. Blue staining of water, sinks and fixtures can be an indicator of extreme copper plumbing corrosion.



Drinking Water Best Management Practices

Bacteria

Drinking Water Fountains

Drinking water fountains should be cleaned on a daily basis to reduce possible bacterial contamination. Fountains should also be included in the regular flushing of the facility's plumbing system (as described in the section Routine Measures for Reducing Lead Exposure).

Drinking Water Fountain Daily Cleaning Procedures¹

The following procedures should be considered for daily cleaning:

- Gather necessary materials and suggested protective equipment;
- Obtain Material Safety Data Sheets (MSDS) for all chemicals being used and review manufacturer's instructions for use;
- Check the flow of the water to make sure there is a constant stream;
- Spray disinfectant cleaner solution on the inside surfaces of the mouthpiece and protective guard;
- Using a scrub brush, clean the inside and outside of the mouthpiece and protective guard;
- Rinse the mouthpiece and protective guard with water; and
- Wipe drinking fountain surfaces with a clean cloth dampened with water.

It is also important to clean drinking water fountains to remove lime and calcium build-up. Lime and calcium build-up can begin to block



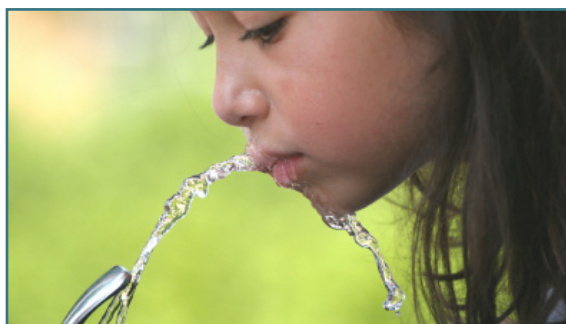
Lime build-up on mouthpiece and protective guard of drinking fountain.

the water from coming through the mouthpiece and going down the drain.

Removing Lime Build-up on Drinking Fountains or Ice Machines

- Spray descaler onto the bowl and back of the drinking fountain;
- Use a clean, lint-free cloth saturated with the descaler. Apply to the surfaces with the lime build-up. Let stand for the length of time recommended on the label;
- Wring out all excess solution from the cloth;
- Wipe the surface clean with the cloth. If necessary, use a brush or scrub pad to remove hard build-up. Be careful not to damage surfaces while scrubbing; and
- Thoroughly rinse the surfaces with clean water.

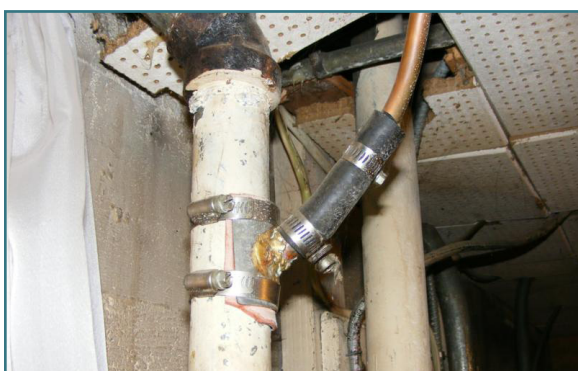
For a list of EPA-approved disinfectants to use in your facility, please visit: <http://www.epa.gov/oppad001/chemregindex.htm>



¹ Iowa State University Facilities Planning & Management – Custodial Task Procedures

Hot Water Tanks

Hot water tanks are susceptible to the development of biofilm, which is a surface deposit of bacteria that accumulates creating a slime layer. Similar to the plaque that forms on teeth biofilms accumulate over time. It is recommended that you consult with an experienced professional to have your hot water tank periodically cleaned to remove existing biofilms and sediments.²



A cross connection between a dishwasher drain (copper pipe) and a main pipe.

