To National Drinking Water Advisory Council, Comments by Susan Kanen, 9/26/2012

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Compliance with the Lead and Copper Rule (LCR) does not accurately determine if the public is exposed to harmful levels of lead leaching into drinking water from lead service lines (LSL).

a) Research in DC on lead leaching in drinking water from LSL pipeloops is misrepresented and manipulated to falsely demonstrate results that underestimate lead leaching in an attempt to be consistent with LCR Compliance as presented by DC Water utility
b) DC Water is manipulating LCR Compliance using site selection, sampling protocol, seasonal sampling
c) Over time additional studies are documenting the failure of the LCR to be protective of public health. Included in my comments is a list of quotes from experts that lead contamination in drinking water from LSL is still an issue.

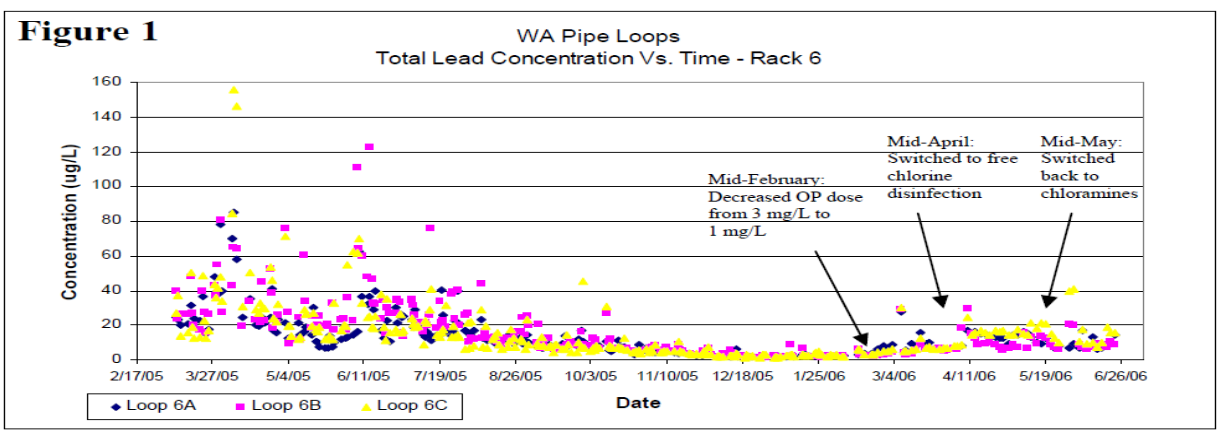
Adherence to the current LCR underestimates the exposure to the public of lead contamination of drinking water from LSL and the LCR is not protective of public health.

DC LEAD PIPELOOP STUDIES

I observed the Dalecarlia LSL pipeloops in Washington, DC produce over 100 ppb lead at the 2005 summer temperature peak. This was one year after system-wide addition of orthophosphate corrosion inhibitor. There has been over 10,000 lead concentration data points in this experiment. The data was misrepresented online until July 2010 and manipulated data continues to be posted online to this day.

The EPA presentation of the data removed from online at the EPA website on DC Lead in July 2010: http://www.epa.gov/dclead/WA_rack_6_Aug06.pdf

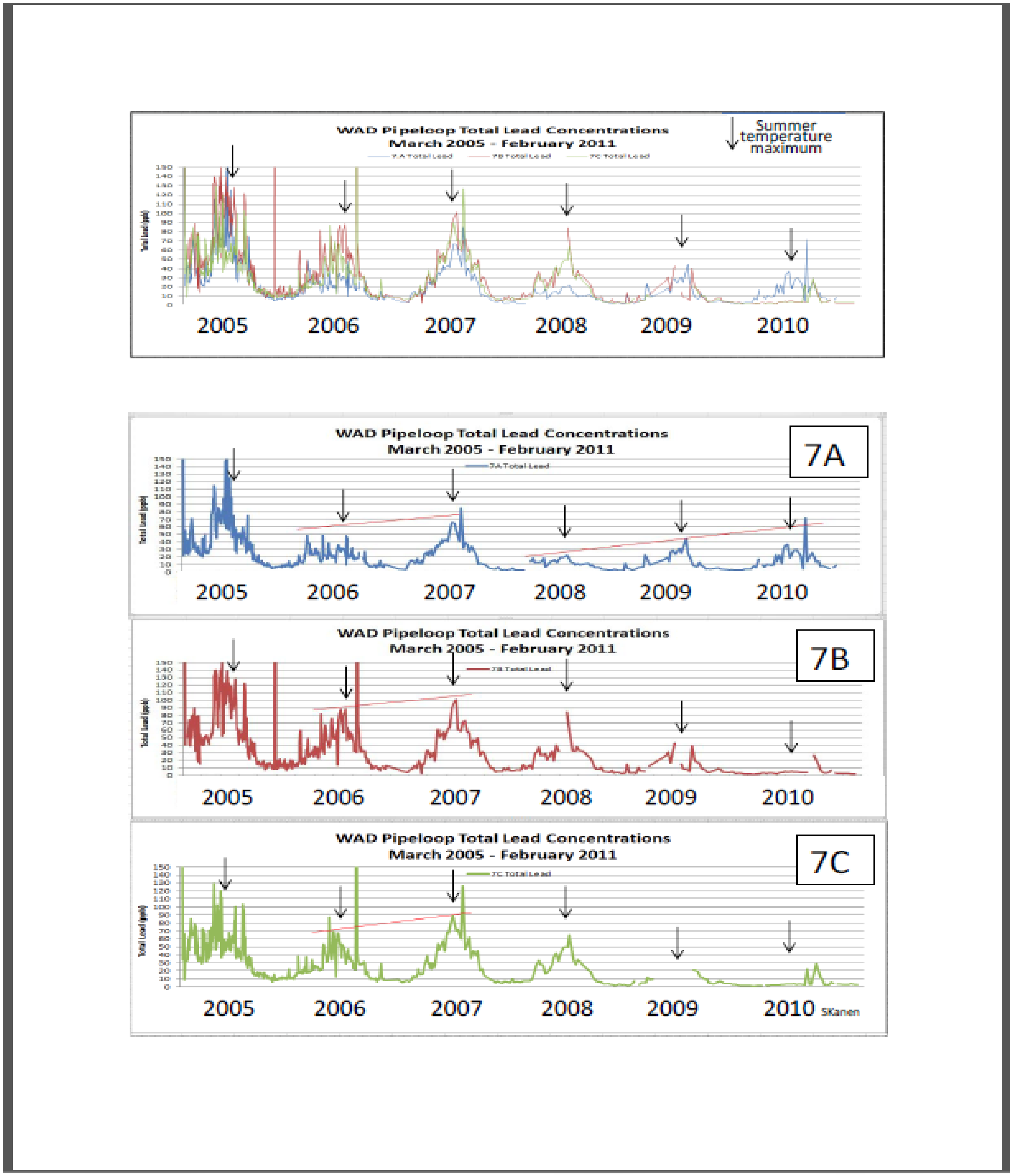
Washington Aqueduct Pipe Loop Study – Updated August 2006



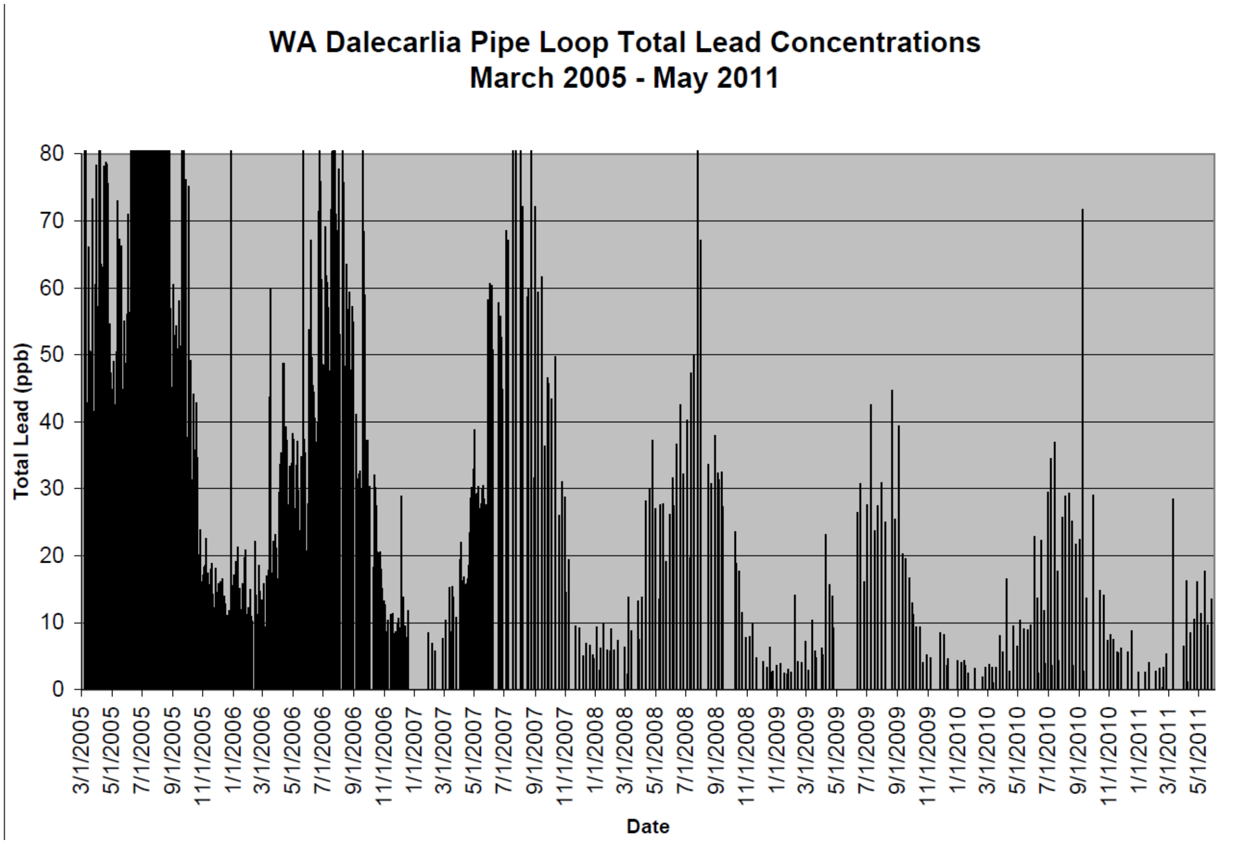
This 2006 chart above was from the data generated by the experimental conditions at Dalecarlia water treatment plant. From this chart, it looks like the lead was high and over time diminished to levels below 15 ppb and the lead leaching was solved once and for all end of 2005. The three loops of Rack 6 in this chart with additional caustic added and were not representative of water distributed to DC residents as in Rack 7 with pH control using lime. The data from unrepresentative Rack 6 was further misrepresented by cutting off the data after June 2006 thus truncating the known recorded upturn in the lead results (data points from 30 to 60 ppb in Rack 6, summer 2006) due to warmer weather. This upturn can be seen on this chart although the expanded y axis obscures the amplitude of the returning upturn in lead results for the spring of 2006. All data points were reported are too low since not all the piping in the loops was lead and the additional water from plastic pipe diluted the lead results by a factor of about two times. A large font on the data points rather than a line chart further obfuscates the results. The lead in DC drinking water crisis was claimed to be solved at the time of second semester 2005 LCR Compliance results and the WA lead pipeloops research was misrepresented in an attempt to falsely confirm this. The EPA finally removed these two pages from their website on DC Lead, Corrosion Control Research in July 2010. The replacement charts in the years since representing this study are from three triplicate loops of Rack 7 which is more representative of distribution water to DC. I have been pointing out the continued misrepresentation in the data presentations recorded in the Technical Expert Working Group (TEWG) minutes since February 2011.

From my version of the data in the multi-colored line chart below, the three triplicate loops of Rack 7 can be clearly seen. Up to 4/2008 the triplicate values are in very good agreement and on parallel courses. Up to 4/2008 the three loops are consistently proportional to each other. The reason for this is at the time of startup, the 13 foot of LSL used for each loop was attached by the plumbers to variable amounts of nonleaded piping. The center loop 7B in red on my chart is usually more concentrated in lead since the center pipeloop was closer to the sample tap location. Loops 7A and 7C left and right were farther from the center tap and had more nonleaded piping and therefore their lines are consistently below 7B in lead concentration due to dilution of water contained in extra nonlead piping used to connect the loop to the sample taps. Before 4/2008 all three loops peaked each year at the summer's maximum temperature. Zoom in on the first chart below with all three loops. Also look at each three loop charted separately on the next page. Seasonal lead peak at the exact time of the temperature peak and the change in the proportion of the three loops to one another are patterns very well established for three years at WA loops. The repeating impression crafted by WA authored charts is that of continual improvement in lead levels, but careful observation of my version of the data shows times of increasing lead levels. Dates of unexplained missing samples are more apparent in my charts below. The same data is used by WA in the black bar graph later in this report has a much different effect. Misrepresenting the data in 2006 with the Rack 6 results continues again. In 2006, the EPA/WA chart lead levels dropped to successfully diminished levels over about 4 months, just like the LCR Compliance in DC success. This was exposed in the pipeloops chart with return of summer lead levels in rack 7 in 2006, 2007, up to 4/2008 when the appearance of the WA pipeloops data falls apart. Now the WA charts seem to be trying to show high levels at summer peaks slowly over 8 years diminish to acceptable <15 ppb. I didn't buy this story in 2005 and I don't buy it now. The WA pipeloops were/are being misrepresented and manipulated. This research is potentially of much better quality than looking at LCR Compliance data to assess effectiveness of corrosion control on lead leaching from LSL. The WA pipeloop data is from the same sites repeated in triplicate over years generating multiple lead concentration values with computer controlled sampling protocol and stable ambient conditions. In future studies, I hope scientists will more carefully control the most important variables demonstrated at WA pipeloops of temperature and pH before assessing any other contributors to lead leaching from LSL.

Chart below authored by SKanen:



I produced the previous multicolored line chart from the same data that the Washington Aqueduct (WA) produced the following black bar chart below. Both charts appear in the June 2, 2011 TEWG minutes. http://www.epa.gov/dclead/TEWG632011.pdf



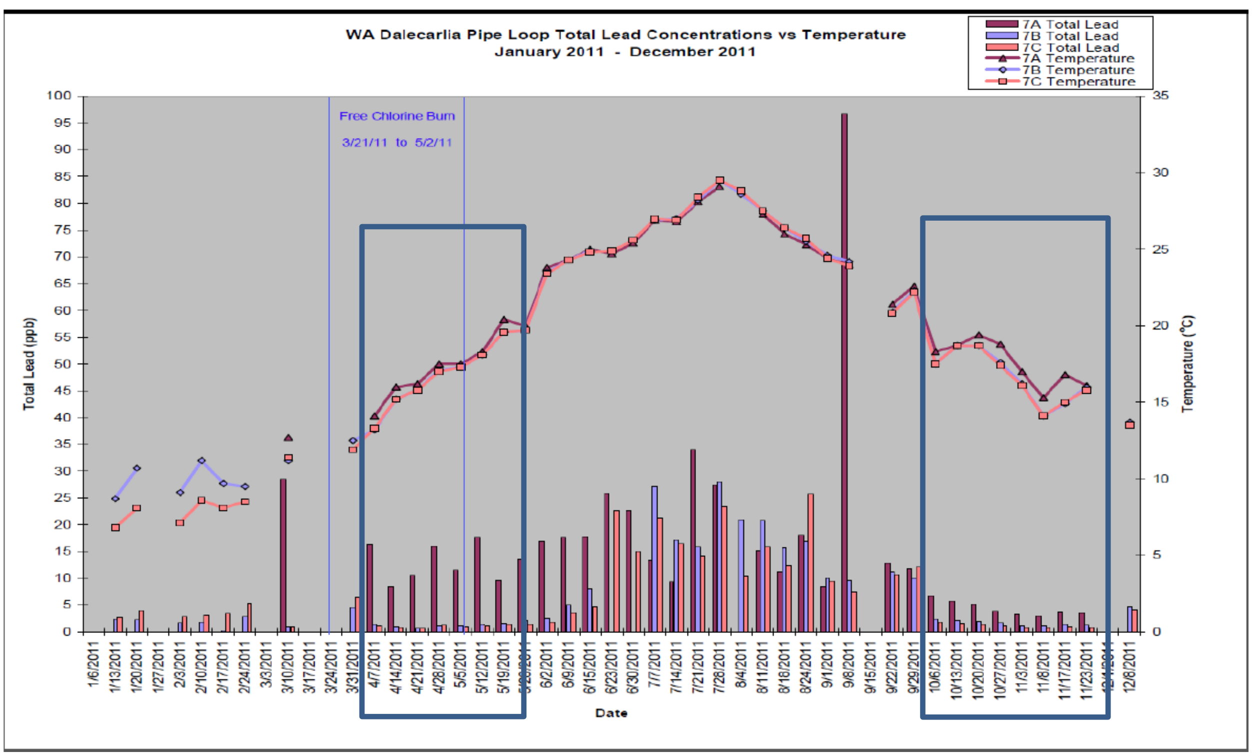
Note the WA version has no legend describing 3 separate loops or that they are from Rack 7 with lime not the discontinued Rack 6 experimental loops with caustic added as posted online until July 2010. The three separate triplicate loops 7A, 7B. 7C cannot be differentiated in this WA version. The data is grossly misrepresented and evidence of manipulation can be seen by comparing to my version of the same data. There is a lack of agreement in the three triplicate loops starting 4/2008 and the totally missing samples of loop 7C in summer 2009. In evidence is three years from 2005 to 4/2008 of lead leaching at over 100 ppb (correcting for sample dilution with plastic tubing) varying exponentially with temperature. After 4/2008 when the contractors no longer monitored this project at the WA, the data losses this pattern and summer peaks are missing and the three loops no longer agree. Now in 2013 predictably as a result of gross manipulation, the WA pipeloops charts have flat lined to no more lead leaching at all. See the chart presented for the Aug 2, 2013 TEWG meeting below. I believe this erroneous collection of data in the chart below is contrived to find agreement with the false impression of the low level of lead leaching from LSL done by DC Water in their presentation of LCR Compliance results.

Stagnation time manipulation was in evidence in the next chart below for WA pipeloops showing only 2011 data. This was hidden by in the black bar chart above by reformatting the three separate data series from loops 7A, 7B, and 7C to black (not the grey scale default setting) to hide in some years over 20% missing scheduled samples and that the three triplicate loops were no longer in agreement.

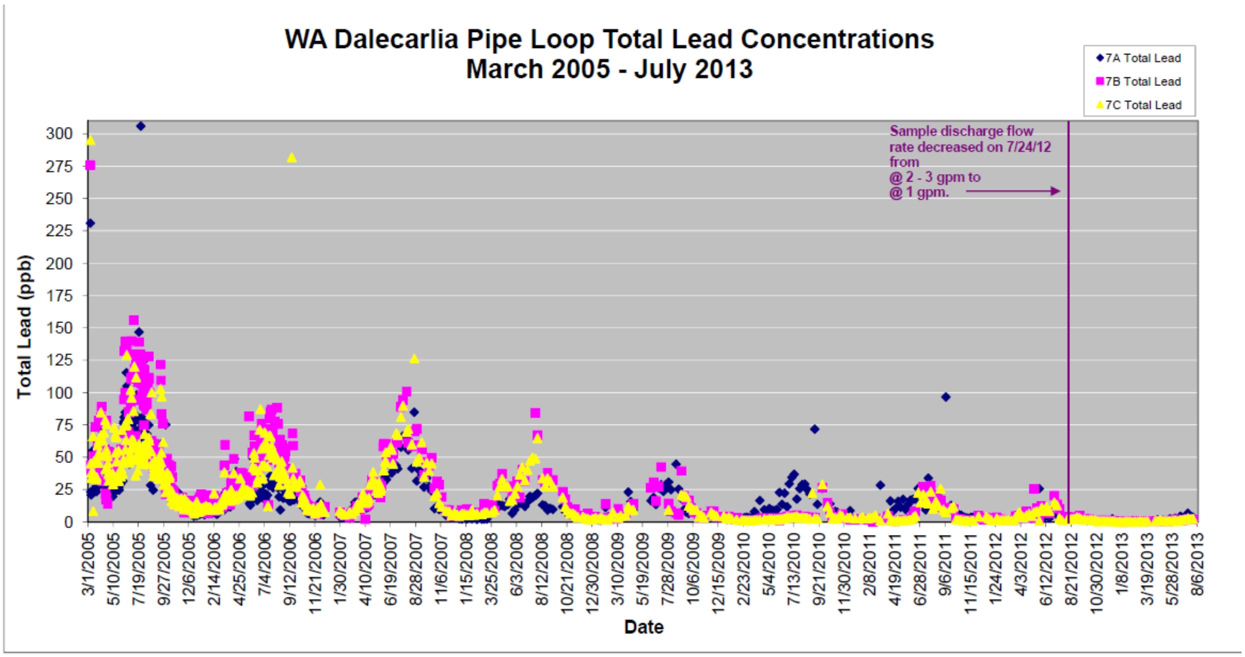
If stagnation time is manipulated in one loop, there can be no confidence that the technique of varying stagnation time is not an ongoing proposition. On my independent sampling there in July 2011, I was not allowed to observe stagnation time of samples in the loops and the LSL pipeloops were still generating 55 ppb lead (corrected for dilution water from non lead piping) as late as July 2011, seven years after optimal corrosion control treatment.

The room temperature deep in the lower floors of the Dalecarlia treatment plant is slightly different than river temperature and it takes time for the water in the lead pipeloops to equalize to ambient room temperature. The different lead and temperature results in loop 7A as opposed to 7B and 7C indicate the three triplicate loops were not soaking the same length of time therefore not leaching the same amount of lead in the spring and winter of 2011. See inside blue rectangles. Loop 7A has consistently higher temperatures than 7B and 7C for the dates that it has higher levels of lead leaching. All three loops, 7A, 7B, and 7C are supposed to be triplicate samples. Interesting that loop 7A with historically in 2005 to 4/2008 had lower lead levels than the other two loops, in 2009 and 2010, loop 7A has the highest lead levels of the three loops of Rack 7.