Cross Connections

A cross connection is an actual or potential connection between your facility's drinking water system and other liquids or substances. It is important to be aware of cross connections within your facility, as contamination can occur. Cross contamination from backflow of harmful substances may occur as a result of reduced pressure in the drinking water system or because of increased pressure in the contaminating source. Be aware, cross contamination may not be immediately apparent because a contaminant may not have a strong taste, odor or color.

² National Environmental Services Center, Tech Brief. Biofilm Control in Distribution Systems, Summer 2008, Vol. 8, Issue 2.

Boil water orders are issued by your municipal water system when elevated levels of bacteria and viruses are a concern. However, boiling water does not reduce lead levels in drinking water. Because some of the water evaporates during the boiling process, the lead concentration of the water actually increases as the water is heated. Hot tap water also dissolves lead more readily than cold tap water. If you are concerned about lead levels in your water and your municipal water system issues a boil water alert for reducing bacteria or viruses, you should find alternate sources of drinking water until the alert is over.

Cross contamination can happen at facilities under a number of circumstances, including:

- When a tube or hose from a faucet is submerged in a solution, beaker or custodian's sink;
- A pipe is connected from a drinking water source to chemical lab equipment, a storage tank or cafeteria equipment; or
- A hose is dropped into a waste/floor drain in an automotive shop, boiler room or cafeteria.



A garden hose creates a dangerous cross connection between potable and non-potable water.

Other sources of potential cross contamination include cross connections between the drinking water system and heating system boilers, water coolers, lawn sprinkler systems, fire sprinkler systems or soft drink machines.

Cross contamination can be prevented by using backflow prevention devices that only allow water to flow in one direction, from the source to the tap, so liquid cannot flow back down the tap and contaminate the water in the distribution system. Backflow prevention devices should be tested annually. If you have questions about cross connections and contamination, contact the local building/plumbing inspector or for more information on cross contamination please visit: <http://water.epa.gov/infrastructure/drinkingwater/pws/crossconnectioncontrol/index.cfm>.

Lastly, inspect your facility's pipes to make sure there are no leaks or outside indications of corrosion. Leaks in your plumbing system can be a way for bacteria to get into your water.

Lead

Voluntary Testing of Lead in Drinking Water

You cannot see, taste or smell lead in your drinking water. As such, testing the facility's water is the only sure way to know if there are elevated levels of lead in the water.

EPA developed the 3Ts for Reducing Lead in Drinking Water in Schools, Revised Technical Guidance (Training, Testing and Telling) to help schools and child care facilities implement simple strategies for managing the health risks of lead in drinking water. The 3Ts include:



Lead exposure poses a great risk to young children.

- **Training** school and child care facility officials to raise awareness of the potential occurrences, causes and health effects of lead in drinking water, assist facilities in identifying potential areas where elevated lead may occur, and establish a testing plan to identify and prioritize testing sites;
- **Testing** drinking water in the facility to identify potential problems and take corrective actions as necessary; and
- **Telling** students, parents, staff and the larger community about monitoring programs, potential risks, the results of testing and remediation actions.

The 3Ts for Reducing Lead in Drinking Water in Child Care Facilities is available at: <http://water.epa.gov/infrastructure/drinkingwater/schools/guidance.cfm#3ts>

EPA also developed the, “What Your School or Child Care Facility Should Know About Lead in Drinking Water” DVD available for order from the National Service Center for Environmental Publications (NSCEP) at: <http://water.epa.gov/infrastructure/drinkingwater/schools/guidance.cfm>³

Test the Facility’s Drinking Water for Lead



It is important to test all of the drinking water outlets in your facility, especially those that provide water for drinking, cooking and preparing juice and infant formula. Lead in drinking water can be a very localized problem and can vary from tap to tap. Just because there is lead getting into your water from one outlet does not mean that all your taps are vulnerable or contaminated. At the same time, just because one tap sample is free from lead does not mean that all your taps are clear. It is a good idea to test ALL outlets including drinking fountains and water faucets where water will be used for drinking or cooking. Unusual sources of drinking water, such as locker room shower heads and other non-drinking water taps used to fill water jugs and carboys, should also be included when tested for lead.

If your sink has separate hot and cold water knobs then samples should be collected from cold water as hot tap water is not recommended for food preparation or direct consumption. If

you have one lever, be sure to turn it on to the cold water side. The 3Ts for Reducing Lead in Drinking Water in Schools, Revised Technical Guidance, provides step-by-step guidance on how to properly collect samples and test your facility’s drinking water outlets for lead.⁴

The concentration of lead in your drinking water samples will be reported in metric form, such as milligrams per liter (mg/L) or micrograms per liter (µg/L), or as parts per million (ppm) or parts per billion (ppb).

EPA recommends that schools and child care facilities take action if samples from any drinking water outlets show lead levels greater than 20 parts per billion.

Routine Measures for Reducing Lead Exposure

Whether you have tested your water or not, or even if you have and your water has shown low levels of lead, there are best practices that will further reduce the potential for lead exposure at your facility as well as reduce sediment in your water.

Develop a flushing plan

- Determine how water enters and flows through your facility by developing a plumbing profile.⁵ Consult with your maintenance personnel, licensed plumber or local water service provider to develop a plumbing profile;
- Locate all water outlets that are used for consumption;

³ Also available by calling NSCEP at 1-800-490-9198. For International Orders: Call NSCEP at (301) 519-6640 or e-mail NSCEP at nscep@bps-lmit.com

⁴ See Section II: Testing of the 3Ts for Reducing Lead in Drinking Water in Schools, Revised Technical Guidance, available at: <http://water.epa.gov/infrastructure/drinkingwater/schools/guidance.cfm#3ts>

⁵ See Section II: Testing of the 3Ts for Reducing Lead in Drinking Water in Schools, Revised Technical Guidance, available at: <http://water.epa.gov/infrastructure/drinkingwater/schools/guidance.cfm#3ts>

- Identify the drinking water outlet(s) farthest from the main water service line (Note: If your facility has multiple wings there will be more than one outlet farthest from the main service line);
- Determine the best order to open and flush drinking water outlets, starting with those farthest from the main service line;
- Identify options for collection and non-potable re-use of flushed water (e.g., plant watering); and
- Develop a system for accountability, including identifying one person who is in charge and developing a record keeping system.

Flush all water outlets used for drinking or food preparation

- At the start of each day, before using any water for drinking or cooking, flush the cold water faucet by allowing the water to run for a period of time. Contact your municipal water system to find out what the recommended flushing time is for your facility based on your system size and piping. This should be done for all water outlets used for drinking or food preparation.
- Flushing, or opening up a tap and letting the water run, replaces the stagnant water that may have been in contact with lead-containing plumbing fixtures overnight or over the weekend. The longer water is exposed to lead pipes or solder the greater the likelihood of lead contamination.
- Flushing times vary depending on your buildings pipes and outlets, refrigerated water fountains can take as long as 15 minutes to properly flush out the reservoir.
- If many taps need flushing, the tap farthest from the main pipe should be opened for approximately ten minutes to flush out the main pipe. Then, individual drinking water taps should be flushed to rid stagnant water from the pipes. Keep in mind that if your facility has more than one wing there may be

more than one tap that is furthest from the water line.⁶

Use only cold water to prepare food and drinks

- Hot water dissolves lead more quickly than cold water and is therefore more likely to have greater amounts of lead.
- If hot water is needed, water should be drawn from the cold tap and heated.
- Use only thoroughly flushed water from the cold water tap for drinking and when making mixed baby formula, juices or foods.

Clean debris out of all outlet screens or aerators on a regular basis

- Small screens on the end of a faucet can trap sediments containing lead. Note: Aerators are often used to regulate flow, reduce splash and conserve water. Check to see if your faucets have aerators, since not all faucets have them.