Evidence of stagnation time manipulation in the chart below:



Note in this latest WA version below, at my suggestion, the legend is back identifying the three separate loops. The deceptive bars with black reformatting are replaced by three colors of data points. Still their fonts are unnecessarily too large hiding much data. Despite all the irregularities I have pointed out over years, the EPA officials seem to do nothing to hold WA to account. I would volunteer to investigate this experiment with an independent committee to validate that all data was included and experimental conditions were not altered without notification over the course of the experiment.



Misrepresentation of the WA pipeloops in the following AWWA and EPA report:

Awwa Research Foundation
Advancing the Science of Water

EPA

Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues

The WA pipeloops are discussed in this report posted on http://www.epa.gov/dclead/corrosion_research.htm with a link to

http://www.waterrf.org/PublicReportLibrary/91229.pdf

My assessment of this report:

3 Factors in Error in AwwaRF 3018 concerning WA Pipeloops:

- 1. Dilution by non-lead pipe = **2.0/1.1** ratio of total water volume to leaded pipe volume
- 2. Selective averaging of concentration values of lead at cooler temperatures taken from Nov05 –May06 Racks 2,3,6,7 and average to Nov05-Jan06 values for Racks 1,4,5. Only Rack 7 is valid, all racks used in AwwaRF 3018 average of **7.3 ug/l**. (true level at summer peaks of **80ug/l** for 2005,2006,2007)
- 3. Omitted factor for total number of liters in a LSL, a factor from 4.4 to 10 times. Using factor of 4.7 of Table 3.9:
- RESULTANT % ERROR IN MASS OF LEAD FROM LSL BASED ON WA PIPELOOPS= **683/17.1=4000%**

The data analysis of the WA pipeloops by the EPA and AWWARF missed the contribution of LSL to lead leaching as demonstrated at the WA pipeloops by a factor of 40X. Nevertheless the full report does afirm the major contribution of LSL to lead in drinking water contamination.

Table ES.1
Average % Contribution of Major Lead Sources

Lead Source	Average % Contribution to Mass of Lead Measured at Tap during Profile Sampling [(1)]
Lead Service Lines	50% - 75%
Premise Piping	20% - 35%
Faucets	1% - 3%

(1) From sites with lead service lines. Based on "mass of lead" results measured at the tap from sequential samples collected for this study

The other two lead pipeloops sites are at the McMillan site in DC and at DC Water utility. Data from these two lead pipeloop sites, if examined carefully, erroneously portray lead leaching from LSL as a problem solved. Since most of the lead is particulate, the McMillan pipeloops being horizontal and sampled at low flow rate leave much of the lead generated behind sedimentated in the loop at the time of sampling see my report on Particulate Lead in the TEWG minutes of 3/2/2012. I demonstrated this in lead measurements of the water to drain immediately after sampling at the McMillan loops. The DC Water pipeloops are a recirculating system with the 100 liter tank water replaced every 24 hours. Any lead leached from LSL in about 1 liter is diluted 100X before sampling. The current DC Water pipeloops generate lead at the rate of 9X an LCR Compliant sample. My calculations and concerns are outlined in TEWG minutes of 8/26/11 with these calculations below from sampling done July 2011.

All three pipeloop sites have been adjusted to give the public a false sense of security that the lead in water crisis is solved.

	Length of lead pipe, 1 foot contains 0.095 liter/ft	Lead results from 3 sites analyzed by Virginia Tech	Dilution by non-leaded compo-nents of the loop	Select a stagnation time	Total lead mass in ug generated per loop	Lead mass in **ug per foot LSL**, 8 hours stagnation, temperature 28 deg C, pH 7.7	All lead generated contained in the water volume inside lead pipe	Comparing to 15 ppb compliant samples
SITE	Calculate:	ppb or ug/liter	times	times	equals	divide by feet of lead pipe per loop	divide by 0.095liter/ft	divide by 20 ppb
WASA 7/12/2011	9 ft (0.86 liter)	**4 ppb**	100 liters 0.86	8 hours 24 hours	155ug	155 ug/ 9 ft = **17** ug/ft	180 ppb or ug/liter	**9X**
McMillan 7/8/2011	12 ft (1.14 liter)	**3.5 ppb** Loop 3	2.0 liters 1.14	8 hours 8 hours	6.1ug *10ug	6.1 ug/12ft = **0.51** ug/ft *10 ug/12ft = **0.83** ug/ft	5.4 ppb *8.7 ppb	***0.44X**
Dalecarlia 7/7/2011	13 ft (1.24 liter)	**27 ppb** Loop 7B	2.0 liters 1.24	8 hours 8 hours	44 ug	44 ug/13ft = **3.4** ug/ft	36 ppb	**1.8X**
LCR compliant sample	10.5 ft (1.0 liter)	<15 ppb	none	8 hours 6 hours	<20 ug	<20 ug/10.5 ft=<**1.9**ug/ft	20 ppb for 8 hours stagnation	1X

*includes ug of lead flushed by two volumes of water through the loops to the drain immediately after sampling, does not include any ug lead generated during 8 hour stagnation left behind in the loop after sampling

DC WATER LCR COMPLIANCE SAMPLES

Do all sites used by DC Water for LCR Compliance meet Tier 1 requirements? NO

Errors in service line material record keeping is not a new problem with DC Water (WASA). http://www.epa.gov/dclead/index.htm in 2006 "DC WASA to Pay $10,000 Penalty for Reporting Errors". Twelve samples were invalidated from the 2nd semester 2005 LCR Compliance list and 37 sites were removed from the 2006 LCR sampling list **because the LSL was fully replaced**. For 2nd semester 2012 LCR samples from Washington, DC, an amazing 67% rarely produce lead concentrations over 3 ppb in first or second draw. One explanation is some of these sites **have fully replaced LSL**. The site, 43XX 38th St NW, was removed from 2012 LCR sampling list since it no longer had LSL. 43XX 38th NW sampled 11/4/11 was posted online as having a copper service line on DC Water's 2nd semester 2011 LCR sample list. I was told it was posted as copper service in error online, that on 11/4/11 the site still had a partial LSL and it was replaced in 12/2011.

How the non LSL invalidations even showed up in 2005 was the customer wrote on their chain of custody-this house doesn't have a LSL. The second 2005 LCR Compliance was calculated with three sites on it with known LSL totally replaced, non Tier 1 for LCR left on because WASA didn't know at the time of sampling and reporting the service material. This is OK with EPA. The final LCR calculation for 90 percentile for semester of 2nd semester 2005, the first LCR compliant semester in DC since exceeding LCR action level for lead, a change of ***one site, one ppb of lead*** and the whole city of Washington DC would be out of LCR Compliance. This is absurd. (on the second semester 2005 Compliance list with completely replaced LSL are "A" St. Huidekopper Pl and Carrollsburg Pl). Lisa Donahue of EPA wrote to file signed on June 4, 2006 there were OTHER fully replaced sites on 2nd 2005 LCR Compliance list. How many in 2005, in 2013? For years I have been concerned that up to 50% of the LCR Compliance list may be from fully replaced LSL based on Feb 2002 EPA Guidance documents. How would anyone know?

Since 2005, there are exactly 1666 LCR Compliance samples site collections from DC Water posted online (about 200 per year X8 years). I sorted them by site and marked samples I considered from a site that consistently with few exceptions from year to year produced <3ppb for lead for first and second draw. These could be fully replaced or altered LSL sites. Very disturbing are sites with lead data >3ppb that seem to convert from a lead producing site (>3ppb) **suddenly** in one semester to a non lead producing site (<3ppb) and remain non lead producing from then on. All the 2nd 2005 invalidated sites with nonLSL had less than 3 ppb lead for first and second draw. All three that were revalidated since they had truely LSL had at least one sample over 3 ppb averaging at 7ppb. Possibly, a true LSL may always produce at least one draw over 3ppb lead in water with 2005 protocol. (Pipeloops, 10,000 samples, even in the winter had measurable low lead levels all loops, usually over 3ppb.) Using this low lead level to point to other such fully replaced sites, there are 21 more low level sites in compliance 2nd 2005. Maybe the lost 10 sites of 0508093, are low level lead too and fully replaced LSL. From 2nd semester 2005 there were 3 (revalidated)+ 12 (invalidated and replaced)+21 (low producing lead < 3ppb) +10(missing from #0508093) possibly 46 non LSL sites. WASA may be approaching 50% fully lead replaced sites being initially submitted for 2nd 2005 compliance.

50% fully lead replaced sites is okay with EPA in a 2/2002 Guidance document. I checked for low level lead sites (<3ppb both draws) for first half 2006--close to 50% also!! This percentage has increased about 3% per year and is now 2nd 2012 semester at 67% of LCR Compliance samples at usually <3ppb first and second draw. All compliance semesters for at least 50% of sites <3ppb both draws pointing percentages of potentially fully replaced LSL being used for LCR Compliance. This would also explain EPA directing WASA in the past to ask more questions on the chain of custody forms to be sure that a home with a full lead replacement has at least as an alternative lead solder or interior lead pipes to assure Tier 1 status. If EPA is assured that a fully LSL replaced site meets the lead solder/interior pipes criteria they may or may not have just left it in the sampling pool up to 50% of the sampling sites. Next quote is from EPA Guidance Feb. 2002 interpreting the LCR law.
http://www.epa.gov/ogwdw/lcrmr/pdfs/guidance_lcrmr_monitoring_reporting.pdf

Labeled on page 19 (page 26 of 105 pdf): "**Tier l** sampling sites are single family structures: ***with copper pipes with lead solder installed after 1982 (but before the effective date of your State's lead ban) or contain lead pipes; and/or*** that are served by a lead service line." Labeled on page 20 (or page 27 of the pdf):"If your system contains lead service lines, then, if possible, half of the required sampling sites should be served by a lead service line. "

Research in the above AWWARF table states the LSL contributes 50-75% of lead in water contamination for LCR testing. With no LSL, making LCR Compliance is so much easier. **Every year** 2007-2012, an average of 30 LCR samples are from new sites that are added each year to DC Water's sampling pool. For 2012, also 17/26 of the new sites that are on the LCR Compliance list for the first time show up at with <3ppb first or second draw. A sample testing out at <15 ppb can be considered 'chemically' replaced. How can all these low producing sites at consistently <3ppb first or second draw possibly be worst case sites?

I am requesting that the EPA to do an **independent audit of LCR Compliance samples for service line material**. What documentation of LSL does DC Water actually have on their LCR sampling list? Is 50% fully replaced LSL still acceptable for LCR site selection?

<u>Are all samples that are collected used in calculating LCR Compliance?</u> NO

It is not reasonable that any samples be thrown out at all since this invalidates getting a representative sample citywide. This was done recently in New Orleans where high leaded samples were not included in the LCR percentile calculations. From FOIA'ed data, WA submitted samples from the work order# 0508093 that had 64 samples with 32 first draw and 32 second draw samples. Ten first draw samples within the sequence did not appear on the LCR Compliance list. These were not invalidated due to non LSL material. Were the results thrown out? Why? (#0508093-007, 009, 011, 027, 031, 041, 045, 053, 055, 057).

A very high percentage of sample bottles distributed to DC Water customers do not return. How do we know when these potential samples are lost to the sampling pool? Were they pretested with paper strip tests for lead and discarded if high? I recommend a serial number be placed on sample bottles and the customers mail in a postcard to EPA verifying they took the samples, sealed them with a tamperproof seal, placed then outside for pickup, and noticed they were picked up.

I observed in 2005 many sample bottles (about 200 a week in 2005) labeled for LCR Compliance including names and addresses and date sample. Some returned at one time having had samples in them but were never logged in for LCR testing. Only 400 per year are needed to sample for LCR. Why all the bottles?

<u>Does LCR sampling protocol target portion of water stagnant in LSL?</u> NO

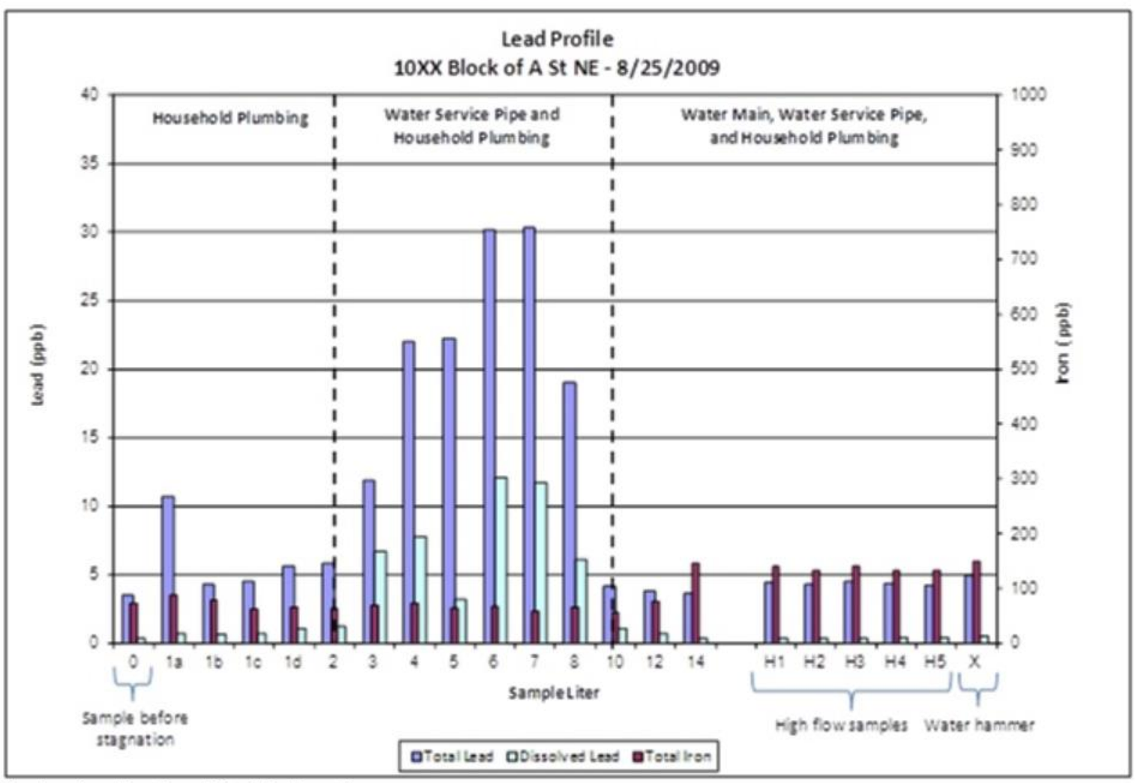
From lead profiles, the water stagnant in the LSL is captured in about the 3rd to 11th liter depending on the site. A tap flows about 7 liters per minute. The LSL exposed water starts to come out the tap at about the time of 30 seconds (0.5 minutes X 7 liters/minute= 3.5 liters into the lead profile) and ends at two minutes (2 minutes X 7 liters/minute = 14 th liter) after the tap is turned on. The first draw sample does not catch the portion of the water exposed to LSL. FOIA'ed results from 2nd semester LCR for DC document that the time between 1st and 2nd draw for LCR Compliance samples averaged 6 minutes. Any water contaminated by LSL is long gone by then. The LCR must be amended to drop the protocol of flushing until a temperature change between draws. No one will answer when I ask during TEWG conference calls, how long the tap runs between LCR samples currently. Also any preflushing the night before removes any water left in the plumbing that may have been exposed to LSL prior to sampling.

Are LCR samples representative of the known highest lead leaching times of the year? NO

All three lead pipeloop research sites demonstrate that the lead levels peek during the summer. DC Water LCR Compliance sampling (see below) routinely misses an average of 60 consecutive days each summer.

					TOTAL	DAYS MISSED		
						MAY	June	JULY
2005		15-Apr	TO	26-Jul	70	15	30	25
2006		19-May	TO	24-Jul	64	11	30	23
2007		24-May	TO	23-Jul	58	6	30	22
2008		5-Jun	TO	29-Jul	58	0	30	28
2009		21-May	TO	27-Jul	65	9	30	26
2010		27-May	TO	27-Jul	58	3	30	25
2011		19-May	TO	26-Jul	66	11	30	25
2012		29-May	TO	23-Jul	53	1	30	22

Example of a Household Lead Profile



This lead profile posted on DC Water website. Note liters #2-10 represent LSL exposure. Lead leaches from the LSL exposed liters at 30 ppb on 8/25/09. This is not the hottest day of that year and most likely it was taken in the morning after stagnation for 6 hours at night which is not the warmest time of the day. This is just an example and may not be the worst case DC Water has in their files. They are reluctant to say on the TEWG calls. As demonstrated at WA pipeloops, the lead concentration that leaches from

LSL doubles every 5 degrees C. This profile could potentially be 60 ppb in the portion stagnant in the LSL at the highest possible temperature it is exposed and this in 2009, five years after EPA declared DC Water LCR Compliant. Much of this lead (up to 70%) is particulate and therefore can sediment and dislodge at a variable rate exposing consumers to much higher slugs of lead precipitate should the flow rate of water sampling be greater for the consumer than the low flow rate recommended by paid consultants to DC Water for LCR sampling.

Quotes:

12/2005 **Investigation of Higher Than Standard Lead Concentrations in Drinking Water From Washington, D.C**

Adarkwah, N. E.; Ararso, I.; Garcia, N.; Goldman, A.; Lieu, C.; Mondragon, J.; Swamy, V.; Unigarro, M.; Cuff, K. **http://adsabs.harvard.edu/abs/2005AGUFMED43A0839A**

"The majority of samples collected from the D.C. area were obtained from schools and homes located in the central north-northeast section of the District. Of these samples, 72% contained lead in excess of the EPA action limit. Despite reports that lead levels have fallen significantly over the past year, 63% of all homes tested during the second year of our study still contained lead levels that exceed the EPA limit."

Association between children's blood lead levels, lead service lines, and water disinfection, Washington, DC, 1998–2006 Environ Res. 2011 Jan;111(1):67-74. doi: 10.1016/j.envres.2010.10.003. Epub 2010 Nov 26

http://www.washingtonpost.com/wp-srv/metro/documents/cdc_dc_water12012010.pdf

"Conclusions: LSLs were a risk factor for elevated BLLs even when WASA met the EPA water action level"

Public Health Protection under the EPA Lead and Copper Rule

Dr. Yanna Lambrinidou and Dr. Marc Edwards Posted on **April 1, 2013** by **Public Health Law Research**

http://blogs.law.harvard.edu/billofhealth/2013/04/01/public-health-protection-under-the-epa-lead-and-copper-rule/

"The LCR's monitoring requirement allows utilities to conduct testing in ways that can miss serious lead-in-water problems in their jurisdictions. This can lead to prolonged exposures by consumers who assume that their water is safe."

Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study

Environ. Sci. Technol., **2013**, *47* (16), pp 9300-9307 **Publication Date (Web):** July 23, 2013 **DOI:** 10.1021/es4003636 Miguel A. Del Toral, Andrea Porter, and Michael R. Schock

"current sampling protocols will often considerably underestimate the peak lead levels and overall mobilized mass of waterborne lead in a system with lead service lines."

Summary and suggestions for action

The research from lead pipe loops in DC has been misrepresented and manipulated and underestimates the concentration of lead leaching from LSL. Adherence to LCR is NO guarantee that the public is safe from significant lead exposure from LSL. I observed the >100 ppb particulate lead peak at the WA pipeloops in summer 2005. Others too are also coming to realize that the public is exposed to lead leaching into drinking water from LSL at levels detrimental to health; despite the claims of DC lead pipeloop research and DC Water LCR Compliance numbers.

To the National Drinking Water Advisory Council, please support:

1) A public warning not to use tap water from LSL for making infant formula

2) Appoint independent committee including myself to investigate misrepresentation and manipulation of lead pipeloops at Dalecarlia, McMillian Plants and the DC Water utility.

3) Investigate DC Water LCR Compliance sites actually confirm LSL Tier 1 requirements (full lead or partial lead) and are not altered to miss lead leaching from LSL.

4) Amend LCR protocol to sample water actually stagnant in LSL at warmest time of the year and representative-of-actual-use high flow rate. Prohibit pre-flushing before LCR sampling.

Non-Ferrous Founders' Society

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February 25, 2013

Reduction of Lead in Drinking Water Act of 2011
Jeff Kempic
U. S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Mail Code: 4607M
Washington, DC 20460

Dear Mr. Kempic:

The Non-Ferrous Founders' Society (NFFS) respectfully submits the enclosed comments in response to the request for additional input put forth during the public meeting on Implementation of the Reduction of Lead in Drinking Water Act that was held on Thursday, August 16, 2012.

To begin, the Society and its member foundries understand the difficult position that Congress placed the agency in, and the difficult challenge the agency faces in developing the standards and regulatory approaches required to achieve the objectives of the Lead Free Act within the constraints of the legislatively-mandated effective date. We commend the agency for its open outreach to stakeholders – including the manufacturers of products that fall under this law –to understand their concerns. We believe that an honest an open and honest dialogue among all parties can provide the basis for successful development of the implementing standards, regulations, and enforcement mechanisms required by the law.

The Non-Ferrous Founders' Society and its member foundries stand ready to collaborate with the EPA in implementing this legislation, thereby achieving the goal of reducing the lead exposures from potable water. To that end, we are pleased to provide our input and comments as contained in the following pages.

Sincerely,

Executive Director

JLM/
Enclosure

Reduction of Lead in Drinking Water Act of 2011

Comments on the Scheduled January 4, 2014 Implementation by the Non-Ferrous Founders' Society

Introduction

The Reduction of Lead in Drinking Water Act was signed on January 4, 2011 and becomes effective on January 4, 2014. It changes the definition of lead free materials used in potable water applications from 8% to not more than 0.25%, and, in addition, expands the definition to cover both the plumbing fittings and fixtures. It was modeled in part upon the AB 1953 law enacted in the state of California that was passed into law on September 30, 2006, with an effective date of January 1, 2010.

EPA held a stakeholder meeting in August of 2012, at which time the agency noted that enacting the required standards and regulations to implement the new law would not be as simple as taking the existing rules and changing the allowable content limit for lead from 8% to 0.25%. In fact, the agency identified several key questions on implementing the requirements of the Act where it needed to solicit additional input from the industry before proceeding.