Faucet Aerators

Many taps that are used to provide water for human consumption have an aerator as part of the faucet assembly. Aerators serve to introduce air into the water flow which makes it feel as if a larger water flow is coming out of the tap. The use of aerators is a common water conservation practice. Screens are not intended to remove contaminants in the water, but may trap sediment or debris as water passes through the faucet. Lead bearing sediment may end up in drinking water from physical corrosion of leaded solder and can build up in the aerator over time.

⁶ Lead in School Drinking Water Program (<http://www.mass.gov/dep/water/drinking/sclcatlg.pdf>).

Faucet Aerators Cleaning Procedures

- Remove the aerator by twisting off with hands or pliers;



- One or more parts are contained within the aerator. Note the order and orientation of the parts as you remove them;



- Rinse the pieces with water and brush off the debris. For deposits that are difficult to remove, soak the parts in water for a few minutes and scrub with a new toothbrush. Backwashing aerator components is also an effective cleaning method for many aerator types. Hold removed aerator upside down under flowing water to backwash screens and mesh filters;



- If any parts are cracked or broken, replace them. If the washer has hardened it should be replaced; and



- Reassemble the aerator by screwing it back onto the faucet and hand-tighten.

It is not recommended that aerators be removed from faucets immediately before sampling for lead as the sample will fail to identify the typical available contribution of particulate lead from that tap and thus additional actions needed to reduce exposure to lead in drinking water will fail to be taken.

However, if the results from the initial sample are above the action level, you can consider taking a second sample to determine whether particulate matter is the source of lead. For this sample, the aerator would be cleaned or removed prior to sampling so that the two samples could be compared.⁷ It is advised that a regular cleaning schedule be established for aerators.

The frequency of cleaning depends on how quickly the debris builds up on the inside walls of the aerator. Generally, the aerator should be cleaned at least quarterly. If blockages from scale or particulate accumulation are noticed, the frequency should be increased to monthly. Flow pattern changes are an indication of buildup.

⁷ EPA, Oct 2006. Memorandum: Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule. Available at: http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/upload/2006_10_27_lcrmr_memo_tapsamples-aerators_10202006.pdf.

Follow-up lead monitoring

Water quality changes over time and it is important to make sure that the water in your facility remains free of lead. Periodic retesting of fixtures is recommended.

Respond to Elevated Lead Levels

EPA recommends that schools and child care facilities take action if samples from drinking water outlets show lead levels greater than 20 ppb. Any outlet with test results above this level should not be used until the source of the contamination is found and the lead levels are reduced to 20 ppb or less. If you are going to stop using an outlet due to high lead levels you should place a physical barrier, such as tape or an illustrative sign over the faucet so that everyone knows it should not be used until it is fixed. In addition, you should encourage parents to have their children's blood tested for lead if high lead levels are detected in the water. Facilities should develop Standard Operating Procedures (SOPs) for responding to elevated lead levels and administrators or directors should be encouraged to communicate this information to parents (or the teachers) so they can protect their children. The following remedies can be used to respond to elevated lead levels:

Provide an alternative "lead-free" drinking water

- Bottled water can be used as a temporary measure; and
- Make sure the bottled water distributor meets federal and state bottled water quality standards (which are different than tap water) and that their filtration technology is National Sanitation Foundation International (NSF) certified for lead reduction (<http://www.nsf.org/>).

Remove sources of lead in the plumbing system

These remedies are most appropriate for localized contamination problems and are best handled by a licensed plumber:

- Replace solder joints with lead-free joints;
- Replace the outlet or fixture/faucet with "lead-free" materials (according to NSF/American National Standards Institute (ANSI) Standards 61 and 372; or
- Replace piping with "lead-free" materials (according to NSF/ANSI Standards 61 and 372).

You can search for NSF Drinking Water System Components here: <http://www.nsf.org/certified/pwscomponents/>

Prior to replacing fixtures when elevated lead levels are determined, be sure to test the new fixtures to ensure the fixtures are "lead free." If you are purchasing a large volume of faucets ask the manufacturer or vender to test the faucets with your local tap water to make sure no lead is leached out of the faucets. If you are only purchasing a few faucets make sure the fixtures are certified as lead-free according to NSF/ANSI Standard 61 for lead content.