Background

Many metalcasting industry organizations - including both the Non-Ferrous Founders' Society and the American Foundry Society - opposed the enactment of the AB 1953 regulation when it was first introduced in California in 2006. Among the reasons cited for this opposition, it was felt that the current performance-based standard (NSF 61), which evaluates the quality of the water coming out of the faucet for consumption, ensured the integrity of California drinking water and adequately protected consumers. Industry suggested that AB1953 legislation represented a rejection of the value of the NSF-61 performance standard and the NSF process in favor of an arbitrary content formula proposed within the bill without proper scientific consideration or justification. Other arguments against AB 1953 were also presented, which in retrospect are no longer deemed relevant to these comments.

Despite this opposition, and almost immediately upon the introduction of AB 1953 bill, the industry formed a consortium comprised of eleven metalcasters, six alloy producers, two plumbing product manufacturers, a research lab, and three industry trade associations to discuss the technological implications of the enactment of the bill and to begin to lay out a roadmap to research the practical application of various alternative no-lead copper alloys. The consortium established seven sub-committees, each charged with investigation of a critical area of concern, including: health effects; alternative materials, including bismuth and silicon alloys; and production considerations (casting, machining, plating, etc.). The results of the consortium's research efforts were published in 2010.

Upon the enactment of AB 1953, and despite their prior opposition to its passage in California, the industry supported the introduction in Congress and eventual passage of national legislation which became The Reduction of Lead in Drinking Water Act of 2011, although not entirely for altruistic reasons. Rather, it was the industry's position that enactment of a national lead content standard for plumbing brass was vastly preferable to having to address a plethora of lead content rules as might be enacted by each of the 50 states. In fact, in the period between the enactment of the California law in 2006 and the passage of the RLDW Act in 2011, similar though varying laws had already been proposed or enacted by several other states.

Current Status and General Concerns

Upon its introduction, and even at its enactment, AB 1953 was a seriously flawed bill. It established a lead content limit for plumbing brass with no scientific investigation or justification as to whether it would achieve the goal of reducing lead exposures from water consumption. Rather, since lead exposure is known to have significant health effects, the law was guided by the common but impractical assumption that the only acceptable exposure risk level for lead should be zero. The level the law set also gave no consideration to whether companies that produce the products to be regulated could in fact actually meet the requirements of the law, nor did it provide any guidance for enforcement or standards for determining compliance. And it gave no consideration whatsoever to the costs that would be imposed on any of the affected parties, including producers, consumers, or public water systems.

To address some of the shortcomings within AB 1953, its companion bill (SB 651) proposed to strengthen the law by clarifying some of its terms and definitions, and by including a requirement for third party certification. This is done primarily to ensure that all potable water component manufacturers – both foreign and domestic – would be required to comply with its requirements. But again, while outlining an enforcement inspection methodology, the law still gave little if any guidance on how the state of California would pay for its enforcement.

The transition of the reduction of lead content in plumbing brass regulation to the national level placed the task of overcoming the shortcomings within the California law in the hands of Congress. Regrettably, the enactment of the Safe Drinking Water Act Amendments has once again simply shifted the problem downstream. Congress adopted the national lead content limit for plumbing brass and established its effective date, but shifted the burden of enacting the required standards and regulations to implement the new law to the EPA. The problem of enforcing the law was delegated to the states.

During the stakeholder meeting on August 16, 2012, EPA staff suggested that the issues surrounding the implementation of the Safe Drinking Water Amendment would probably not be answered in a timely fashion for manufacturers. The agency has elected to incorporate revisions of the lead free content to the proposed *Lead and Copper* rule scheduled to be proposed in 2013, then, as a best case scenario, to promulgate final revisions somewhere around the date at which the SDWA amendments go into effect. It will take time to resolve questions such as product marking & labeling, third party certification, and treatment techniques that are applied to public water supply systems, but making these revisions as part of the national primary drinking water rule means they would go into effect three years after the Lead and Copper regulation is promulgated. Doing a separate rule would take considerably longer for the agency. Meanwhile, the lower lead content limits become the law of the land on January 4, 2014, and there is no regulation that the agency can use to change the effective date of the legislation.

Specific Input Requests from EPA Stakeholder Meeting Held 8-16-2012

During the stakeholder meeting, the agency posed several questions for which it is seeking guidance from the affected parties.

Should manufacturers be required to demonstrate that a product is lead free, and if so how? The lack of compliance / enforcement guidance was one of the principal flaws in AB 1953. The requirement for third party certification was added to address that deficiency, as well as to establish a basis for assuring that all products being offered in the marketplace would meet the requirements of the law. We believe this is the only valid mechanism by which to assure that products are lead free.

There is no way to visually inspect a product to verify that it meets the content limits of the law. Nor does EPA have either the expertise or resources necessary to specify how such testing should be performed. Should the agency therefore certify or approve third-party certifiers? We believe not. Third party certifiers have already been functioning for many years, and very successfully. Organizations such as the American National Standards Institute (ANSI) already have established procedures to achieve that objective. Should EPA mandate that a particular certifying agency be used? Absolutely not. Such action would create a certification backlog far worse than could ever be imagined. Even the International Organization for Standardization (ISO) allows for any qualified certification service (registrar) to be engaged.

Should companies be allowed to self-certify that their products are lead-free? Again, we say no. Some level of assurance beyond *"we say they are"* is needed - for the consumer, for the marketplace, and for those manufacturers who have invested heavily to assure that their products do indeed meet the law. Several agencies can provide certification/listing of NSF 372 compliance. Other test methods should also be permitted as long as equivalence is established.

How should lead content be calculated? The law states that *the weighted average lead content of a pipe, pipe fitting, plumbing fitting, or fixture assembly shall be calculated to address total wetted exposure of the product, based upon each component's wetted surface area and maximum % lead content.* The lead content of the non-wetted areas are not of concern.

It is important to bear in mind that this is a content-based law. The lead content of the surface or wetted areas must be in conformance, but no treatment, wash or coating will conform to the "*content"* limit for the material. The lead leaching provisions of the earlier law were not retained in the current revision, notwithstanding the incorporation by reference of NSF 61 as a voluntary consensus standard.

How should lead-free products be identified? Lead free products that meet the California AB 1953 law are already being manufactured and have been in the marketplace since January, 2010. Some manufacturers have elected to make products from both the lead-free and traditional materials, and to label products as to whether or not they are *suitable for potable water applications,* but those markings might be different for each product and/or product line, and what works in one application may not work in another.

Some manufacturers choose to incorporate a mark on the casting itself noting that it is made of a lead-free material. This mark means little to the consumer, but is essential in the recycling of products to avoid contamination of the scrap stream and to maintain the value of more expensive metal. Moreover, there are several alternative materials already in use that meet the lead content law, but might have different alloying elements. Identifying these varying materials is more important in recycling than in in-service application. Industry must be the best judge as to how these products can and should be marked.

Painting, marking, and labelling products do impose a cost on the manufacturer, but these costs pale in comparison to the cost of adapting or changing the manufacturing process itself to the lead-free material. Put another way, what goes on the outside costs far less than what goes into the product. Foundries and plumbing manufacturers have been engaged in the effort to adapt their manufacturing systems to make lead-free products since 2006.

Should all plumbing products be required to meet the lead-free definition, or should there be "dual lines" of products allowing higher lead content for some statutorily noted exemptions? The law does not portend to outlaw the manufacture or the offer in commerce of products not intended for use in potable water applications. Moreover, the law as enacted contains two exemptions – one for products specifically intended for non-potable applications, the other for products such as shower valves, service saddles, or water distribution main gate valves that are 2 inches in diameter or larger. EPA does not, in our opinion, have the authority to change the intent of the law, to restrict or eliminate the manufacture or distribution of products not required to conform to the Safe Drinking Water Act Amendments, nor to mandate how they will be manufactured. The question of whether there should be “dual lines” of products has been answered within the language of the law.

If dual product lines are allowed, how should non-potable products be identified? As previously noted, such products already exist in the marketplace without markings. Parts made from traditional materials (7 or 8% lead) make no reference on packaging or labeling claiming to be lead free. If products that are lead-free and thus suitable for potable water application are properly identified, no physical markings on non-potable water products should be required.

Product packaging or labelling is the most efficient way to inform the consumer that a product is fit for use in drinking water applications. Once a product has been purchased or installed, the consumer does not care how it was marked. Moreover, a non-conforming product that was introduced into commerce legally on or before January 3, 2014 cannot be used in the installation or repair of a PWS or residential or non-residential facility providing water for human consumption after the effective date of the SDWA amendments. However, it is impossible to guarantee that even an informed consumer will not knowing misapply a product not intended for use in potable water applications. As a matter of enforcement delegated to the states, EPA should not try to regulate against such an occurrence.

Should just the package be labelled, or should there be some sort of identification on the product itself, or should both be required? The purpose of the marking should dictate what is required. A label should be adequate to inform the consumer that a pipe, pipe fitting, plumbing fitting, or fixture assembly is suitable for drinking water use. A mark on a lead-free product – even if not readable or even visible to the consumer – is better used to distinguish lead-free materials in recycling. As stated above, product packaging or labelling is the most efficient way to inform the consumer that a product is fit for use in drinking water applications.

Can one part of a system or facility be repaired using lead-free component parts and returned to service, even if other component parts that were not repaired do not meet the new lead-free definition? The law does not require that products currently in service must meet the definition of lead free. While the replacement of components must be done with parts that meet the content limits of the law, the law does not specifically require that every part of a system or facility – including those not being replaced – be returned to service as 100% lead-free. Clearly, over time, all parts will become lead-free, but the costs of replacement can be spread over the useful life of the component, thus mitigating the cost impact.

***What about routine check, then reinstalling old non-compliant product*?** As a corollary to the previous comments, it is logical to presume that a product that is removed for routine inspection and found to be performing properly does not need to be replaced – even though it does not meet the content limit imposed by the law. Mandating the replacement of properly-functioning elements of the water distribution system was not intended and is not mandated by the law, and would simply add needless costs.

Will industry have difficulty meeting certification or labelling requirements by Jan. 4, 2014, because obtaining an ANSI accredited third-party certification takes time? Conforming products are already in the marketplace in several states, and foundries and plumbing manufacturers are positioning to being able to supply these products on a national basis prior to January 4, 2014. While it might be considered useful to have a uniform labeling system in place prior to the effective date of the SDWA Amendments, EPA has already acknowledged that this cannot be achieved – perhaps unless done on a voluntary basis by industry. However, even gaining EPA's endorsement of a voluntary labeling regime is both improbable and unrealistic.

ANSI accredited third-party certification takes time, and domestic manufacturers are already struggling to meet this objective. However, as the only acceptable means of demonstrating that products being offered in the marketplace will in fact meet the content limits of the law, they are aware that this must be accomplished. EPA cannot definitively regulate how that certification is to be attained prior to the effective date of the law.

Conclusion

Congress adopted the national lead content limit for plumbing brass and established its effective date at January 4, 2104 but shifted the burden of enacting the required standards and regulations to implement the new law to EPA. EPA has already stated that, as a best case scenario, incorporating the revisions into the national primary drinking water rule cannot be achieved until perhaps three years ***after*** the SDWA amendments take effect, and there is no regulation the agency can use to change the effective date of the legislation. EPA should recognize that this is a content-based law and be guided accordingly when developing the implementing standards. Meanwhile, states must be prepared to enforce the law upon its effective date, but must also be prepared to exercise great discretion in enforcing against standards, procedures and protocols that will not be finalized for several years after the effective date of the law.

The Non-Ferrous Founders' Society and its member foundries stand ready to collaborate with the EPA in implementing the Safe Drinking Water Act amendments, thereby achieving the goal of reducing the lead exposures from potable water. To that end, we have been pleased to provide our input and comments as contained in these pages, and we will welcome the chance to respond directly to any comments and/or questions the agency may have on anything noted herein.

Public Comment on Lead and Copper for December 11 and 12 NDWAC Meeting
September 4, 2013 at 10:59 am by e-mail to the DFO

Dear Mr. Simon:

Due to the distance I would not be able to attend any meetings however I would like to address some concerns that we have here in Sturgis S.D. We have been testing for lead and copper for around fifteen years with no bad results but yet we must continue to do these tests that are costly. Also there is a new rule that we must start using no lead meters and repair fittings in January of 2014 which I have no problem with other than the fact that we were not told about this rule until sometime around November of 2012 and they did not stop selling the leaded fittings until just recently. This left a lot of small rural cities and water systems with an expensive inventory that we will have to replace in January of 2014 at a very high cost and for no good reason as I have stated we have been testing with no bad results. We should be able to use our inventory and replace with no lead fittings when we run out of our inventory. I would think there should be waivers allowed for the lead and copper if everything has been testing ok for that many years.

Thanks
Dale Olson
Water Superintendent
City of Sturgis,S.D
605-347-4425

Statement by the Non-Ferrous Founders' Society to the National Drinking Water Advisory Council Meeting, December 11-12, 2013

Good afternoon. My name is James L. Mallory, and for the past 28 years I have been proud to serve as the Executive Director of the Non-Ferrous Founders' Society (NFFS), a 70 year old trade association representing the non-ferrous metalcasting industry. Many NFFS members produce castings that are used in potable water delivery systems nationwide. Other NFFS members are ingot producers that supply the alloyed material melted by foundries that is then cast into valves, faucets, water meters and other such components.

The Society was pleased to submit written comments on February 25, 2013 in response to EPA's request for input on issues surrounding the implementation of the Reduction of Lead in Drinking Water amendments to the Safe Drinking Water Act. We have provided copies of those comments for distribution to this committee, and we respectfully ask that they be referenced in their entirety and appended to this statement for the record. But let me try to summarize and reiterate some of the concerns raised in that document.

The Reduction of Lead in Drinking Water Act that was signed into law on January 4, 2011 and which becomes effective on January 4, 2014 changes the definition of lead free materials used in potable water applications from 8% to not more than 0.25%. The amendments were modeled in part upon the AB 1953 law enacted in the state of California that was passed into law on September 30, 2006, with an effective date of January 1, 2010.

At its stakeholder meeting last August, EPA stated that enacting the required standards and regulations to implement the new law is not be as simple as taking the existing rules and changing the allowable content limit for lead from 8% to 0.25%. The agency identified several key questions on implementation issues and solicited input from the industry before proceeding. The response from our association, as well as those from other organizations representing our industry, was crafted in response to that request.

The metalcasting industry has been actively engaged in seeking alternative materials for plumbing applications that could reduce lead exposures in drinking water for more than 20 years. As EPA moves to implement the new requirements incorporating the Reduction of Lead in Drinking Water Act of 2011, agency officials need to consider the current Safe Drinking Water Act (SDWA) requirements and how they have been successfully implemented and regulated by States, municipalities, and end users without significant governmental oversight. Substantial reductions of lead in drinking water have already been achieved through the implementation of national standards such as AWWA and ASTM, through user specifications as part of contracts and bid documents, by demonstrations of compliance, and as a result of industry and trade group oversight.

Almost immediately upon the introduction AB 1953 in 2008 California in 2008, the metalcasting industry formed a diverse consortium to investigate the technological implications of the bill and to begin to lay out a roadmap to research the practical application of various alternative no-lead copper alloys. The results of the consortium's research efforts were published in 2010, but investigations into the viability of other potential replacement alloys for plumbing applications continued to be pursued.

At its introduction, and even upon its enactment, AB 1953 was a seriously flawed bill. It established a lead content limit for plumbing brass with no scientific investigation or justification as to whether it would achieve the goal of reducing lead exposures from water consumption. Rather, the law was guided by the common but impractical assumption that the only acceptable exposure risk level for lead is zero.

The transition of the reduction of lead content in plumbing brass regulation to the national level placed the task of overcoming the shortcomings within the California law in the hands of Congress, but regrettably once again the problem simply shifted downstream. Congress adopted the national lead content limit for plumbing brass and established its effective date, but delegated the burden of enacting the required standards and regulations to implement the new law to the EPA.

During the August stakeholder meeting, EPA suggested that the implementation issues could not be answered in a timely fashion for manufacturers. Instead, the agency elected to incorporate revisions of the lead free content to the proposed *Lead and Copper* rule, which we now know is a central issue being addressed at this meeting. However, given the presumed schedule to enact the Lead and Copper Rule, it is obvious that the SDWA amendments will have been the law at least several years before the implementing regulations will be enacted. So how should this committee proceed? Let me try to offer a few suggestions.

1. The lack of compliance / enforcement guidance was one of the principal flaws in AB 1953. A requirement for third party certification was added to address that deficiency, as well as to establish a basis for assuring that products being offered in the marketplace would meet the requirements of the law. The Non-Ferrous Founders' Society agrees that this is the only valid mechanism by which to assure that products are truly lead free, but some consideration must be given to both the cost of the testing and the practical enforcement of the law. If domestic producers are required to provide third-party documentation as evidence of compliance, then the same rules must be applied to products made in other countries and imported for sale in the U.S. Failing to do that places American manufacturers that are required to pay for testing at a competitive disadvantage in the marketplace. Without effective enforcement, a law is nothing more than a suggestion.

2. The committee should not try to specify how lead-free products are to be marked, labelled, or otherwise packaged. Lead free products are already being manufactured and have been in the marketplace since January, 2010. Some metalcasters went "lead free" even before that. Some companies make products from both lead-free and traditional materials and label products as to whether or not they are *suitable for potable water applications,* but the markings may be different for each product and/or product line, and what works in one application may not work in another. If products that are lead-free - and thus suitable for potable water applications - are properly identified, it really shouldn't matter whether a common system of marking has been applied. Moreover, EPA has already acknowledged that a uniform labeling system cannot be achieved prior to the effective date of the SDWA Amendments. Imposing new marking or labeling requirements years after the law takes effect – and after companies have already made significant product marketing investment decisions - is both impractical and counter-productive.

3. The committee **MUST NOT** seek to reduce the content limits for lead and copper beyond the level specified in the current law. As previously noted, the metalcasting industry has been voluntarily seeking ways to reduce the lead content in plumbing brass, and significant investments in retooling production lines have already been made by many companies in their efforts to meet the 0.25% content limit. As the agency has itself recognized, enacting the required standards and regulations to implement the new law is not be as simple as taking the existing rules and changing the allowable content limit for lead from 8% to 0.25%. Changing production capabilities, switching materials within a metalcasting facility, is far more complicated – and costly - than that.

In conclusion, the Society and I thank the agency for allowing me the opportunity to present this statement today, and we stand ready to assist the Council in its further discussions on the proposed regulatory revisions to the Lead and Copper Rule under the SDWA and other program issues as may be helpful.

Contents

Background for the Current Lead and Copper Rule Revisions Process

Under the Safe Drinking Water Act (SDWA) EPA sets public health goals and enforceable standards for drinking water quality.[1] The Lead and Copper Rule (LCR) is a treatment technique rule. Instead of setting a maximum contaminant level (MCL) for lead or copper, the rule requires public water systems (PWSs) to take certain actions to minimize lead and copper in drinking water, to reduce water corrosivity and prevent the leaching of these metals from the premise plumbing and drinking water distribution system components and when that isn't enough, to remove lead service lines.

The current rule sets an action level, or concentration, of 0.015 mg/L for lead and 1.3 mg/L for copper. An action level is not the same as an MCL. An MCL is based on health effects; whereas an action level is a screening tool for determining when certain treatment technique actions are needed. Because the LCR is a treatment technique rule, the LCR action level is based on the practical feasibility of reducing lead through controlling corrosion. In the LCR, if the action level is exceeded in more than ten percent of tap water samples collected during any monitoring period (i.e., if the 90th percentile level is greater than the action level), it is not a violation, but triggers other requirements that include water quality parameter monitoring, corrosion control treatment (CCT), source water monitoring/treatment, public education, and lead service line replacement (LSLR). The rule also requires States to report the 90th percentile for lead concentrations to EPA's Safe Drinking Water Information System (SDWIS) database for all water systems serving more than 3,300 persons, and for those systems serving fewer than 3,300 persons only when the lead action level is exceeded. States only report the 90th percentile for copper concentrations in SDWIS when the copper action level is exceeded in water systems regardless of the size of the service population. Public education requirements ensure that drinking water consumers receive meaningful, timely, and useful information that is needed to help them limit their exposure to lead in drinking water.

In early 2004, EPA began a wide-ranging review of the implementation of the LCR to determine if there was a national problem related to elevated levels of lead in drinking water. As part of its national review, EPA collected and analyzed lead concentration data and other information, carried out a review of implementation in States, held four expert workshops to discuss elements of the regulations, and worked to understand local and State efforts to monitor for lead in school drinking water, including a national meeting to discuss challenges and needs. EPA released a Drinking Water Lead Reduction Plan (DWLRP) in March 2005. This plan outlined short-term and long-term goals for improving implementation of the LCR. The plan can be found at the following web address:
http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/lead_review.cfm

In 2007, EPA promulgated regulations, which addressed the short-term revisions to the LCR that were identified in the 2005 DWLRP. These requirements enhanced the implementation of the LCR in the areas of monitoring, treatment, LSLR, public education, and customer awareness. These revisions better ensured drinking water consumers receive meaningful, timely, and useful information needed to help them limit their exposure to lead in drinking water.

EPA has continued to work on the long-term issues that required additional data collection, research, analysis, and full stakeholder involvement, which were identified in the 2005 DWLRP and the 2007 rule revisions. This new action is referred to as the LCR Long-term Revisions (LTR) The LCR LTR would apply to all community water systems (CWSs) and non-transient non-community water systems (NTNCWSs). EPA's primary goal for the LCR-LTR is improve the effectiveness of the corrosion control treatment in reducing exposure to lead and copper and to trigger additional actions that equitably reduce

[1] EPA establishes national primary drinking water regulations (NPDWRs) under SDWA. NPDWRs either establish a feasible maximum contaminant level (MCL) or a treatment technique "to prevent known or anticipated adverse effects on the health of persons to the extent feasible."

the public's exposure to lead and copper when corrosion control treatment alone is not effective. While not inclusive of all potential revisions to the LCR, key categories where revisions are being considered are:

- Sample site selection criteria for lead and copper
- Lead sampling protocols
- Public education for copper
- Measures to ensure optimal corrosion control treatment
- Lead service line replacement

Previous Federal Advisory Committee Involvement

EPA has sought input from Federal Advisory Committees on two previous occasions. The Science Advisory Board (SAB) provides comments to EPA on the quality and relevance of scientific and technical information supporting EPA's national drinking water standards. The Office of Ground Water and Drinking Water (OGWDW) formally requested SAB evaluation of current scientific data to determine whether partial lead service line replacements are effective in reducing lead drinking water levels. The SAB issued their report on September 28, 2011. (See http://yosemite.epa.gov/sab/sabproduct.nsf/0/964CCDB94F4E6216852579190072606F/$File/EPA-SAB-11-015-unsigned.pdf)

EPA also previously consulted with the National Drinking Water Advisory Council (NDWAC) in meetings on July 21-22, and November 18, 2011(see http://water.epa.gov/drink/ndwac/meetingsummaries/index.cfm) and wrote a letter to EPA on December 23, 2011 (see http://water.epa.gov/drink/ndwac/upload/ndwaclettertoepadec2011.pdf).

EPA continues to require input on the feasibility, and cost effectiveness of potential revisions to the Lead and Copper Rule. Therefore, EPA is convening a NDWAC working group to consider several key questions for the LCR LTR, taking into consideration previous input.

Key Issues for Consideration

EPA's goal for the LCR-LTR is to improve the effectiveness of corrosion control treatment in reducing exposure to lead and copper and to trigger additional actions that equitably reduce the public's exposure to lead and copper when corrosion control treatment alone is not effective. Lead and copper are present in plumbing materials and water distribution system components throughout the United States. Therefore, treating the water to make it less likely to corrode lead and copper from these materials remains the most cost effective way to reduce exposure to these metals. However, because corrosion control is not always effective, the LCR must compel additional actions in those systems that cannot sufficiently reduce lead and copper levels. Those actions should provide equitable protection to all of the consumers. In making these improvements, EPA seeks to advance the goal of environmental justice, which is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income. The following is a description of key issues and questions for which EPA seeks stakeholder input in achieving these goals. This document is meant to lay the initial foundation for the stakeholder process, with more detailed technical information and questions likely to be raised during future working group meetings.

A. Sample Site Selection Criteria

Goals/objectives of rule change: In the preamble to the LCR in 1991, EPA wrote that it believes, "…that the requirement to collect samples from locations that are most likely to have high concentrations of lead and copper in drinking water is reasonable and necessary given the nature of the problem of corrosion…" Thus, the goal of the LCR sample site selection criteria is to target locations with high-risk lead and copper in drinking water systems in a cost-effective manner. Selection and use of the highest risk sites is important, because the number of samples collected is relatively small and contaminant levels can vary between systems and sites based on water quality, and distribution system and usage characteristics. Targeting these locations helps ensure that appropriate action is taken if a lead or copper problem is identified in the system.

Background Information

The 1991 LCR established a tiering system for prioritizing the selection of sampling sites based on the likelihood of the sites to release elevated levels of lead and copper; for lead, sites with lead service lines (LSLs), lead pipes, or copper pipes with lead solder; for copper, copper pipes with lead solder. The figure below outlines the current rule requirements.

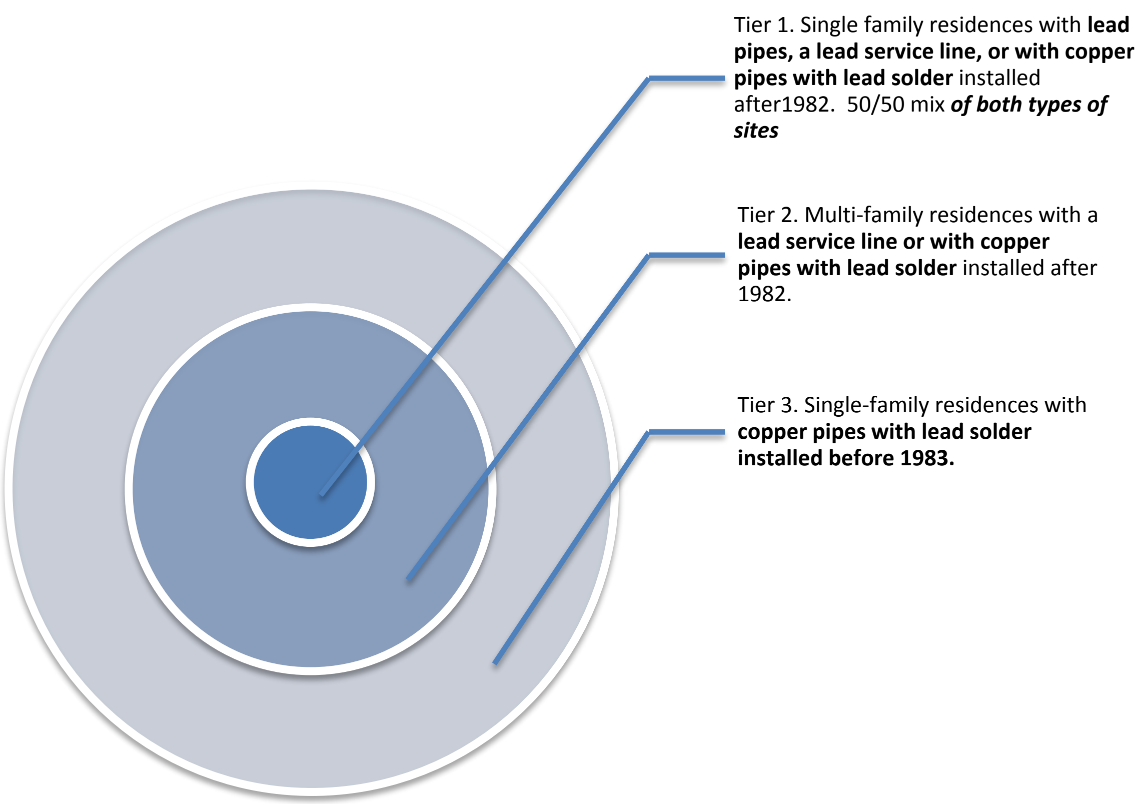

Figure 1: Current Site Selection (tiering) Structure

Although EPA made short-term revisions to the LCR in order to address some implementation issues in January 2000 (65 CFR 1950) and October 2007 (72 CFR 57781), the Agency has not revised the tiering criteria since the rule was promulgated in 1991. New information exists regarding lead and copper release patterns, which raises the question of whether the current sample site selection criteria should be revised. Key points include:

Lead

- Full and partial LSLs represent the greatest source of lead to drinking water. PLSLRs are frequently associated with short-term elevated drinking water lead levels, that tend to gradually stabilize overtime, sometimes at levels below and sometimes at levels similar to those observed prior to the replacement. The current criteria do not solely prioritize sampling from LSLs (full or partial).
- Over twenty years have passed since lead solder was banned in all jurisdictions. Because lead release from solder decreases with time, these sites now are likely to be releasing levels of lead comparable to contributions by brass plumbing components and interior pipe corrosion byproduct scales.
- Studies have shown that much higher lead levels are frequently found in water in contact with lead service lines.
- Lead has been shown to accumulate in corrosion scales or deposits formed in premise plumbing, downstream of LSLs, and can be released sporadically, often in response to treatment changes or line disturbances.

Copper

Since 1991, a large body of published corrosion literature on copper has shown that copper and lead release patterns differ. The original LCR sample site selection criteria for copper no longer targets highest-risk copper, since these sites have now aged. Water chemistry and pipe age play a more dominant role than what was originally thought for copper release.

- Corrosion can occur to copper plumbing of any age. However, in the presence of certain water qualities, copper levels in excess of the action level are most likely to occur in newly constructed homes and buildings with copper plumbing, or at sites that have been recently renovated with new copper plumbing. Corrosion of new copper pipes is not a problem for many water systems. It is limited to water systems that have water quality aggressive to copper.
- Water chemistry characteristics that contribute to copper release also can vary in different zones within a distribution system as well as between different systems with respect to aggressiveness to copper.

Lead and Copper

- Differences exist between lead and copper release patterns in water systems.
- Water chemistry variations within the water distribution system vary temporally and spatially. This phenomenon affects the site selection for lead, as well as copper. In order to capture high-risk sites, it is important that sampling reflect zones where water quality is aggressive to these contaminants.
- Research since the 1991 rule indicates that brass and other metallic premise plumbing materials may be a more significant immediate and long-term source of lead and copper in drinking water than originally believed, especially in newer homes.

EPA is evaluating whether the sampling sites as outlined in 1991 are still the appropriate sites to monitor to assess the effectiveness of corrosion control treatment for both lead and copper. EPA is revisiting these criteria to examine whether they target the sites most likely to leach elevated levels of lead and copper and, thus, serve as good indicators of whether corrosion control treatment is needed or has been optimized. Selection and use of the highest risk sites is important, since the number of samples collected is relatively small, contaminant levels can vary between systems and sites (water quality, plumbing configuration(s), and usage patterns contribute to variations in lead and copper levels). Public health protection is the main goal of the LCR, but because the LCR is a treatment technique rule, sites are selected to assess performance of systems' corrosion control treatment not to assess exposures.

- In order to better target each contaminant, EPA is considering revising the site selection criteria to create two separate tiering structures, one for systems with LSLs and another for systems without LSLs.
- EPA also is evaluating whether to monitor at separate sites for copper. EPA is considering requiring PWSs to conduct copper monitoring at separate sampling sites with new copper piping, which are likely to have elevated copper levels.
- EPA also is considering allowing a copper monitoring waiver which would allow systems with water qualities not considered aggressive to copper to eliminate copper monitoring. This copper waiver could reduce costs for systems that can demonstrate water qualities which are unlikely to leach copper (e.g. a system that provides no disinfection or oxidation treatment, and meets a specific pH criterion; or a system with disinfection and/or oxidation treatments that has water quality parameters within the specified pH and alkalinity ranges).

Discussion questions:

- How should sample site selection criteria be developed to capture the highest risk sites for both lead and copper in a simple, health protective, and cost effective way? Is the knowledge base on both lead and copper sufficient to confidently respond to the question?
- At what sites should lead and/or copper samples be taken to be representative of the greatest release for each contaminant?
- Should sampling for lead and copper occur at separate sites? If so, what could the potential sampling scheme look like?
- What are the cost implications of developing separate sampling sites
- Should the sample site selection criteria for LSL systems and non-LSL systems differ to prioritize sampling from locations likely to demonstrate the greatest release for each contaminant? If so, what would that sample site selection criteria look like?
- How many samples for each contaminant would be needed to be statistically significant?
- What age copper piping should be sampled in order to capture the greatest likelihood of copper release?
- In what ways could evaluating water quality parameters from all systems be used to help identify systems with zones of water quality aggressive to copper? For lead?
- Would taking copper samples from pipe rigs (with copper the same age as in the distribution system) be useful in helping to reduce sampling burden for large systems? If so, how, and how should the data be used to determine action level compliance?
- What might copper waiver conditions look like, including water quality and non-water quality based conditions?
- How many systems can consistently meet water quality parameters, showing that water is not aggressive to copper, to obtain a copper waiver?

- How could water quality parameter data be used to accurately assess which systems are likely to need copper monitoring and which do not?
  - How might these data be used to develop copper monitoring waivers for systems meeting specific water quality criteria?
  - Do you have or know of data that EPA could consider to develop such waivers

B. Lead Sampling Protocol

Goals/objectives of rule change: Establish procedures that will result in a PWS having a set of samples that will assess the corrosivity of the water being provided and/or to indicate if the corrosion control is effective in reducing lead and/or copper corrosion from LSLs and plumbing materials.

Background

The current LCR contains a single sampling procedure for both sites with lead service lines and sites with lead-soldered copper pipes. A one-liter first draw sample (no water wasted prior to drawing the sample) is taken after a minimum six-hour stagnation time. The current sampling protocol allows residents to collect the first-draw samples.

Lead Service Line Sampling

EPA analyzed data from a number of studies where sequential samples were taken at the same site to generate a profile (i.e. several consecutive liters of water were taken and analyzed until water that had been in contact with the LSL was reached) and found that the first draw sample may underestimate the amount of lead that can be in samples in contact with the LSL. Where they are present, LSLs (full or partial) are the greatest source of lead in the distribution system. EPA is considering different sampling procedure options for sites with a partial or fully intact LSL to better assess the amount of lead contributed by lead service lines and, thus, whether further action is needed to reduce the corrosivity of the water.

One service line sampling approach is to collect and discard a specific number of liters prior to taking (using a fresh bottle) a one-liter sample representative of the service line. The sampling instructions would be the same for all sites in the sampling pool. A challenge to this approach is determining the specific number of liters to collect and waste to get a representative sample, since plumbing configurations and service line lengths will vary across sites.

Another service line sampling approach is to collect a series of sequential samples at each site in the sampling pool to identify the liter containing the highest lead at the site (an initial profile), and use that site-specific identified liter for subsequent monitoring and compliance purposes. In subsequent monitoring periods, the number of liters to get to that sample would be wasted before the one-liter service line sample for that site would be collected in a new sample bottle. The volume of water being wasted prior to sample collection will vary among sites under this approach. This approach seeks to balance obtaining site-specific samples while reducing analytical costs since sequential sampling to identify the liter containing the highest lead would be conducted one time at each location and when new sampling sites were added to the pool. An important consideration with this approach would be whether the added complexity could be appropriately managed by the public and drinking water utilities to ensure reproducible results.

The logistics of sampling present other challenges, e.g. in working with homeowners to collect service line samples.

Aerators

Another sampling instruction issue is the inclusion of recommendations to remove the aerator and clean it before the start of the stagnation period. EPA issued guidance on October 20, 2006 indicating that PWSs should not recommend that customers remove or clean aerators before or during the collection of tap samples for lead. While removal and cleaning of the aerator is advisable on a regular basis, if customers are only encouraged to remove and clean aerators prior to drawing a sample for lead, the system could fail to identify the typically available contribution of lead from that tap and thus fail to take additional actions needed to reduce exposure to lead in drinking water.

Pre-stagnation Flushing

A third sampling instruction issue for service line samples is pre-stagnation flushing and what that means with respect to whether the sample was in contact with the faucet and interior plumbing or with the lead service line. Some systems' sampling instructions recommend flushing the tap for an extended period of time (5 minutes or longer) prior to the start of the minimum six-hour stagnation time. Concerns about this practice include whether it leads to biasing the sample downward (e.g. by flushing particulates). One approach would be to prohibit recommendations on pre-stagnation flushing in the sampling instructions. EPA is looking for input on other alternatives that best represent the water in the service line.

Number of Required Sample Sites

The number of sample sites in the current LCR varies by the size of the system and monitoring frequency. The number of sites range from 5 to 100 under standard monitoring and from 5 to 50 under reduced monitoring. Each sample is analyzed for both lead and copper. The distribution of sample sites is not addressed in the current LCR. A sampling protocol that better represents the contribution of the service line to lead levels in the water may allow a reduction in the number of sites that need to be monitored to assess the effectiveness of corrosion control in lead service line systems.

The number of sample sites needed to target high-risk sites (and to assess corrosion control for those systems using CCT) should be considered for systems with and without LSLs. Sampling sites that better represent the contribution of copper may necessitate separate sampling sites, and perhaps a different number of samples, for lead and copper, rather than a single sample being analyzed for both contaminants. LSL samples may not adequately reflect copper levels because of limited contact with copper; however, it may be possible to assess the effectiveness of corrosion control solely by the lead levels from the service line samples.

Another issue is that a water system may have a variety of water sources within its system, and the sampling sites as they are currently configured may not be able to capture all the water quality variability (which affects lead and copper corrosion) within the distribution system. Thus, it may requiremore specific targeting of sampling sites to assess over all corrosion control effectiveness given this variability.

While there are a variety of factors that can influence the number of sampling sites necessary to assess the effectiveness of corrosion control in an individual system, the LCR does need to have baseline monitoring for all classes of systems for effective rule implementation.

Discussion questions:

- For locations with LSLs, what does a cost-effective lead sampling procedure look like that captures lead where concentrations are likely highest?
  - Who should collect samples? The PWS? The homeowner/resident? If the latter, how can the procedure be reliably executed? How can instructions to homeowners/residents be as clear and easy to follow as possible?
  - Should aerator removal be addressed? If so, how?
  - What are the pros and cons of addressing pre-stagnation flushing of pipes? How should this issue be addressed, if at all? What is the best way to represent the water in the service line?
  - What are the advantages/disadvantages of a single prescriptive liter versus a site-specific sequential sampling approach?
  - Under what conditions could OCCT be based on the lead results from the lead service line samples?

- What is an appropriate number of samples to be collected by a water system to capture the highest risk lead and copper sites in the distribution system and, where CCT is in place that will indicate if the corrosion control is effective in reducing lead? In reducing copper?
  - How important is the size of the PWS population in determining this number?
  - How much does geographic distribution of samples matter, particularly with respect to non-homogenous water quality and non-homogeneous construction distribution?

C. Public Education for Copper

Goals/objectives of rule change: To improve the health of consumers by motivating consumers to take actions in reducing exposure to copper in drinking water in systems with elevated copper levels.

Background

While corrosion can occur to copper plumbing of any age, in certain water qualities copper levels in excess of the action level are most likely to occur in newly constructed homes and buildings with copper plumbing, or at sites that have been recently renovated with new copper plumbing. Corrosion of new copper pipes is not a problem for many water systems. It is limited to water systems that have water quality that is aggressive to copper. The health effects of copper are nausea and vomiting (short-term), and there may be liver damage and possible nervous system effects in sensitive subpopulations (e.g. individuals with Wilson's disease). Both the maximum contaminant level goal (MCLG) and action level for copper (1.3 mg/L) were established based on the prevention of acute nausea as a result of elevated copper levels in drinking water. EPA recommends that individuals with Wilson's disease should consult their personal physician if the levels of copper in their water exceed the action level. Infants fed formula prepared with copper-tainted tap water consume a higher amount of tap water on a per body weight basis than adults, which may increase their risk for an adverse response.

Currently, there are no public education materials[2] or informational statements[3] provided on the health risks of copper exposure, or steps consumers can take to reduce their risk of exposure. EPA is evaluating whether materials should be provided to consumers to address potential exposures to copper in premise

[2] These "public education materials" may be delivered to all consumers in the distribution system when the public water system has exceeded the copper action level. The mechanism of delivery could be similar to the way consumers are educated about lead after a lead action level exceedance.

[3] The term "informational statements" describes educational materials that would be delivered to consumers in the distribution system when systems have water quality that is aggressive to copper but delivery would not be based on exceeding the copper action level

plumbing. EPA is also evaluating the target audience for any materials that might be developed. The Agency is considering requiring copper public education materials for systems exceeding the copper action level and/or a brief informational statement to consumers served by systems which have water quality aggressive to copper.

Outreach materials[4] could explain the potential health effects of elevated copper, the likelihood of copper levels being higher at newly built homes and buildings where water quality is aggressive to copper, and actions that the consumer can take to reduce their exposure to copper.

The following are key elements that EPA is considering for a public education requirement for copper in the event of a copper action level exceedance:

(1) Explanation of what copper is, the possible sources of copper in drinking water and how copper enters drinking water;
(2) Explanation of copper health effects;
(3) Steps the consumer can take to reduce their exposure to copper in drinking water;
(4) Explanation of why there are elevated levels of copper in the system's drinking water (if known) and what the water system is doing to reduce the copper levels in homes/buildings in the area; and
(5) Explanation of the likelihood of concern related to copper leaching from copper pipes in homes/buildings in the area.
(6) Explanation of what other plumbing materials are available for use in water qualities aggressive to copper, that a builder or consumer might choose to reduce their exposure to undesirable levels of copper in the water.

Discussion questions:

- Are there aesthetic warning signals of copper corrosion in drinking water and, if so, what are they and what recommendations should be given to consumers to help them avoid the health effects of copper through consumption of drinking water?
- Should copper public education materials be included in the LCR using the same basic structure as the public education materials for a lead action level exceedance?
- Should different types of outreach materials to consumers with different content be required depending on whether or not the copper action level is exceeded? If so, what information should be included (e.g., public education for an action level exceedance, informational statement about copper if an action level is not exceeded)?
- If copper public education materials or informational statements are required, what should the delivery frequency be?
- If public education is not required for copper action level exceedances, should EPA require systems to deliver outreach materials/informational statement to consumers who visit or live in a newly/recently built or renovated building/dwelling with new copper piping?
  - Should systems be required to identify newly/recently built or renovated building/dwelling with new copper piping?
  - Should systems be required to work with local inspection services to incorporate the outreach materials or informational statement into building/dwelling occupancy permits?
  - How much and what kind of direction should be provided by EPA with respect to public education materials or informational statements?

[4] The term "outreach materials" is a general term used to describe any materials that are distributed to the public.

- If a water system demonstrates water quality aggressive to copper, should those consumers receive informational statements about copper? If so, what information should be included?

D. Measures to Ensure Optimal Corrosion Control Treatment

Goals/objectives of rule change: Enhance the process for systems to improve the effectiveness of their corrosion control treatment; ensure adequate incentives for optimization and provide greater clarity about treatment optimization.

Background information

The Lead and Copper Rule requires systems to install optimized corrosion control treatment (OCCT) while insuring that the treatment does not cause the water system to violate any NPDWRs. Since the promulgation of the LCR and the initial optimization of corrosion control, systems have faced the ongoing challenge of continuing to maintain optimal corrosion control while making necessary adjustments to treatment processes or system operations unrelated to corrosion control to comply with other NPDWRs. The current optimization process includes requirements for systems to:

- Conduct monitoring
- Conduct a CCT study (if required by the State)
- Obtain State designated OCCT
- Adjust existing CCT
- Conduct follow-up monitoring
- Obtain State review of installation of CCT and designation of optimal water quality parameters (OWQPs)
- Operate the treatment in compliance with OWQPs

Research has shown that there are many factors that can affect lead and copper levels. Maintaining OCCT can be challenging; therefore EPA is evaluating a number of revisions to the corrosion control requirements that make targeted improvements to the current process:

- Expand scope of study for systems with LSLs to include a system-wide assessment of factors that may limit the effectiveness of the CCT or the ability of the system to optimize their treatment. Allow the State and/or EPA to tailor study requirements for systems without LSLs. LSLs contribute about 50-70% of the total mass of lead at consumer's taps. To a lesser extent, premise plumbing contributes about 20-35% of total lead mass measured at the tap and meters contribute less than that.
- Consistent with international experience, require systems using orthophosphate to evaluate higher doses and those systems not using orthophosphate to study its use for their system.
- Revise steps and deadlines for corrosion control treatment.
- Allow Non Transient Non Community Water Systems (NTNCWSs) serving fewer than 10,000 people the option of installing Point of Use (POU) treatment units in lieu of having to install CCT as a potentially more effective mechanism to reduce lead exposures in these systems.