Install point-of-use treatment devices



A faucett filtration system.

- A point-of-use (POU) device is a filtration system that can be installed directly on a drinking water outlet.
- Use a device that is certified by NSF

International to remove lead.⁸

- Maintaining POU treatment devices is very important. Refer to the manufacturer's instructions for maintenance procedures. If not maintained properly, some treatment devices may increase lead and other contaminant levels.
- If using a POU device you should do follow up testing to make sure the water is still below the action level.
- With the use of a POU device, flushing is not necessary.
- If using POU devices on some faucets, but not all, make sure that faucets without a POU device are clearly labeled that they are not for drinking or cooking water.

Communicate with Your Community about the Voluntary Lead Testing Program

It is important to communicate early and often about your testing plans, results and next steps. Telling parents and staff about your voluntary lead testing program will demonstrate your proactive commitment to protecting the health of your students and staff and build confidence in your facility's ability to provide a safe and healthy environment, whether or not elevated lead levels are found in your facility.

Additional Considerations

Copper

Testing for copper may be appropriate if your water is somewhat acidic (with a pH below 7) and when it is disinfected. Copper corrosion decreases steadily over time under normal water usage conditions, but elevated copper levels can persist for many years in new copper pipes. If you are experiencing blue staining of your water, sinks, bathtubs or showers or if there is growing blue encrustation on the fixtures, this may be an indicator of high copper levels, and you should have your water tested for both copper and lead. If you are experiencing elevated copper levels in the drinking water system, the easiest method for reducing exposure to copper is to flush the system to avoid drinking or cooking with water that has been in contact with the plumbing system for more than four hours. Particularly when first drawing water in the morning, flush the system by running the cold water faucet long enough to get fresh water from the main, which could vary from about two minutes to five or ten minutes, depending on the size and length of the pipes and the flow rate. Each faucet where water is drawn for drinking or cooking purposes should be flushed separately, starting with the faucet or outlet farthest from where the fresh water enters the building.

⁸ The Lead and Copper Rule: Quick Reference Guide for Schools and Child Care Facilities that are Regulated Under the Safe Drinking Water Act, available at: http://water.epa.gov/infrastructure/drinkingwater/schools/upload/2006_1_11_schools_lead_sqrg_lcr_schools.pdf.

Water Conservation

Schools and child care facilities use large amounts of water every day for heating and cooling systems, restrooms, drinking water, cooking, locker rooms, cafeterias, laboratories and outdoor playing fields and lawns. Options to conserve water for these facilities include:

- Consider replacing old equipment such as dishwashers with energy and water saving devices;
- Repair water leaks and leaky toilets;
- Install aerators and automatic shut-off devices on faucets;
- Using low-flow shower heads and timer shut-off devices to reduce water use during showers;
- Installing timers on sprinklers;
- Installing toilet dams on older models;
- Replacing plants and grasses that require a lot of water with native sustainable vegetation; and
- Using rain barrels and teach the students about green roofs.

WaterSense

The WaterSense program promotes water efficiency and enhancing the market for water-efficient products, programs and practices. Since the program's inception in 2006, WaterSense has helped consumers save a cumulative 46 billion gallons of water and \$343 million in water and sewer bills. For additional information, visit: <http://www.epa.gov/watersense/>

Teaching Students about Drinking Water

There are a variety of ways to teach students about drinking water:

- Early science classes demonstrating the water cycle;
- Mathematics classes demonstrating supply and demand principles;

- History lessons discussing early settlement patterns near water sources and our nation's system of government, laws and regulations provide important knowledge for water resource decision-making.
- Involve students in the voluntary lead testing program to make it a teaching moment, ensuring that the students wear proper safety equipment and are not exposed to lead.