Determining whether treatment is optimized can be challenging, given the variety among systems in their distribution system composition, water qualities and other circumstances. One idea under consideration is the addition of a system-wide assessment as part of the mandatory CCT study requirements for systems with LSLs. This is intended to ensure the studies are comprehensive and that the proposed treatment addresses any existing or anticipated water quality, treatment or operational issues that may interfere with or limit the effectiveness of the corrosion control optimization or re-optimization.

While some changes are well understood for their potential to adversely affect lead and copper levels, such as fluctuations or changes in pH or alkalinity, others are more complex and involve factors like the quantity and type of disinfectant used or the chemical composition of the protective scales within the lead service lines. In a system-wide assessment, a water system will evaluate the variability of water quality throughout the distribution system due to differences in source water quality within distinct hydraulic boundaries, different or variable residence times and multiple types of distribution system materials. Revisions to the study elements would also target key parameters that are known to affect or limit the effectiveness of CCT generally, such as the variability of pH and alkalinity, as well as more system-specific water quality or process control parameters. Since the promulgation of the original LCR, research has confirmed the most effective treatments for optimization of corrosion control are pH/alkalinity adjustment, and the use of orthophosphate. Consequently, EPA is considering removal of the requirement for systems to study calcium hardness adjustment as a potential option for optimizing corrosion control, along with the associated mandatory monitoring for calcium, conductivity and water temperature. EPA is also considering more specific requirements for systems that are currently not using orthophosphate to study the use of orthophosphate and for systems using orthophosphate to study the use of higher dosages of orthophosphate. EPA will consider alternatives to orthophosphate where appropriate and effective to reduce the waste water discharge burden of phosphorous in those areas sensitive to phosphorous release.

A key provision of the LCR requires water systems to sample for State approved OWQPs. OWQPs are measurable indicators that help systems determine if they are maintaining optimal CCT. Corrosion control treatment techniques are means specified in the rule, such as pH/alkalinity adjustment and the addition of corrosion inhibitors (e.g., orthophosphate) that promote the formation of insoluble scales that prevent lead from leaching from pipes into the drinking water. Having proper OWQPs is the method by which EPA, States, and water systems know whether water characteristics are in the ideal range (determined through CCT optimization studies) for their corrosion control methods.

After water systems recommend OWQPs, it is up to the States to approve them. Currently, OWQP ranges may not be set as tightly as needed to effectively control lead corrosion for those systems that continue to exceed the lead action level. EPA is evaluating whether to require systems exceeding the lead action level to re-optimize CCT, before being triggered into LSLR, and if that re-optimization process should be well-defined.

Under the current LCR, a system that exceeds an action level is required to install CCT, but may cease conducting lead and copper tap and WQP monitoring while it is evaluating and installing CCT. Regular monitoring during this timeframe may provide additional information to the systems and States to ensure the proper treatment is installed and fully optimized.

EPA is considering designating lead service line systems that have optimized or re-optimized corrosion control for lead to also be deemed to have optimized corrosion control for copper.

Discussion questions:

- How can LCR requirements be structured to encourage optimal corrosion control treatment and retain enforceability?

- How can existing OWQP monitoring requirements be strengthened while retaining implementability? What is the most effective way for reducing lead exposure?
- What are the challenges to optimizing corrosion control treatment?
- What are some of the lessons learned from implementing corrosion control treatment?

E. Lead Service Line Replacement

Goals/objectives of rule change: Remove sources of lead in the distribution system; encourage optimization of CCT to prevent lead leaching; address environmental justice concerns associated with LSLR; and maintain and enhance enforceability of the LCR.

Background

Under the current LCR, water systems that exceed the lead action level after the installation of CCT and/or source water treatment must annually replace at least seven percent of the initial number of LSLs in their distribution system. To meet the seven percent annual LSLR requirement, systems can do full or partial LSLRs or "test out" a LSL if all samples from it are at or below the lead action level (*i.e.*, a "tested-out" line is not physically replaced, but is still counted as such for the seven percent LSLR requirement). A concern with "test outs" is they may not reliably reflect the lead levels in the water because they only represent a single snap shot in time. Under the current LCR, systems must replace the portion of the LSL they own/control. Where a system does not own/control the entire LSL, it must offer to replace the owner's portion at his or her expense. If the owner elects not to have his or her portion replaced, then the system is not required to replace the privately-owned portion. This results in a PLSLR.

One of the challenges of full LSLR versus PLSLR is environmental and public health equity among customers of different economic means and home ownership status.

For the LCR, EPA's current interpretation of the term "control" is limited to what a water system owns. But in the original 1991 LCR EPA established a broad definition of control as it applies to LSLs in the distribution system that included: (1) authority to set standards for construction, repair or maintenance of the line; (2) authority to replace, repair or maintain the service line; or (3) ownership of the line. American Water Works Association challenged EPA's original definition of control. The court remanded the matter because EPA failed to provide adequate notice and comment on the control definition. In 1996, EPA proposed a revised definition of control. EPA solicited comments regarding the degree to which systems may have the authority to replace the privately-owned portions of LSLs. EPA also solicited comments regarding the option of only requiring replacement of the portion of the LSL owned by the system. In the final rule in 2000, EPA elected to define control as ownership to eliminate confusion and avoid rule implementation delays. Thus, under the current LCR a water system is not required to pay the cost of replacing the portion of the LSL that it does not own.

EPA asked the Science Advisory Board (SAB) to evaluate the current scientific data regarding the effectiveness of PLSLR and the review centered around five issues: (1) associations between PLSLR and blood lead levels in children; (2) lead tap water sampling data before and after PLSLR; (3) comparisons between partial and full LSLR; (4) PLSLR techniques; and (5) the impact of galvanic corrosion.

The SAB found that the quantity and quality of the available data are inadequate to fully determine the effectiveness of PLSLR in reducing drinking water lead concentrations. The small number of studies available had major limitations (small number of samples, limited follow-up sampling, lack of information about the sampling data, limited comparability between studies, etc.) for fully evaluating

PLSLR efficacy. Nevertheless, despite these limitations, the SAB concluded that PLSLRs have not been shown to reliably reduce drinking water lead levels in the short-term, ranging from days to months, and potentially even longer. Additionally, PLSLR is frequently associated with short-term elevated drinking water lead levels for some period of time after replacement, suggesting the potential for harm, rather than benefit during that time period. The available data suggest that the elevated tap water lead levels tend to increase then gradually stabilize over time following PLSLR, sometimes at levels below and sometimes at levels similar to those observed prior to PLSLR.

The SAB also concluded that in studies comparing full LSLR versus PLSLR, the evaluation periods were too short to fully assess differential reductions in drinking water lead levels. However, the SAB explained that full LSLR appears generally effective in reliable achieving long-term reductions in drinking water lead levels, unlike PLSLR. Both full LSLR and PLSLR generally result in elevated lead levels for a variable period of time after replacement. The limited evidence available suggests that the duration and magnitude of the elevations may be greater with PLSLR than full LSLR.

EPA is contemplating several revisions to mandatory LSLR requirements. Options that would be helpful to evaluate include:

- Delaying mandatory LSLR requirement until after CCT re-optimization.
- Considering an expanded definition of control similar to what was included in the 1991 LCR to facilitate full LSLRs.
- Eliminating the requirement to do a PLSLR when the property owner does not agree to pay for the replacement of the portion of the LSL on private property after the action level has been exceeded. Full LSLR would be required by the LCR if the water system owns the entire LSL, or the property owner agrees to pay for the replacement on the private side or if the water system voluntarily pays the entire cost after the action level has been exceeded.
- Eliminating the “test-out” provision.
- Requiring water systems to provide impacted owners and residents with a NSF/ANSI 53 certified pitcher-filter or other treatment unit that removes lead before the system begins any LSLRs.

Discussion Questions:

- Has the seven percent annual LSLR requirement been an effective part of the LCR and, if so, what has been achieved? How does it impact compliance tracking and enforcement? If PLSLR requirements were to be eliminated, what other options could accomplish similar results?
- Should EPA consider another percentage requirement for LSLRs instead of 7%? If so, what. What would the impact be on incentives for treatment optimization?
- If PLSLRs and “test outs” are no longer allowed, then how might a water system obtain a sufficient number of agreements from owners and residents to achieve full LSLRs at an annual rate of at least seven percent?
- When optimization does not bring lead levels under the action level how should systems reduce exposure from LSLs in a way that protects public health, is feasible and assures equitable protection among the system’s users?
- If EPA requires the public and privately-owned portions of the LSLs to be removed, how would systems go about educating owners and residents about the importance of LSLR once triggered into the mandatory replacement program?

- Would water systems be more likely to achieve greater LSLRs with an expanded definition of control? What would result if EPA does not change the definition of control?
- What are the environmental justice concerns associated with LSLRs? How can an even distribution of benefits be achieved, to avoid either disproportionate health or economic impacts?
- If the definition of control is expanded beyond ownership and the water system is required to replace the entire LSL, including any portion on private property, how can costs be allocated equitably?
- What measures might a PWS and/or its customers employ to address temporarily elevated lead levels during the times of exposure when LSRL and/or reoptimization is occurring?

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October 29, 2013

Mr. Roy Simon
U.S. Environmental Protection Agency
Office of Ground Water and Drinking Water (MC 4601M)
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: NYC DEP Comments on LCR Rule Revisions for NDWAC Consideration

Dear Mr. Simon:

The New York City Department of Environmental Protection (DEP) is pleased to offer these written comments on revisions to the Lead and Copper Rule (LCR), for consideration by the National Drinking Water Advisory Council (NDWAC) Members. DEP, which operates the country's largest unfiltered water supply and provides clean drinking water to more than 8 million city residents, strongly supports LCR revisions that promote meaningful health protection benefits for our citizenry, and which correct some of the problems with the existing rule construct. However, with a system that has almost 7,000 miles of water mains, and over 1 million service connections, there are substantial challenges in implementing the LCR, so the rule revisions need to remain flexible to account for differences in the size and characteristics of different water supply systems. The following are some of the issues that DEP is concerned with and should be considered when evaluating recommendations for revisions to the LCR.

Sincerely,

Steven C. Schindler
Director of Water Quality

Enclosure
c: P. Rush, P.E., Deputy Commissioner NYC DEP
D. Lipsky, PhD, Chief, NYC DEP
C. Glaser, Section Chief, NYC DEP
file

NYC DEP Comments on LCR Rule Revision
For NDWAC meeting December 11-12, 2013

Clarify the objectives of the LCR:

DEP believes that the United States Environmental Protection Agency (EPA) should clarify the objective of the 90th percentile Action Level (AL) - as being a measure of corrosion control effectiveness. There is a dichotomy between the objective to monitor a specific and relatively constant pool of residences at "high-risk" for lead for the purpose of tracking corrosion control performance, and the objective of using these same data as an indicator of public health significance. This dichotomy occurs because the method by which samples are collected under the LCR, while adequate as a treatment technique for the purposes of optimizing corrosion control, are not adequate as an indicator of public health risk. The samples are not representative samples of exposure; rather they represent a potentially worst-case sample that is not representative of the water delivered throughout the day to the customer.

Additionally, the metric used to determine exceedance or non-exceedance of the AL, namely the 90th percentile, that triggers public education activities and lead service line replacement activities by the utility, is not a good metric for determining health risk. For example, in a pool of 100 samples, the 90th percentile value will be the same whether the highest 10 samples are in the range of 15-20 μg/L, or whether the highest ten values are in the range of 15-200 μg/L. Yet the potential health risks are clearly different. In the absence of guidance on acceptable levels of lead in at-the-tap water samples, the public, state, and local regulatory agencies, and the water utilities, continue to use the performance based action level established as a treatment technique, as a quasi-health standard, which makes the public education component confusing and potentially misdirected. An example of the confusion is obvious with respect to selecting a compliance pool. If the action level represents a public health guidance value, then DEP believes it is contradictory to continue to sample from the same sites with lead service lines year after year. Instead, DEP believes EPA should encourage utilities to advise the residents at these properties that they can and should take some type of remedial action to remove the lead from their at-the-tap water. However, any remediation would potentially lead to their exclusion from the sampling pool, which seems to go against the current directive of the LCR.

DEP believes EPA should consider these contradictions when making revisions to the LCR, and change the rule to encourage homeowners with lead service lines to replace the service lines in their entirety. DEP recognizes, however, that encouraging people to replace their lead service lines will potentially increase the difficulty of locating and maintaining sites for a compliance pool, which currently is meant to monitor corrosion control performance. In New York City finding sites to sample under the LCR has been an ongoing challenge. As it is, in order to build up a larger pool of lead service line sites, DEP has had to resort to offering a financial incentive for homeowners to participate in compliance sampling. When revising sampling requirements under the LCR, DEP believes that EPA should carefully reconsider the objectives of the rule in order to best protect public health while ensuring adequate corrosion control.

Address Service Lines that are Privately Owned:

In New York City, service lines are the responsibility of the property owner. In a city of over 8 million people, the majority of properties are privately owned. If buildings are served by privately owned services lines, the owners of those lines should be responsible for any remedial action if there is a LSL, not the water utility.

Furthermore, some of the potential exposure to lead in drinking water is a result of lead solder or lead fixtures, over which the water utility has no control. To make the utility responsible for the lead content of the water, after corrosion control has been implemented and adjusted to maximize benefit, when the utility has no ability to mitigate the sources of lead is not a reasonable strategy. DEP believes that other innovative strategies should be considered. To protect against exposure to lead from internal plumbing, the entire building may need to be re-plumbed (a costly enterprise), or alternatively, a resident can install at-the-tap filters. DEP believes that because these changes need to occur inside the residence, the choice and the responsibility for how to mitigate the exposure to lead through tap water should be the owner's, not the utility's, which did not design or install the internal plumbing. Furthermore, utilities such as DEP have no legal authority to mandate remediation efforts. Often, and certainly in NYC, the local health department is the authority that can require some type of sanitary inspection and remediation if there are residents in a building who have children with elevated blood lead levels. One possible strategy, therefore, is to recommend improved communication with the local health department whenever elevated levels of lead are found in drinking water, and to assist local health departments in determining the service line composition.

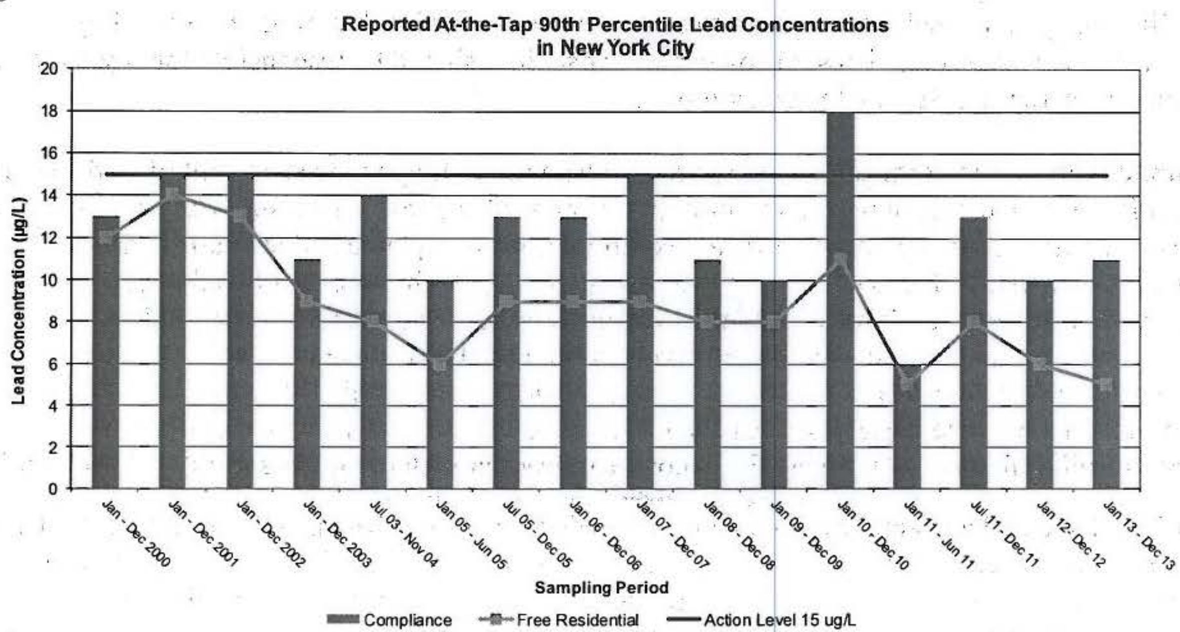
Copper Sampling:

DEP does not think that the current guidelines for copper sampling should be changed. In a city such as New York, with a very old housing stock, it would be a very difficult task to identify homes where new copper plumbing has been installed. Although records are kept for service line replacement, they are not kept for plumbing work that occurs inside of a building. In addition, through our free residential sampling program DEP has copper results for an extended period of time, from points all over the City; and it is rare for any site to have copper levels that exceed the current Action Level (AL) of 1.3 mg/L. For the years of 1997-2013, to date, with over 10,000 sites sampled, New York City has found only 139 first draw samples, and only 46 one-to-two minute flush samples whose copper levels exceeded the AL. Therefore, DEP believes a better approach would be to provide public education materials to homeowners, realtors, and plumbers to help them better understand any risks associated with exposure to copper plumbing, and as part of full disclosure and a responsible due diligence practice.

Criteria for Site Selection:

Since 1992, DEP has offered free residential testing to New Yorkers and to date DEP has sent out over 58,000 sample kits. When a comparison is made between the 90th percentile for compliance sites (those with lead service lines or copper pipe joined by lead solder) and the data collected through the free residential program, fluctuations in free residential and compliance data follow similar trends (see graph below).

Figure 1



DEP believes that these data show that with a sufficient number of samples, this type of sampling provides a good measure of corrosion control. DEP believes that random sampling throughout the City, and throughout the year, provides a larger dataset that accurately reflects the overall success of the corrosion control program. DEP thinks that a program such as our free residential testing is a better metric to use in terms of community wide risk assessment, as well as a better method for finding residences where the second and third flushes may have higher lead concentrations than the first draw samples collected from a relatively constant and limited compliance pool. The data from this type of program can then be used to identify locations for health departments to inspect, and for perhaps more targeted sampling and investigation. EPA should consider not changing the AL for compliance under the LCR, but rather allow utilities to utilize data such as these for targeted response actions.

When to Collect Samples:

Under the LCR DEP conducts compliance sampling at residences that are at high risk for lead and copper contamination. Detailed inspection records are kept for compliance sites so it can be determined if the residence has either a lead service lines (LSL) or copper pipes with lead solder (CLS) (installed between 1983-1986). In most cases these sites are only sampled with a first draw samples. However, DEP has data from a limited group of sites where in addition to the first draw sample, a one to two minute flush sample was collected, and some where an additional five minute flush was collected. These data demonstrate that the first flush sample often does not capture the highest concentration of lead.

Additionally, in 2011, DEP conducted a profiling study of two homes with lead service lines. Results show that the immediate flush sample may not quantify the worst case at-the-tap lead level following a stagnant period, nor does it give a predictable level of the peak value. DEP believes that lead concentrations in first flush samples are often not indicative of the worst concentrations in a residence's tap water. For consistency and as a measurement of corrosion control DEP believes that the first flush sample is adequate. This conclusion is also supported by data from DEP's free residential program, which indicate that the trends in lead concentration in first flush samples correlate with the results from compliance sampling. Based on these and other profiling studies, DEP suggests that EPA consider bifurcating the LCR sampling into two objectives – one for corrosion control and one for health risk assessment. To meet the corrosion control objective, DEP believes that the current methodology for collecting samples from a compliance pool is appropriate, along with the requirement that the utility complete public notification and optimization of corrosion control practices whenever the 90th percentile lead level exceeds the action level of 15 µg/L. To meet risk assessment objectives, utilities should work closely with local health departments to determine if a targeted program to profile the levels of lead in the home is warranted. This could provide a better indicator of health risk on a case by case basis. Local health departments, who, unlike a water utility, typically have the power to intervene in homes where there is exposure to lead or other sources of environmental risk. That is the current practice in New York City, where DEP communicates all lead results, and locations, particularly lead values over 15 µg/L to New York City's highly effective Lead Poisoning Prevention Unit.

Where to Collect Samples:

DEP recognizes that EPA is considering a change in sampling protocol, and we believe that if the protocol becomes more complex this will make it more difficult to find residents to participate in the LCR sampling program. DEP believes it would be an inconvenience to homeowners to have them collect samples directly from lead service lines rather than from at-the-tap locations. Many residents, particularly those in multi-family residences, or those who are elderly, may not have access and/or would have difficulty collecting samples from the service line. It is already hard to identify sites that meet the requirements laid out in the LCR, and whose residents are willing to participate in the sampling program. If residents are asked to collect water samples directly from the service line, DEP believes the number of sites available for sampling would be further limited. DEP has already resorted to offering customers a $25 rebate on their water bill to encourage them to participate in the LCR sampling program. Any complexities that are added to the sampling requirements will create an additional burden on utilities that already have difficulty maintaining a pool of sampling sites.

Local Health Department:

DEP believes that it is important for water utilities to work closely with local and state health departments and notify them of any exceedances of the action level, as another way of ensuring that the proper authorities investigate residences where there may be children at risk. EPA should consider adding a provision to the LCR that would encourage the development of innovative lead risk reduction programs, for example, a provision that would allow the Primacy Agency the flexibility to foster greater coordination between the utility and local health agencies, in promoting multi-media lead exposure reduction programs, in lieu of generally static, expensive, and narrowly focused utility driven public education programs that address only lead in drinking water. This would be particularly effective in places like New York City, where the health department operates a robust and highly effective lead poisoning prevention program that has comprehensive, clear, and measurable goals and priorities for reducing total lead exposures.

EPA should recommend that utilities work with their local health departments to distribute the public education materials to vulnerable populations. Working with the health departments should constitute "a good faith effort", rather than the current wording which reads *Make a good faith effort to contact all customers who are most at risk...* The revisions should be worded to state that the utility shall give the public education materials to the local health department, or shall, under the direction of the local health department, provide the materials to other organizations, so long as the local health department provides current contact information for said organizations.

Partial Lead Service Line Replacement:

DEP believes that utilities would have a difficult time identifying all the homes where service line modifications occur. In New York City there are almost 7,000 miles of water mains, and the long term water main replacement activities are handled by another city agency. Because the repairs are done by another City agency, DEP would have to work with that agency to notify customers of repairs in New York City. With an estimated 55,000 lead service lines in the city (about 5% of the total number of connections), notifying customers of water main repairs would be a monumental task. Additionally, it would be difficult for DEP as a water utility to sample each and every customer with a lead service. More importantly, about 40 percent of the housing stock in New York City consists of multifamily houses and apartment buildings; therefore there are many non-bill paying customers who might be affected by water main replacement work. Identifying and notifying customers who do not receive a water bill would be especially difficult. DEP believes it would be more practical to create a targeted education program or inform the private contractors about the issue.

Algal Toxins and Drinking Water

National Drinking Water Advisory Council Meeting
Thursday, December 12, 2013

Purpose

- To share what EPA is doing to address harmful algal blooms and cyanotoxins in drinking water.
- To get feedback on the information provided on EPA's website and solicit ideas on what actions might best help states and water systems address algal toxins.

Issue

Known as red tides, blue-green algae or cyanobacteria, harmful algal blooms may have severe impacts on human health, aquatic ecosystems and the economy.

Depending on the route of exposure, Harmful Algal Blooms can produce toxins that can sicken or kill people and animals.

- However, it is not known how often ***toxin-producing*** blooms occur in drinking water supplies or which conventional drinking water treatment configurations sufficiently reduce toxin concentrations to protect public health. *
- It is also unclear whether the public is being routinely exposed to very low levels of these toxins in drinking or recreational waters or what the long-term health effects of these exposures might be. *

* **Harmful Algal Research and Response: A National Environmental Science Strategy 2005–2015 (pp.12-13)**

Algal Blooms:

Insert/Go to:

A report from Ohio

What is EPA currently doing to address harmful algal blooms?

- **OST- efforts to develop communications materials**
  - Summer webinar series
  - New Website: Cyanobacteria and Cyanotoxins - Information for Drinking Water Systems:
  - Developing Health Advisory for Microcystin
- **OGWDW- efforts to reduce risk from HABs in source waters and finished water**
  - Addressing HABs through the SDWA process
  - Developing analytical methods
  - Facilitating and promoting Source Water Protection tools and activities

Office of Science and Technology Initiatives to address *Harmful Algal Blooms*

Elizabeth (Betsy) Behl, Director
Lesley D'Anglada, Sr. Scientist
Health and Ecological Criteria Division
Office of Water. US EPA

Outline

- EPA Cyanobacterial Harmful Algal Blooms (CyanoHABs) website
  - ✓ Factors that promote HABs formation
  - ✓ Information for drinking water treatment operators
  - ✓ Climate change and algal bloom fact sheet
- HABs Webinar Series
- Developing Health Advisories for Cyanotoxins

EPA National Drinking Water Advisory Council

http://www2.epa.gov/nutrient-policy-data/cyanobacterial-harmful-algal-blooms-cyanohabs

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Cyanobacterial Harmful Algal Blooms (CyanoHABs)

Algae are natural components of marine and fresh water flora performing many roles that are vital for the health of ecosystems. However, excessive growth of algae becomes a nuisance to users of water bodies for recreation activities and to drinking water providers. Excessively dense algal growth could alter the quantity and quality of light in the water column. Some types of algae may also cause harm through the release of toxins. When conditions like light availability, warm weather, low turbulence and high nutrient levels are favorable, algae can rapidly multiply causing "blooms." When blooms (or dense surface scums) are formed, the risk of toxin contamination of surface waters increases especially for some species of algae with the ability to produce toxins and other noxious chemicals. These are known as harmful algal blooms (HABs).

Algal bloom at Grand Lake St. Mary's, Ohio, 2010. Photo by Russ Gibson, Ohio EPA

The Harmful Algal Bloom and Hypoxia Amendments Act of 2004 mandates that the National Oceanic and Atmospheric Administration (NOAA) advance the scientific understanding and ability to detect, monitor, assess, and predict HABs and hypoxia events in coastal waters and the Great Lakes. Research and advances in knowledge have occurred regarding marine HABs. However, research on U.S. inland and fresh waters HABs has not been as extensive with the greatest federal efforts focused on the Great Lakes.

Cyanotoxins | Detection | Health and Ecological Effects | Research | Causes, Prevention and Mitigation

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Factors that promote HABs Formation

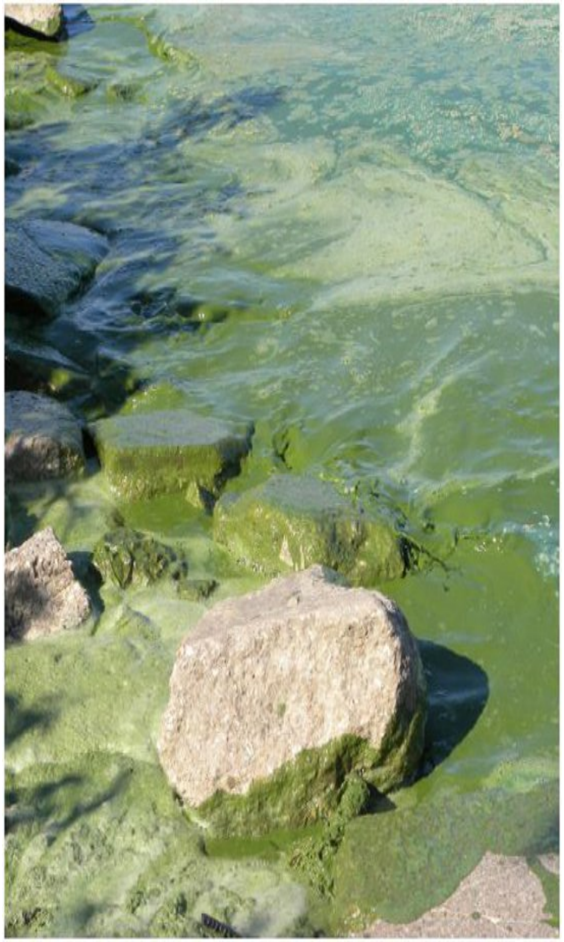
•There is widespread agreement within the scientific community that the incidence of HABs is increasing.

•Some physical factors that promote HABs formation include the availability of light, meteorological conditions, alteration of water flow, vertical mixing and temperature. Chemical factors include pH changes, nutrient loading and trace metals.

•The causal factors related to bloom formation are high nutrient input, low water flow and mixing, and an increase in temperature.

•EPA is currently analyzing the National Lakes assessment data to evaluate stressor-response relationships between the nutrients nitrogen and phosphorus and harmful algal bloom occurrence.

•The most effective preventative measures are those that control the anthropogenic influences that promote blooms such as the leaching and runoff of excess nutrients.



http://www2.epa.gov/nutrient-policy-data/cyanobacterial-harmful-algal-blooms-cyanohabs

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POLICIES AND GUIDELINES

Currently there are no U.S. federal guidelines, water quality criteria and standards, or regulations concerning the management of harmful algal blooms in drinking water under the Safe Drinking Water Act (SDWA) or in ambient waters under the Clean Water Act (CWA). However, several countries outside the U.S. do have various values that serve as guidelines or thresholds for certain management actions.

The SDWA requires EPA to publish a list of unregulated contaminants that are known or expected to occur in public water systems in the U.S., with a frequency and at levels of public health concern and where there is a meaningful opportunity for health risk reduction. This list is known as the Contaminant Candidate List (CCL). EPA's Office of Water has listed cyanobacteria and cyanotoxins on the three drinking water CCLs (CCL 1 of 1998, CCL 2 of 2005 and CCL 3 of 2009). Based on toxicological, epidemiology and occurrence studies, the EPA Office of Ground Water and Drinking Water has focused on 3 of the over 80 variants of cyanotoxins reported, recommending Microcystin congeners LR, YR, RR and LA, Anatoxin-a and Cylindrospermopsin for further research activities. The EPA uses the Unregulated Contaminant Monitoring Rule (UCMR) program to collect data for contaminants suspected to be present in drinking water that do not have health-based standards.

The absence of standardized analytical methods for individual toxins has prevented EPA from including cyanobacterial toxins in the UCMR. Due to this factor and to the absence of certified toxin standards to support analyses and the lack of capacity to deal with multiple toxin congeners, EPA has not made regulatory determinations or established any guidelines for cyanobacteria and their toxins in drinking water.

The World Health Organization (WHO) released in 1998 a provisional guideline of 1 µg/L for microcystin-LR in drinking-water. This guideline value covers only microcystin-LR since there are insufficient data to derive a guideline value for cyanobacterial toxins other than microcystin-LR. For recreational waters, the WHO considered a single guideline value for cyanobacteria or cyanotoxins to be not appropriate. Due to the variety of exposures in recreational activities (contact, ingestion and inhalation) it is necessary to differentiate between the chiefly irritative symptoms caused by unknown cyanobacterial substances and the more severe hazard of exposure to high concentrations of known cyanotoxins, particularly microcystins. The WHO guidance values for the relative probability of acute health effects during recreational exposure to cyanobacteria and microcystins are:

Relative Probability of Acute Health Effects	Cyanobacteria (cells/mL)	Microcystin-LR (µg/L)	Chl (µg/
Low	< 20,000	<10	<10
Moderate	20,000-100,000	10-20	10-50
High	100,000-10,000,000	20-2,000	50-5,(
Very High	> 10,000,000	>2,000	>5,00

Several U.S. states have implemented standards or guidelines that apply to cyanotoxins and cyanobacteria i water using risk assessment methods and the guidelines provided by the WHO for recreational waters. For U.S. states with guidance values being used to post advisories and beach closures see the table below or se Recreational Freshwaters paper by Jennifer L. Graham, Keith A. Loftin, and Neil Kamman (2009).

State	Recreational Water Guidance/Action Level	Recommended Action
California	Microcystin: 0.8 µg/L Anatoxin-a: 90 µg/L	Advisory

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Links to State Information

- California Department of Public Health, Blue-Green Algae (Cyanobacteria) Blooms
- Florida Department of Health, Division of Environmental Health, Aquatic Toxins Program
- Georgia Department of Public Health, Coastal Health District, Harmful Algal Bloom
- Illinois Environmental Protection Agency, Harmful Algal Blooms (HABs) and Algal Toxins
- Indiana Department of Environmental Management, Addressing concerns about blue-green algae
- Iowa Department of Public Health, Harmful Algal Blooms
- Kansas Department of Health and Environment, Blue Green Algae
- Maine Department of Environmental Protection, Algal Toxins
- Maryland Department of Natural Resources, Harmful Algal Blooms in Maryland
- Massachusetts Department of Public Health, Environmental Toxicology Program, Algae
- Minnesota Department of Health Blue-Green Algal Blooms and Microcystin
- Minnesota Pollution Control Agency, Blue-green Algae and Harmful Algal Blooms
- New England Interstate Water Pollution Control Commission, Regional Cyanobacteria Workshop
- New Hampshire Department of Environmental Services: What You Should Know About Cyanobacteria
- New York State, Department of Environmental Conservation, Blue-Green Harmful Algal Blooms
- North Carolina Department of Health and Human Services, Blue-Green Algae
- Ohio Department of Health, Department of Natural Resources
- Ohio EPA: Grand Lake St. Marys Toxic Algae Information
- Oregon Health Authority, Harmful Algal Bloom Surveillance Program
- Oregon Health Authority, Algae Resources
- Rhode Island Department of Health, Cyanobacteria
- South Carolina Department of Natural Resources, South Carolina Algal Ecology Lab
- Texas Parks and Wildlife Department, Harmful Algal Blooms
- Vermont Department of Health, Cyanobacteria, Blue-Green Algae in Lake Champlain
- Vermont Department of Environmental Conservation, Water Quality Division, Cyanobacteria toxins

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More Information

U.S. Environmental Protection Age

- The Interagency, International Symposiu sponsored by the EPA, NOAA, FDA, US and areas of uncertainty concerning freshwater harmful algal blooms. The proceedings of the symposium were published in a monograph that could be download here:
- Climate Change Indicators in the United States report presents the trends of 24 indicators, including, global sea surface temperature, related to the causes and effects of climate change.
- EPA's National Water Program Watershed Framework Approach is a coordinating framework for environmental management that focuses public and private sector efforts to address the highest priority problems within hydrologically-defined geographic areas, taking into consideration both ground and surface water flow.
- Watershed Analysis and Management (WAM) Guide for States and Communities is a guideline that outlines the methods, tools and process to ensure an effective watershed partnership
- The Environmental Technology Verification Program, Advanced Monitoring Systems Center Immunoassay Test Kits for detection and quantification of Microcystins in water
- Harmful Algal Blooms and Seafood Safety
- Toxicological Reviews of Anatoxin-a, Cylindrospermopsin, and Microcystins with available data regarding toxicity of these toxins in support of the health assessment of unregulated contaminants on the CCL.
- National Lakes Assessment: A Collaborative Survey of the Nation's Lakes. This report states the lakes conditions in the United States for 2010
- EPA Region 1 New England Lakes and Pond Projects. Provide an assessment of the ecological and water quality condition of lakes and ponds across the New England region
- EPA Region 3 Chesapeake Bay Program information on HABs and waterways monitoring.
- Office of Research and Development, National Center for Environmental Assessment, Environmental Monitoring for Public Access and Community Tracking Program. Automated biological monitoring system that measured toxicity caused by HABs in the Chicamacomico River, a tributary of Chesapeake Bay.
- EPA Region 4 Gulf of Mexico Program Information on HABs and useful links and resources
- EPA Region 9 National Watershed Program. Blue Green Algae Monitoring in the Klamath River and reservoirs.
- Office of Water. Office of Ground Water and Drinking Water. Contaminant Candidate List (CCL) and Regulatory

National Drinking Water Advisory Council

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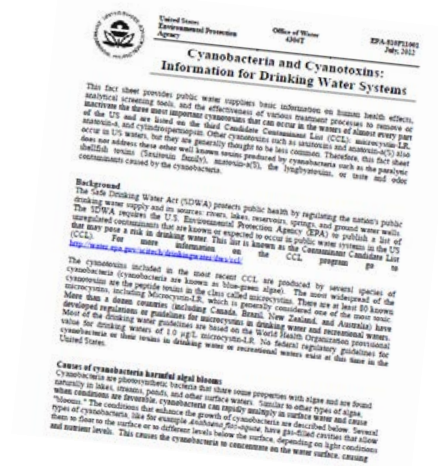
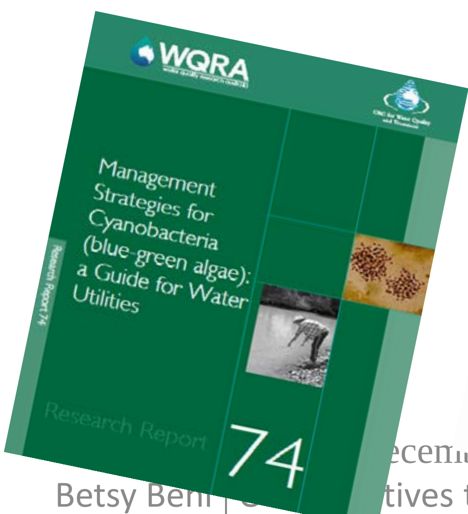
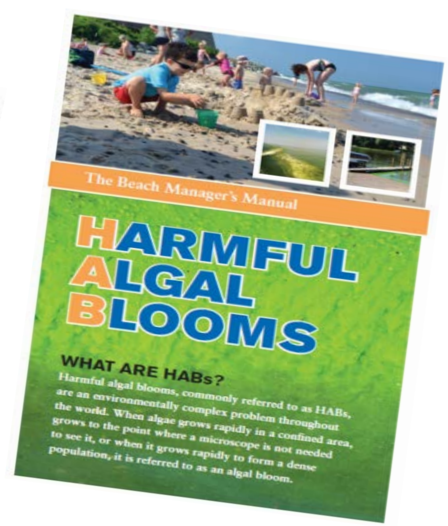
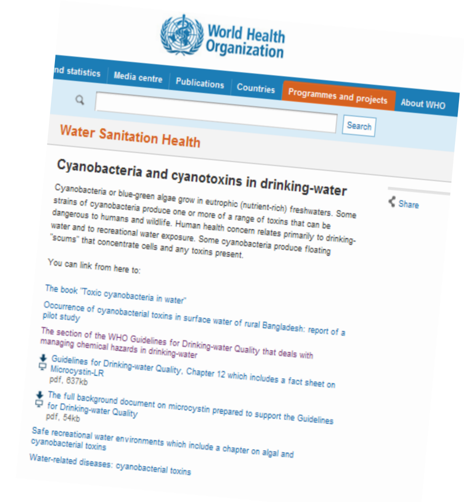
LINKS

- Treatment Options, International Guidance Manual for the Management of Toxic Cyanobacteria, Water Quality Research Australia
- Climate Change and Harmful Algal Blooms Fact Sheet
- Harmful Algal Blooms (HAB) – The Beach Manager's Manual (PDF) (8 pp, 3.4MB, About PDF)
- Cyanobacteria and Cyanotoxins: Information for Drinking Water Systems fact sheet (PDF) (9 pp, 78K, About PDF)
- Interagency, International Symposium on Cyanobacterial Harmful Algal Blooms
- US EPA Climate Change Indicators in the United States
- US EPA Watershed Framework Approach
- US EPA Watershed Analysis and Management (WAM) Guide for States and Communities
- WHO Toxic cyanobacteria in water: A guide to their public health consequences, monitoring and management
- WHO Guidelines for Safe Recreational Waters Volume 1 - Coastal and Fresh Waters
- Australia Guidelines for Managing Risks in Recreational Water
- Management Strategies for Cyanobacteria (Blue-Green Algae) and their Toxins: a Guide for Water Utilities
- US EPA OW Nutrient Pollution Video









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9-page Fact Sheet for Drinking Water System Operators

United States Environmental Protection Agency | Office of Water 4304T | EPA-810F11001 July, 2012

Cyanobacteria and Cyanotoxins: Information for Drinking Water Systems

This fact sheet provides public water suppliers basic information on human health effects, analytical screening tools, and the effectiveness of various treatment processes to remove or inactivate the three most important cyanotoxins that can occur in the waters of almost every part of the US and are listed on the third Candidate Contaminant List (CCL): microcystin-LR, anatoxin-a, and cylindrospermopsin. Other cyanotoxins such as saxitoxins and anatoxin-a(S) also occur in US waters, but they are generally thought to be less common. Therefore, this fact sheet does not address these other well known toxins produced by cyanobacteria such as the paralytic shellfish toxins (Saxitoxin family), anatoxin-a(S), the lyngbyatoxins, or taste and odor contaminants caused by the cyanobacteria.

Background

The Safe Drinking Water Act (SDWA) protects public health by regulating the nation's public drinking water supply and its sources: rivers, lakes, reservoirs, springs, and ground water wells. The SDWA requires the U.S. Environmental Protection Agency (EPA) to publish a list of unregulated contaminants that are known or expected to occur in public water systems in the US that may pose a risk in drinking water. This list is known as the Contaminant Candidate List (CCL). For more information on the CCL program go to http://water.epa.gov/scitech/drinkingwater/dws/ccl/

The cyanotoxins included in the most recent CCL are produced by several species of cyanobacteria (cyanobacteria are known as blue-green algae). The most widespread of the cyanotoxins are the peptide toxins in the class called microcystins. There are at least 80 known microcystins, including Microcystin-LR, which is generally considered one of the most toxic. More than a dozen countries (including Canada, Brazil, New Zealand, and Australia) have developed regulations or guidelines for microcystins in drinking water and recreational waters. Most of the drinking water guidelines are based on the World Health Organization provisional value for drinking waters of 1.0 µg/L microcystin-LR. No federal regulatory guidelines for cyanobacteria or their toxins in drinking water or recreational waters exist at this time in the United States.

Causes of cyanobacteria harmful algal blooms

Cyanobacteria are photosynthetic bacteria that share some properties with algae and are found naturally in lakes, streams, ponds, and other surface waters. Similar to other types of algae, when conditions are favorable, cyanobacteria can rapidly multiply in surface water and cause "blooms." The conditions that enhance the growth of cyanobacteria are described below. Several types of cyanobacteria, like for example *Anabaena flos-aquae*, have gas-filled cavities that allow them to float to the surface or to different levels below the surface, depending on light conditions and nutrient levels. This causes the cyanobacteria to concentrate on the water surface, causing

http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/upload/cyanobacteria_factsheet.pdf

Fact Sheet for Drinking Water System Operators

- Bloom management
- Drinking water treatment and Relative effectiveness

Table 2. Cyanotoxin Treatment Processes and Relative Effectiveness

Treatment Process	Relative Effectiveness
Intracellular Cyanotoxins Removal (Intact Cells)	
Pretreatment oxidation	Avoid pre-oxidation because often lyses cyanobacteria cells releasing the cyanotoxin to the water column.
Coagulation/Sedimentation/ Filtration	Effective for the removal of intracellular toxins when cells accumulated in sludge are isolated from the plant and the sludge is not returned to the supply after sludge separation.
Membranes	Study data is scarce; it is assumed that membranes would be effective for removal of intracellular cyanotoxins. Microfiltration and ultrafiltration are effective when cells are not allowed to accumulate on membranes for long periods of time.
Flotation	Flotation processes, such as Dissolved Air Flotation (DAF), are effective for removal of intracellular cyanotoxins since many of the toxin-forming cyanobacteria are buoyant.
Oxidation processes	Avoid because often lyses cyanobacteria cells releasing the cyanotoxin to the water column.
Extracellular Cyanotoxins Removal	
Membranes	Depends on the material, membrane pore size distribution, and water quality. Nanofiltration and ultrafiltration are likely effective in removing extracellular microcystin. Reverse osmosis filtration would likely only be applicable for removal of some extracellular cyanotoxins like cylindrospermopsin. Cell lysis is highly likely. Further research is needed to characterize performance.
Potassium Permanganate	Effective for oxidizing microcystins and anatoxins. Further research is needed for cylindrospermopsin.
Ozone	Very effective for oxidizing extracellular microcystin, anatoxin-a and cylindrospermopsin.
Chloramines	Not effective
Chlorine dioxide	Not effective with doses used in drinking water treatment.
Chlorination	Effective for oxidizing extracellular cyanotoxins as long as the pH is below 8, ineffective for anatoxin-a.
UV Radiation	Effective of degrading microcystin and cylindrospermopsin but at impractically high doses.
Activated Carbon	PAC: Most types are generally effective for removal of microcystin, anatoxin-a and cylindrospermopsin, especially wood-based activated carbon. GAC: Effective for microcystin but less effective for anatoxin-a and cylindrospermopsins.