EPA has developed numerous resources and activities for students and teachers, including:

Drinking Water in Schools and Child Care Facilities (EPA)

Provides multiple resources regarding lead in drinking water, including health information, an overview of laws and regulations and guidance. Website: <http://water.epa.gov/infrastructure/drinkingwater/schools/index.cfm>

Kid's Stuff: Drinking Water and Ground Water (EPA)

Provides activities and materials for students and teachers for grades K-3, 4-8 and 9-12. Website: <http://water.epa.gov/learn/kids/drinkingwater/index.cfm>

Water Science and Technology for Students and Educators (EPA)

Water-related activities and resources for students and teachers. Website: <http://water.epa.gov/learn/resources/index.cfm>

That Magnificent Ground Water Connection (New England Interstate Water Pollution Control Commission in coordination with EPA)

Classroom activities for students demonstrating the many characteristics, uses and threats to ground water resources in New England. Available for grades K-6 and 7-12. Selected activities are available at: <http://www.epa.gov/region1/students/teacher/groundw.html>

Resources

3Ts for Reducing Lead in Drinking Water in Schools

Provides detailed guidance for schools that receive their drinking water from municipal water supplies regarding training and testing for and communicating about lead in drinking water.

Website: <http://water.epa.gov/infrastructure/drinkingwater/schools/guidance.cfm#3ts>

3Ts for Reducing Lead in Drinking Water in Child Care Facilities

Provides detailed guidance for child care facilities that receive their drinking water from municipal water supplies regarding training and testing for and communicating about lead in drinking water.

Website: <http://water.epa.gov/infrastructure/drinkingwater/schools/guidance.cfm#3ts>

EPA's Website on Lead

<http://www.epa.gov/lead/>

EPA's Website on Lead in Drinking Water

<http://water.epa.gov/drink/info/lead/index.cfm>

EPA's Website on Reducing Lead in Drinking Water in Schools and Day Care Centers

http://water.epa.gov/drink/info/lead/schools_index.cfm

Centers for Disease Control and Prevention's Website on Lead

<http://cdc.gov/lead/>

National Lead Information Center Hotline: (800) 424-LEAD

EPA's Safe Drinking Water Hotline: (800) 426-4791

Are You Providing Safe Drinking Water at Your School or Child Care Facility?

For Schools and Child Care Facilities With Their Own Drinking Water Source

Caring for Our Children: National Health and Safety Performance Standards Guidelines for Early Care and Education Programs, 3rd Edition (2011)

Provides national standards that represent the best evidence, expertise and experience in the country on quality health and safety practices and policies that should be followed in today's early care and education settings. Chapter 5 covers drinking water safety, lead testing and appropriate plumbing.

Website: <http://nrckids.org/CFOC3/index.html>

State Drinking Water and Lead Prevention Information Sources

State drinking water programs can describe state-specific requirements and provide additional guidance materials for schools. For a complete list of State Drinking Water program contacts and lead prevention information sources, see:

Implementing the Lead Public Education Provision of the Lead and Copper Rule for Non Transient, Non Community Water Systems, Appendix C:

<http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/upload/Implementing-the-Lead-Public-Education-Provisions-of-the-Lead-and-Copper-Rule-A-Guide-for-Non-Transient-Non-Community-Water-Systems.pdf>

Implementing the Lead Public Education Provision of the Lead and Copper Rule for Community Water Systems, Appendix C:
<http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/upload/Implementing-the-Lead-Public-Education-Provisions-of-the-Lead-and-Copper-Rule-A-Guide-for-Community-Water-Systems.pdf>

Glossary

Acidic:

The condition of water or soil which contains a sufficient amount of acidic substances to lower the pH below 7.0.

Action Level:

The level of lead or copper which, if exceeded, triggers treatment or other requirements that a water system must follow.