EPA National Drinking Water Advisory Council

Cyanotoxins | Detection | Health and Ecological Effects | Research | **Causes, Prevention and Mitigation**

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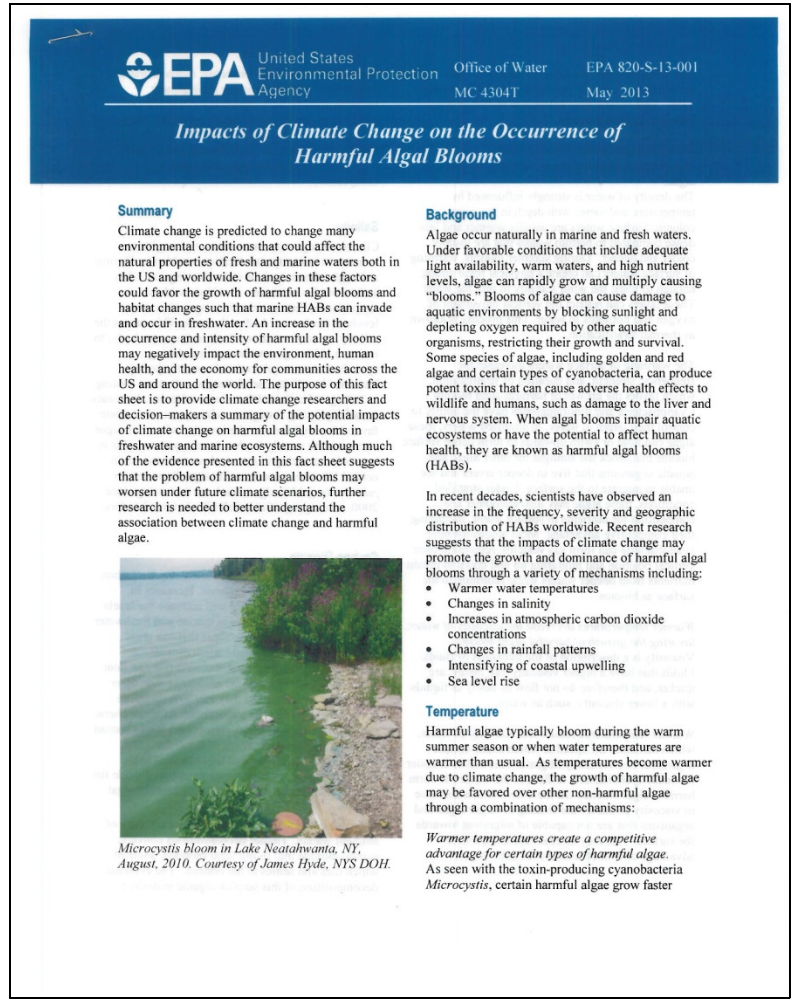
Three-page Fact Sheet on the impacts of climate change on the occurrence of HABs



EPA United States Environmental Protection Agency | Office of Water MC 4304T | EPA 820-S-13-001 May 2013

Impacts of Climate Change on the Occurrence of Harmful Algal Blooms

Summary

Climate change is predicted to change many environmental conditions that could affect the natural properties of fresh and marine waters both in the US and worldwide. Changes in these factors could favor the growth of harmful algal blooms and habitat changes such that marine HABs can invade and occur in freshwater. An increase in the occurrence and intensity of harmful algal blooms may negatively impact the environment, human health, and the economy for communities across the US and around the world. The purpose of this fact sheet is to provide climate change researchers and decision–makers a summary of the potential impacts of climate change on harmful algal blooms in freshwater and marine ecosystems. Although much of the evidence presented in this fact sheet suggests that the problem of harmful algal blooms may worsen under future climate scenarios, further research is needed to better understand the association between climate change and harmful algae.

Microcystis bloom in Lake Neatahwanta, NY, August, 2010. Courtesy of James Hyde, NYS DOH.

Background

Algae occur naturally in marine and fresh waters. Under favorable conditions that include adequate light availability, warm waters, and high nutrient levels, algae can rapidly grow and multiply causing "blooms." Blooms of algae can cause damage to aquatic environments by blocking sunlight and depleting oxygen required by other aquatic organisms, restricting their growth and survival. Some species of algae, including golden and red algae and certain types of cyanobacteria, can produce potent toxins that can cause adverse health effects to wildlife and humans, such as damage to the liver and nervous system. When algal blooms impair aquatic ecosystems or have the potential to affect human health, they are known as harmful algal blooms (HABs).

In recent decades, scientists have observed an increase in the frequency, severity and geographic distribution of HABs worldwide. Recent research suggests that the impacts of climate change may promote the growth and dominance of harmful algal blooms through a variety of mechanisms including:

- Warmer water temperatures
- Changes in salinity
- Increases in atmospheric carbon dioxide concentrations
- Changes in rainfall patterns
- Intensifying of coastal upwelling
- Sea level rise

Temperature

Harmful algae typically bloom during the warm summer season or when water temperatures are warmer than usual. As temperatures become warmer due to climate change, the growth of harmful algae may be favored over other non-harmful algae through a combination of mechanisms:

Warmer temperatures create a competitive advantage for certain types of harmful algae. As seen with the toxin-producing cyanobacteria *Microcystis*, certain harmful algae grow faster

http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/upload/cyanobacteria_factsheet.pdf

Webinars on HABs

Inland HABs Discussion Group Webinars

http://www2.epa.gov/nutrient-policy-data/inland-hab-discussion-group

- October 18, 2012 – States Updates on HAB Monitoring Programs
- January 24, 2013 - Guidelines Development
- April 25, 2013 - Control and Mitigation of Cyanobacteria and Cyanotoxins
- Next January, 2014 – New Research on Cyanotoxins Detection

EPA sponsored webinars

- July 30, 2012 - Cyanobacteria and Cyanotoxins Occurrence and Detection Methods
- May 22-23, 2013 - Health Risks Associated with Cyanobacteria and Cyanotoxins
- Next in 2014 - Bioaccumulation, Control, Treatment

DW Health Advisories (HA) for Cyanotoxins

Microcystins, Anatoxin-a, and Cylindrospermopsin

- Joint collaboration with Health Canada, coordinated with ORD
- HA are non-regulatory concentrations at which adverse health effects are not anticipated to occur over specific exposure durations: one-day, ten-day, and Lifetime.
- Includes:
    - General information and properties
    - Occurrence and exposure
    - Toxicokinetics
    - Health effects data
    - Quantification of toxicological effects
    - Other criteria, guidance, and standards
    - Analytical methods
    - Treatment technologies

Exposure and Health Effects

- Potential routes of exposure and health effects:
  - Dermal contact – Rash, hives, and skin blisters
  - Inhalation - Flu-like illness, respiratory irritation and asthma-like symptoms
  - Ingestion - Abdominal pain, diarrhea, vomiting, nausea, numb lips, tingling fingers and toes, or dizziness

- Health effects related to exposure to cyanotoxins most commonly found in the US are:
  - Hepatotoxic (affect the liver)
    - Microcystin and Cylindrospermopsin
  - Neurotoxic (affect the nervous system)
    - Anatoxin-a and Saxitoxin

Existing Guidelines for Cyanotoxins

- WHO 1998 (provisional)
  - microcystins (based on LR) value for drinking water of 1µg/L and 20µg/L for recreational contact
- Canada 2002 (final)
  - total microcystins value for drinking water of 1.5µg/L
- EPA NCEA 2006 (draft for drinking water)
  - microcystin-LR short term/subchronic: 1.4 µg/L; chronic 0.1 µg/L
  - Cylindrospermopsin subchronic: 1 µg/L
  - Anatoxin a: short term: 70 µg/L; subchronic 14 µg/L
- Australia 2011 (suggested for drinking water)
  - Total microcystin: 1.3 µg/L

Status of USEPA HA for Cyanotoxins

- External Peer Review of the Health Effects Support Document for Cyanobacterial toxins
- Draft final HA
  - Quantification of Toxicological Effects
  - Analytical Methods
  - Treatment Techniques
- Peer Review
- Publication – Summer 2014

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CyanoHABs website
http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/cyanohabs.cfm

OGWDW

- EPA listed three algal toxins on the third Contaminant Candidate List (CCL) in 2009.
  - Anatoxin-a,
  - Microcystin-LR, and
  - Cylindrospermopsin.
- EPA is evaluating algal toxins for regulatory determinations, and must be able to determine if any of them:
  - have adverse effect on the health of persons;
  - will occur in public water systems with a frequency and at levels of public health concern; and
  - presents a meaningful opportunity for health risk reduction for persons served by public water systems.
- EPA is evaluating algal toxins for inclusion in future Unregulated Contaminant Monitoring Rules
  - EPA will need to develop analytical methods with sufficient sensitivity and precision and
  - evaluate sampling protocols that will capture the episodic occurrence

Source Water Collaborative

Purpose: Member organizations work to integrate source water protection into land-use planning and stewardship; road, sewer and water projects; farming, industry and development practices; waste disposal methods; watershed planning, protection and clean-up

Membership: 25 national organizations--federal, state, local, NGOs, including: USDA/FSA, USDA/FS, National Rural Water Association, National Association of Conservation Districts

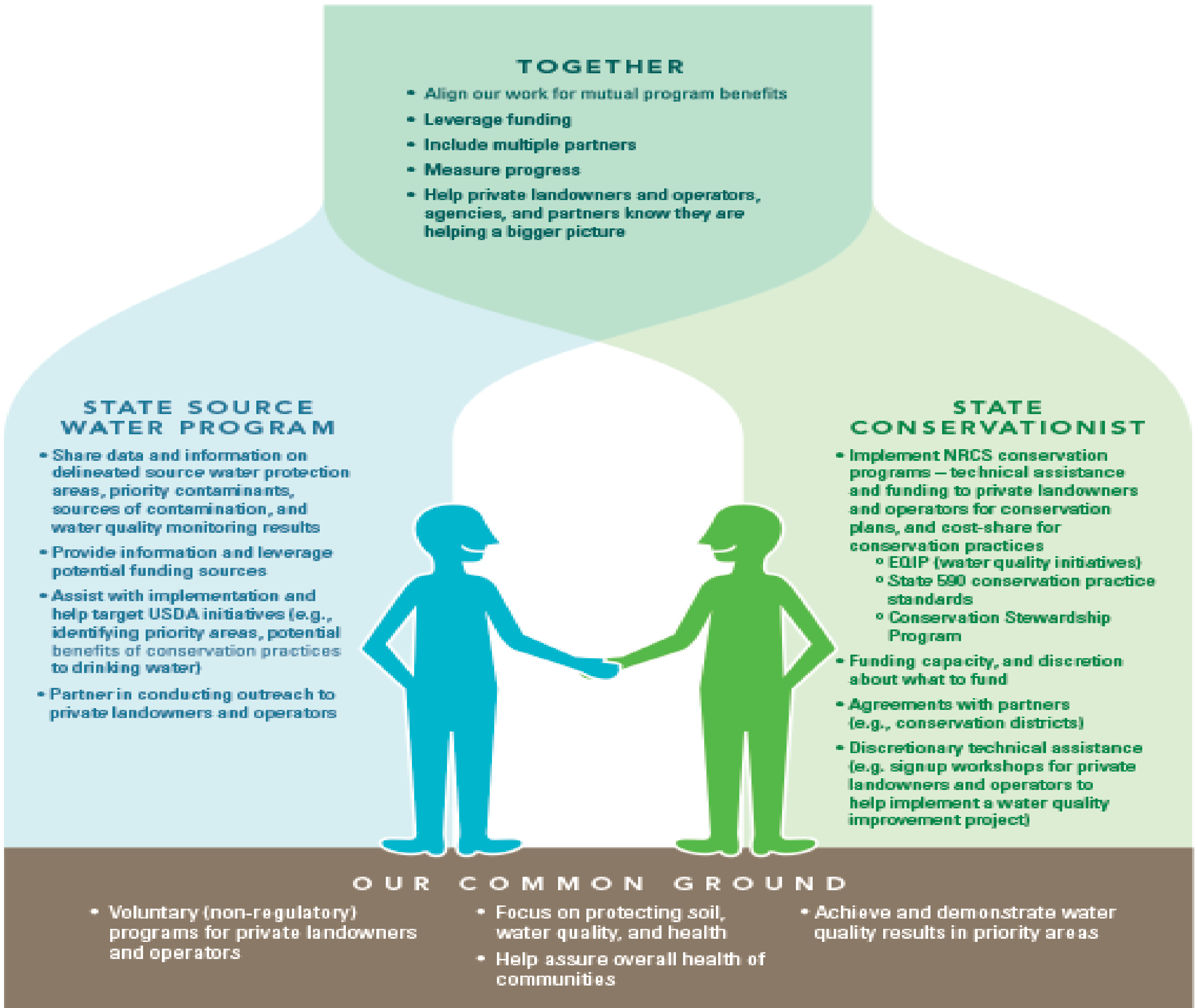
Current Nutrient-Related Activities:

- Promote nutrient reduction activities by partnering with the agriculture community
- Local/Regional based source water collaborative pilot projects

Agriculture-Source Water Collaboration Toolkit

- Promotes partnerships with NRCS State Conservationists to increase use of agricultural conservation practices to protect drinking water sources
- Online toolkit posted at:
  sourcewatercollaborative.org/swp-usda
- Currently updating to include tips for working with local conservation districts

Agriculture-Source Water Collaboration Toolkit: How Collaboration can Protect Sources of Drinking Water



Source Water Collaborative Pilot Projects

Purpose: Facilitate development and dissemination of local, regional and state source water protection models, focusing on nutrient reduction and effective use of Clean Water Act tools to protect and restore drinking water sources.

Lancaster County, Pennsylvania

- Led by the Lancaster County Planning Commission
- Goal: Increase collaboration between water suppliers and key partners to implement best source water protection practices and outreach to stakeholders, focusing on reducing nitrates in ground water.

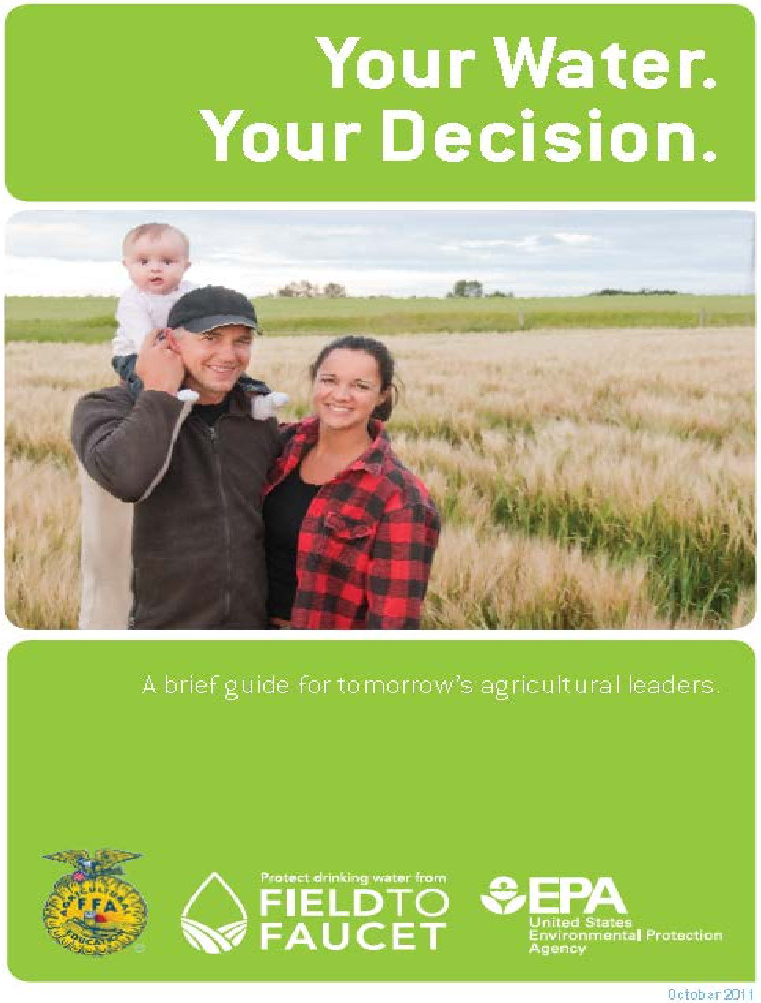
State of Wisconsin (with Rock and Sauk Counties)

- Led by WI Department of Natural Resources' Bureau of Drinking Water and Groundwater.
- Goal: Develop a transferrable, collaborative response, with participation of partners and key stakeholders, to reduce the number of sub-watersheds with drinking water sources approaching unsafe levels of nitrate.

Sheridan, Wyoming (Big Goose Creek Watershed)

- Led by the City of Sheridan & Sheridan Area Water Supply.
- Goal: Develop a watershed control plan to address Cryptosporidium, E. coli and sediment pollution, and design action plans that can be implemented to protect drinking water sources from future contamination.

Protecting Drinking Water From Field to Faucet



- Tool for outreach to future agricultural leaders
- Share annually at FFA Convention with high school ag science students, instructors, parents
- Highlights best conservation practices for protecting drinking water sources:
  - Nutrient management
  - Conservation tillage and crop rotation
  - Fencing and alternative water supply for livestock
  - Integrated pest management
  - Drainage water management
  - Efficient irrigation
  - Smart septic tanks
  - Ground water contamination awareness
- Have also developed "Source Water Protection Lessons" that high school ag science teachers can use, tied to National Science Education Standards for grades 9 – 12. Available on FFA's website

CWA-SDWA Collaboration Initiative

GOAL: EPA and its partners will increase focus on drinking water sources to better protect human health, minimize the burden of additional drinking water treatment costs, and make progress in achieving water quality objectives through collaborative actions among CWA, SDWA and other programs to:

- Protect healthy source waters
- Reduce existing source water impairments
- Improve water quality for all uses

ACTIONS:

Develop relatively short support document for each CWA tool:

- Special considerations for practitioners using those tools – based on experiences and best practices developed.
- Recommended actions for various parties (e.g., EPA-HQ, EPA-Regions, or states) that *"hard-wire" improved collaboration* around these tools (e.g., policies, tools, annual state/Regional commitments)

Topic Specific/Place-based Workgroups:

- Additional workgroups will be formed around specific topical challenges, with particular, place-based implications. (e.g., nutrients and bromides).

Questions/Discussion

Lead and Copper Rule Long-term Revisions: Copper Public Education and Lead Service Line Replacement

Presenter: Lisa Christ, Acting Chief

U.S. EPA, Office of Ground Water and Drinking Water, Standards and Risk Management Division, Targeting and Analysis Branch

Purpose & Overview

Purpose:

To provide the NDWAC with background on the existing LCR requirements for public education and lead service line replacement (LSLR)

Highlight for the Committee the types of regulatory revisions that EPA is considering

Preview the type of detailed stakeholder input EPA is seeking from the Working Group and the NDWAC Committee

Goals and Objectives of Rule Change: Copper Public Education

To improve the health of consumers by motivating consumers to take actions in reducing exposure to copper in drinking water in systems with elevated copper levels

Background: Copper Public Education

Under the LCR, there are no public education materials or informational statements provided on the health risks of copper exposure, or steps consumers can take to reduce their risk of exposure

Health impacts of copper are nausea and vomiting (short-term), and there may be liver damage and possible immune system depression in sensitive populations (e.g. individuals with Wilson's disease)

Both the maximum contaminant level goal (MCLG) and action level (AL) for copper were established based on the prevention of acute nausea

Corrosion and leaching is limited to water systems that have water quality that is aggressive to copper

For those systems with aggressive water quality, corrosion can occur to copper plumbing of any age

Potential Revisions: Copper Public Education

The Agency is considering requiring copper public education materials for systems exceeding the copper AL and/or a brief informational statement to consumers served by systems which have water quality aggressive to copper

These materials may be delivered to all consumers in the distribution system in a way similar to how consumers are educated about lead after a lead action level exceedance

Potential Revisions: Copper Public Education

Topic areas for educational materials include:

- What copper is, the possible sources of copper in drinking water and how copper enters drinking water
- Copper health effects
- Steps the consumer can take to reduce their exposure
- Why there are elevated levels of copper in the system's drinking water and what is being done (if anything) to reduce the copper levels
- What other plumbing materials are available for use in water qualities aggressive to copper

Example Stakeholder Input Questions for: Copper Public Education

What does effective copper public education language look like which increases awareness of the health effects, yet is simple and cost effective?

If public education materials or informational statements are required, what information should be included?