Alkalinity:

The capacity of water to neutralize acids. This capacity is caused by the water's content of carbonate, bicarbonate, hydroxide and occasionally borate, silicate and phosphate. Alkalinity is expressed in milligrams per liter of equivalent calcium carbonate. Alkalinity is not the same as pH because water does not have to be strongly basic (high pH) to have a high alkalinity. Alkalinity is a measure of how much acid can be added to a liquid without causing a significant change in pH.

Alloy:

A solution made of two or more elements, at least one of which is a metal.

Backflow:

A reverse flow condition created by a difference in water pressures which causes water to flow back into the distribution pipes of a potable water supply from any source or sources other than an intended source.

Backwashing:

The process of reversing the flow of water back through the filter media to remove the entrapped solids.

Bacteria:

Microscopic living organisms usually consisting of a single cell. Bacteria can aid in pollution control by consuming or breaking down organic matter in sewage or by similarly acting on oil spills or other water pollutants. Some bacteria in soil, water or air may also cause human, animal and plant health problems.

Contaminant:

Anything found in water (e.g., microorganisms, minerals, chemicals, radionuclides, etc.) which may be harmful to human health.

Corrosion:

The gradual decomposition or destruction of a material by chemical action often due to an electrochemical reaction. Corrosion may be caused by: 1) stray current electrolysis, 2) galvanic corrosion caused by dissimilar metals or 3) differential concentration cells. Corrosion starts at the surface of a material and moves inward.

Cross-Connection:

Any actual or potential connection between a drinking (potable) water system and an unapproved water supply or other source of contamination. For example, if you have a pump moving non-potable water and hook into the ground water system to supply water for the pump seal a cross-connection or mixing between the two water systems can occur. This mixing may lead to contamination of the drinking water.

Descaler:

A solution used to remove and/or prevent limescale and fouling on water taps, kettles, coffeemakers, toilets and water pipes.

Disinfectant:

A chemical (commonly chlorine, chloramine or ozone) or physical process (e.g., ultraviolet light) that kills microorganisms such as bacteria, viruses and protozoa.

Distribution System:

A network of pipes leading from a treatment plant to customers' plumbing systems or the pipes and plumbing within a building that distribute water to all of the water outlets.

Ground Water:

The water that systems pump and treat from aquifers (natural reservoirs below the earth's surface).

Lead Service Line:

A service line made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck or other fitting which is connected to such a lead line.

Monitoring Program:

Testing that water systems must perform to detect and measure contaminants. Specifically, measuring concentrations of certain substances within environmental media (e.g., drinking water) at regularly scheduled intervals.

Municipal Water System:

A network of pipes, pumps and storage and treatment facilities designed to deliver potable water to homes, schools, businesses and other users in a city or town.

Non-Potable Water:

Water that may contain objectionable pollution, contamination, minerals or infective agents and is considered unsafe and/or unpalatable for drinking.

pH:

A measurement of how acidic or basic a substance is. It ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic and a pH greater than 7 is basic.

Point-of-Use Device:

A treatment device applied to a single tap used for the purpose of reducing contaminants in drinking water at that one tap.

Potable Water:

Water that is safe and satisfactory for drinking and cooking.

Remediation:

Removal of pollution or contaminants from environmental media such as soil, ground water, sediment or surface water for the general protection of human health and the environment.

Samples:

The water that is analyzed for the presence of EPA-regulated drinking water contaminants. Depending on the regulation, EPA requires water systems and states to take samples from source water, from water leaving the treatment facility or from the taps of selected consumers.

Soft Water:

Water having a low concentration of polyvalent cations, such as calcium and magnesium ions. According to U.S. Geological Survey guidelines, soft water is water having a hardness (concentration of polyvalent cations) of 60 milligrams per liter or less.

Solder:

A metallic compound used to seal the joints between pipes. Until recently, most solder contained 50% lead. The use of lead solder containing more than 0.2% lead is now prohibited for pipes carrying potable water.

Toilet Dam:

A water-conservation device that is placed inside the tank portion of a toilet to reduce the amount of water the tank will hold by partitioning off part of the tank.