Goals and Objectives of Rule Change: Lead Service Line Replacement

Remove sources of lead in the distribution system

Encourage optimization of CCT to prevent lead leaching

Address environmental justice concerns associated with LSLR

Maintain and enhance enforceability of the LCR

Background: Lead Service Line Replacement

Systems that exceed the lead action level, in two consecutive 6-month monitoring periods, after installing CCT and/or SOWT, must replace at least 7% of LSLs annually

- systems can do full or partial LSLRs, or “test out” a LSL if all samples from the line are at or below the lead AL
- systems must replace the portion of the LSL they own
- it must offer to replace the private property owner’s portion at his or her expense
- the system is not required to replace the privately-owned portion
- Systems conducting partial LSLRs must:
  - Notify customers at least 45 days prior to replacement about the potential for increased lead levels
  - Collect samples within 72 hours of replacement and provide results within 3 days of receipt

Background: Lead Service Line Replacement

Systems can discontinue LSLR whenever lead tap samples are at or below the AL for 2 consecutive 6-month monitoring periods; the system must recommence if samples subsequently exceed the AL

Currently environmental justice concerns raised because only those who chose, and have the ability, to pay for replacement of the private portion of the LSL gain the benefit of total removal of the lead source

Background: LSLR - Science Advisory Board Report

EPA asked the Science Advisory Board (SAB) to evaluate the current scientific data regarding the effectiveness of PLSLR

The SAB review centered around five issues:

- Associations between PLSLR and blood lead levels in children
- Lead tap water sampling data before and after PLSLR
- Comparisons between partial and full LSLR
- PLSLR techniques
- The impact of galvanic corrosion

Background: LSLR - Science Advisory Board Report Continued

The 2011, final SAB Report found that:

"the quantity and quality of the available data are inadequate to fully determine the effectiveness of PLSLR"

PLSLRs have not been shown to reliably reduce drinking water lead levels in the short term

PLSLR is frequently associated with short-term elevated drinking water lead levels, suggesting the potential for harm rather than benefit during that time period

Potential Revisions: Lead Service Line Replacement

To facilitate full LSLRs, revise the definition of **control** to include that portion of the LSL not currently owned by the system, but that may be under the system's control because it has the authority to set standards for construction, repair, replacement or maintenance of the line

Delay mandatory LSLRs until after CCT re-optimization

Elimination of the PLSLR requirement when the property owner does not agree to pay for the replacement of the portion of the LSL on private property

Potential Revisions: Lead Service Line Replacement

Full LSLR would be required if the:

- system owns or controls the entire LSL, or
- the property owner agrees to pay for the replacement on the private side, or
- if the water system voluntarily pays the entire cost.

Elimination of the “test-out” provision

Require systems to provide impacted residents with a NSF/ANSI 53 certified pitcher-filter or other treatment unit that removes lead before LSLRs begin

Example Stakeholder Input Questions for: Lead Service Line Replacement

When optimization does not bring lead levels under the AL how should systems reduce exposure from LSLs in a way that protects public health, is feasible and assures equitable protection among the system's users?

What are the environmental justice concerns associated with LSLRs? How can an even distribution of benefits be achieved, to avoid either disproportionate health or economic impacts?

Comments and Feedback

Copper Public Education and Lead Service Line Replacement

Lead and Copper Rule Long-term Revisions: Sample Site Selection, Sampling Protocol, and Optimized Corrosion Control

Presenter: Lisa Christ, Brach Chief

U.S. EPA, Office of Ground Water and Drinking Water, Standards and Risk Management Division, Targeting and Analysis Branch

Purpose & Overview

Purpose:

To provide the NDWAC with background on the existing LCR requirements for:

- Sample site selection criteria
- Lead sampling protocol
- Optimized corrosion control

Highlight for the Committee the types of regulatory revisions that EPA is considering

Preview the type of detailed stakeholder input EPA is seeking from the Workgroup and the NDWAC Committee

Goals and Objectives of Rule Change: Sample Site Selection

The goal of the sample site selection criteria is to target locations with high-risk lead and copper in drinking water systems in a cost-effective manner

Selection and use of highest risk sites is important, because:

the number of samples collected is relatively small

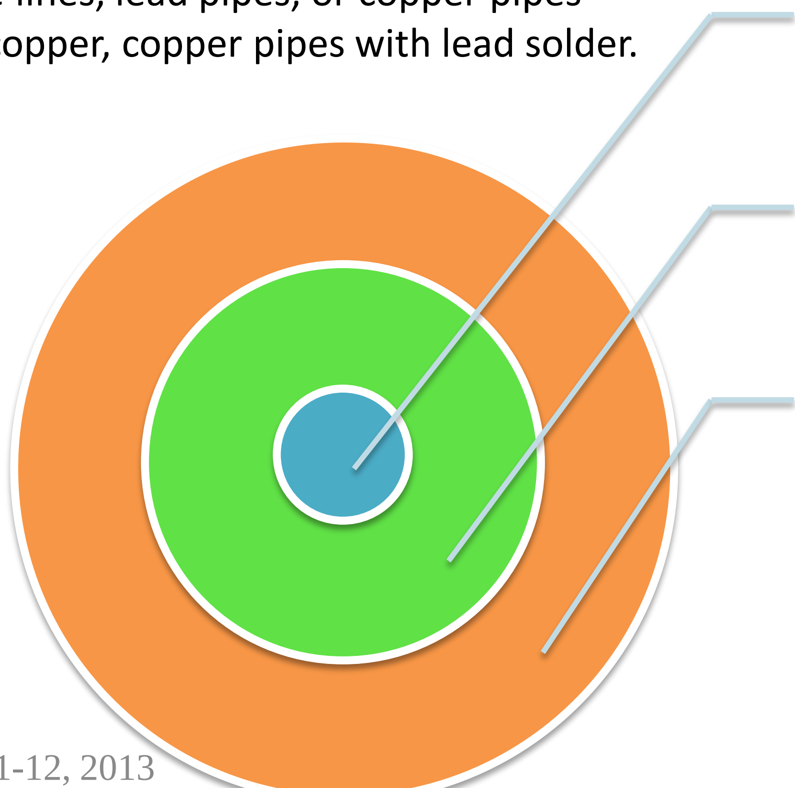
contaminant levels can vary between systems and sites based on water quality, and distribution system and usage characteristics

Targeting these high-risk locations helps ensure that appropriate action is taken if a lead or copper problem is identified in the system

Background: Sample Site Selection

Current Site Selection Criterion: Lead & Copper

The LCR establishes a tiering system for prioritizing the selection of sampling sites based on the likelihood of the sites to release elevated levels of lead and copper; for lead, sites with lead service lines, lead pipes, or copper pipes with lead solder; for copper, copper pipes with lead solder.



Background: Sample Site Selection

New information exists regarding lead and copper release patterns:

Lead

Full and partial LSLs represent the greatest source of lead to drinking water.

Over twenty years ago lead solder was banned, these sites now are likely to be releasing levels of lead comparable to contributions by brass plumbing components and interior pipe corrosion byproduct scales

Lead has been shown to accumulate in corrosion scales or deposits formed in premises plumbing, downstream of LSLs, and can be released sporadically, in response to treatment changes or line disturbances

Background: Sample Site Selection

Copper

Corrosion can occur to copper plumbing of any age

Given certain water qualities, copper levels above the AL are most likely to occur in newly constructed and recently renovated homes and buildings with copper plumbing

Corrosion of new copper pipes is not a problem for many water systems. It is limited to water systems that have water quality aggressive to copper

Water chemistry characteristics that contribute to copper release also can vary in different zones within a distribution system as well as between different systems with respect to aggressiveness to copper

Potential Revisions: Sample Site Selection Criteria

EPA is considering two separate tiering structures, one for systems with lead service lines (LSLs) and another for systems without LSLs

Requiring public water systems to conduct copper monitoring at separate sampling sites with new copper piping, which are more likely to have elevated copper levels

Allowing systems with water qualities not considered aggressive to copper to eliminate copper monitoring through a waiver

Example Stakeholder Input Questions for: Sample Site Selection Criteria

How should sample site selection criteria be developed to capture the highest risk sites for lead and copper in a simple and cost effective way?

At what sites should lead and/or copper samples be collected to be representative of the greatest release for each contaminant?

Goals and Objectives of Rule Change: Lead Sampling Protocol

Establish procedures that result in a water system having a set of samples that will:

Assess the corrosivity of the water being provided and/or

Indicate if the corrosion control is effective in reducing lead and/or copper corrosion from lead service lines (LSLs) and plumbing materials

Background: Lead Sampling Protocol

The current LCR requires a one-liter first draw sample taken after a minimum six-hour stagnation time

- This applies to both lead service lines and lead-soldered copper pipes
- currently residents are allowed to collect the first-draw samples

A number of studies where consecutive liters of water were taken and analyzed until the LSL was reached found that the first draw sample may underestimate the amount of lead that can be in samples in contact with the LSL

EPA's analysis of the data provided by these studies suggests that where present, LSLs (full or partial) are the greatest source of lead in the distribution system.

Potential Revisions: Lead Sampling Protocol

EPA is considering different sampling procedure options for sites with partial or full LSLs to more accurately capture lead releases

Possible new protocols include:

Discarding a specific number of liters prior to taking a one-liter sample representative of the LSL. This sampling regime would be developed based on plumbing configurations ahead of time and be consistent across all sampling sites

Collecting a series of sequential samples at each site in the sampling pool to identify the liter containing the highest lead at the site, and using only that identified site-specific liter for subsequent monitoring and compliance purposes

Potential Revisions: Lead Sampling Protocol

Additional possible changes to the LCR sampling protocol include:

Mandating that aerators should not be removed or cleaned before or during the collection of tap samples

Not allowing flushing of the tap for an extended period of time (5 minutes or longer) prior to the start of the minimum six-hour stagnation time

The total number of sites and the sample site selection criteria may be changed: to better represents the contribution of the LSL to lead levels; allow a reduction in the number of sample sites needed to assess the effectiveness of CCT; and to better capture the affect of different water qualities thought a system.

Example Stakeholder Input Questions for: Lead Sampling Protocol

For systems with LSLs, what does a cost-effective lead sampling procedure look like that captures lead where concentrations are likely highest?

What is an appropriate number of samples to be collected by a water system that will indicate if the corrosion control is effective in reducing lead? In reducing copper?

Goals and Objectives of Rule Change: Optimal Corrosion Control Treatment

Enhance the process for systems to improve the effectiveness of their corrosion control treatment

Ensure adequate incentives for optimization

Provide greater clarity about treatment optimization

Background: Optimal Corrosion Control Treatment (OCCT)

The current LCR requires small systems that exceed the action level to:

- Make optimal corrosion control recommendations to the State for approval (State approves or designates alternative)
- The system implements CCT and conducts follow-up monitoring for one-year
- State reviews data and designates optimal water quality parameters (OWQP) (i.e., min/max pH, alkalinity, inhibitor concentration, etc.)
- Systems compliance with the treatment technique is based on OWQP (not Pb/Cu levels) and on whether they perform the required actions when the action level is exceeded
- A lead action level exceedance after installation of corrosion control treatment triggers the start of lead service line replacement (LSLR)

Background: Optimal Corrosion Control Treatment (OCCT)

Systems are faced with the challenge of continuing to maintain OCCT while adjusting treatment and system operations to comply with other NPDWRs

Research data shows different chemical behavior and optimization conditions for lead and copper release making simultaneous minimization difficult

Potential Revisions: Optimal Corrosion Control Treatment

EPA is evaluating whether to require systems exceeding the lead action level to re-optimize CCT, if that should happen before being triggered into LSLR, and the level of rigor in the re-optimization process

Re-optimization process would include:

A mandatory system-wide Corrosion Control Treatment study for systems with LSLs

That evaluates the variability of water quality throughout the distribution system due to differences in source water quality within distinct hydraulic boundaries, different or variable residence times and multiple types of distribution system materials

Targets key parameters that are known to affect or limit the effectiveness of CCT (e.g. pH and alkalinity)

System would be required to study the use of orthophosphate and for systems using orthophosphate to study the use of higher dosages of orthophosphate

Systems would not be required to study calcium hardness adjustment as a potential option for OCCT

Potential Revisions: Optimal Corrosion Control Treatment

Re-optimization process would also include:

The allowance of more time (at State discretion) to evaluate the treatment prior to setting OWQP ranges

Regular monitoring during re-optimization to provide additional information to the systems and states

Allow NTNCWSs serving fewer than 10,000 people the option of installing Point of Use (POU) treatment units in lieu of having to install CCT

Example Stakeholder Input Questions for: Optimal Corrosion Control Treatment

What are the challenges to optimizing corrosion control treatment and what are some of the lessons learned from implementing corrosion control treatment?

How can LCR requirements be structured to encourage OCCT and retain enforceability?

Comments and Feedback

Sample Site Selection, Sampling Protocol, and Optimized Corrosion Control

Lead and Copper Rule Long-term Revisions: Background and Introduction of Key Issues for NDWAC Consideration

Presenter: Eric Burneson, Acting Director

U.S. EPA, Office of Ground Water and Drinking Water, Standards and Risk Management Division

Purpose & Overview

Purpose:

To provide the NDWAC with background on the Lead and Copper Rule Long-term Revisions in general, and

To highlight for the Committee five areas where EPA is currently considering a range of regulatory revisions and is seeking detailed stakeholder input

Overview:

Background on the Lead and Copper Rule

Key areas for rule revisions that would benefit from in depth Stakeholder input

EPA's proposed stakeholder Working Group structure and timeline

Background: Lead and Copper Rule (LCR)

EPA under the Safe Drinking Water Act (SDWA) sets public health goals and enforceable standards for drinking water quality

Lead and Copper: National Primary Drinking Water Regulation (NPDWR) initially promulgated June 7, 1991

The goal of the LCR is to:

> Protect public health by minimizing lead and copper levels in drinking water, primarily by reducing water corrosivity

The rule applies to all community water systems (CWSs) and non-transient non-community water systems (NTNCWSs)

The LCR addresses corrosion and leaching of lead and copper from service lines and household plumbing in to drinking water

Background: LCR Continued

The LCR requires compliance with a treatment technique (optimized corrosion control) rather than a Maximum Contaminant Level (MCL)

Maximum Contaminant Level Goals (MCLG)

Lead – 0 µg/L
Copper – 1.3 mg/L

Tap sampling results are compared to an action level (AL)

Lead - 15 µg/L
Copper - 1.3 mg/L

Action level for lead is a screen for optimal corrosion control as part of the treatment technique. It is based on treatment feasibility; NOT on a health threshold.

Action level for copper is a screen which triggers optimal corrosion control treatment, and is set at the health based MCLG.

Public Health Benefits of the LCR

Reduction in risk of exposure to lead that can cause damage to brain, red blood cells, and kidneys, especially for young children and pregnant women

Reduction in risk of exposure to Copper that can cause stomach and intestinal distress, liver or kidney damage, and complications of Wilson’s disease in genetically predisposed people

Major Monitoring Provisions of the LCR

Standard Lead and Copper Tap Monitoring:

All community water systems (CWSs) and non-transient non-community water systems (NTNCWSs) are subject to monitoring requirements

Systems must collect first-draw samples at taps in homes/buildings that are at high risk of lead and copper contamination

The number of required samples varies by the size of the population served by the system, from 100 samples for large systems serving over 100K people down to 5 samples for systems serving 100 or fewer people

Systems must conduct monitoring every 6 months unless they qualify for reduced monitoring

The number of required samples and sampling frequency may be reduced if systems meet certain requirements

Monitoring Requirements Continued

Standard Water Quality Parameter Monitoring:

Large systems serving >50,000 people, and small and medium systems serving ≤ 50,000 individuals during monitoring periods in which either AL is exceeded must monitor for water quality parameters (WQPs)

Sampling frequency:

- WQP samples at household/building taps are collected every 6 months
- WQP samples at entry points to the distribution system are collected every 6 months prior to CCT installation, then every 2 weeks

The number of required tap samples varies by the size of the population served by the system, from 25 samples for large systems serving over 100K people down to 1 sample for systems serving 500 or fewer people

The number of required tap samples and sampling frequency may be reduced if systems meet certain requirements

Consumer Notice and Confidence Reports

Within 30 days of learning the results, all systems must provide individual Lead tap results to people who receive water from sites that were sampled, *regardless of whether the results exceed the lead Action Level*

All systems, irrespective of their lead levels, must provide an educational statement about lead in drinking water in their Consumer Confidence Report

Current LCR Actions Triggered Under Action Level Exceedance

For systems serving < 50,000 people, if the 90^{th} percentile of a system's lead sampling results exceed the action level, a system must:

- Conduct public education
- Implement source water monitoring and if needed treatment
- Install or optimize corrosion control treatment
- Implement Lead Service Line Replacement (LSLR), if corrosion control does not reduce lead and copper levels below the ALs

LCR Requirements if the Action Level is Exceeded: Public Education

Systems that exceed the lead AL (*not required if only the copper AL is exceeded)*

<u>CWSs:</u>

deliver materials to bill-paying customers and post lead information on water bills

work in concert with local health agencies to reach at-risk populations (e.g. children, pregnant woman)

provide press releases and conduct new outreach activities

post to Website (CWSs serving > 100,000 only)

<u>NTNCWSs:</u>

posting and distribution to all consumers (can be electronic with State permission)

Can apply to CWSs such as hospitals and prisons where population cannot make improvements

LCR Requirements if the Action Level is Exceeded: Public Education

Delivery of the education materials must be within 60 days after end of the monitoring period in which lead AL was exceeded

Notices must be repeated annually; water bill inserts quarterly; press releases twice a year; and Web posting continuously

Public education can be discontinued whenever lead samples fall below the AL

LCR Requirements if the Action Level is Exceeded: Source Water Monitoring and Treatment

Applies to systems that exceed lead or copper AL

Monitoring is needed to determine the contribution of source water to total tap water lead and copper levels and the need for source water treatment (SOWT)

Once the AL is exceeded one set of samples at each entry point is due within 6 months

The State sets maximum permissible levels (MPLs) for lead and copper in source water based on initial and follow-up source water monitoring

LCR Requirements if the Action Level is Exceeded: Source Water Monitoring and Treatment

The System has 24 months to install any required SOWT

Continuing source water monitoring requirements:

Standard: ground water systems to monitor once during 3-year compliance periods; surface water systems monitor annually

Reduced: systems monitor every 9 years if MPLs are not exceeded during 3 consecutive compliance periods for ground water systems or 3 consecutive years for surface water systems

LCR Requirements if the Action Level is Exceeded: Corrosion Control Treatment

The current LCR requires small and medium systems that exceed the action level and large non-(b)(3) systems (i.e. those systems above 5 µg/L) to:

If the State requires, systems must conduct a corrosion control study within 18 months

The system makes optimal corrosion control recommendations to the State for approval (State approves or designates alternative)

The system implements CCT within 24 months and conducts follow-up monitoring for 2 consecutive 6-month periods on taps every 6 months and at entry points every 2 weeks (monitoring for lead, copper, and other WQPs)

State reviews data and designates optimal water quality parameters (OWQP) (i.e., min/max pH, alkalinity, inhibitor concentration, etc.)

LCR Requirements if the Action Level is Exceeded: Corrosion Control Treatment

System’s compliance with the treatment technique is based on OWQP (not Pb/Cu levels) and on whether they perform the required actions when the action level is exceeded

Systems may stop CCT if both lead and copper samples are below the ALs for 2 consecutive 6-month periods but CCT must recommence if subsequently either AL is exceeded

Reduced tap monitoring requirements:

- if system meets OWQPs for 2 consecutive 6-month periods the number of sampling site can be reduced
- Meeting OWQPs for 6 consecutive 6-month monitoring periods can result in a reduction in sampling sites and annual monitoring
- Meeting OWQPs for 3 consecutive years of annual monitoring can monitor triennially

LCR Requirements if the Action Level is Exceeded: Lead Service Line Replacement

Systems that exceed the lead action level, in two consecutive 6-month monitoring periods, after installing CCT and/or SOWT, must replace at least 7% of LSLs annually

- Systems can do full or partial LSLRs, or "test out" a LSL if all samples from the line are at or below the lead AL
- Systems must replace the portion of the LSL they own
- Systems must offer to replace the private property owner's portion at his or her expense the system is not required to replace the privately-owned portion
- Systems conducting partial LSLRs must:
  - Notify customers at least 45 days prior to replacement about the potential for increased lead levels
  - Collect samples within 72 hours of replacement and provide results within 3 days of receipt

Systems can discontinue LSLR whenever lead tap samples are at or below the AL for 2 consecutive 6-month monitoring periods; the system must recommence if samples subsequently exceed the AL

Background: Long-term Revisions

EPA conducted a national review of LCR implementation issues in 2004

- collected and analyzed lead concentration data
- carried out a review of implementation and monitoring at the state level
- held four expert workshops to discuss elements of the regulations

EPA released the ***Drinking Water Lead Reduction Plan (DWLRP)*** in March 2005

- The plan outlined both short and long term goals for improving LCR implementation

Background: Long-term Revisions

In 2007 EPA promulgated the Short-term Revisions to the LCR

- The rule enhanced monitoring, treatment, lead service line replacement, public education, and customer awareness

EPA is currently working on the Long-term Revisions to the LCR

- The areas of the rule requiring revision were identified in the DWLRP and the 2007 Rule

EPA's Goal for the Long-term Revisions:

Improve the effectiveness of corrosion control treatment in reducing exposure to lead and copper and to trigger additional actions that equitably reduce the public's exposure to lead and copper when corrosion control treatment alone is not effective.

Why is EPA Forming a Working Group?

In 2011, EPA consulted with the NDWAC on key areas of LCR rule revisions

Since 2011, EPA has further analyzed those key areas and is seeking greater, in depth, stakeholder input

To facilitate this input, EPA is forming a Working Group to provide NDWAC with input and recommendations on five key areas for revision to the LCR outlined in this presentation.

Key Issues for Input

Sample site selection criteria for lead and copper

Lead sampling protocol

Public education for copper

Measures to ensure optimal corrosion control treatment

Lead Service Line Replacement (LSLR)

NDWAC Working Group Structure

The Working Group will explore the five specific technical issues and will:

- provide suggestions on how to implement the goals for LCR revisions
- provide information
- share perspectives on advantages and disadvantages of options under consideration by EPA, and
- suggest additional options

The Working Group will provide group advice where consensus is reached and alternatives where consensus is not reached

NDWAC Working Group Structure Continued

The Working Group will make its report to the NDWAC, which in turn will provide advice on these issues to EPA

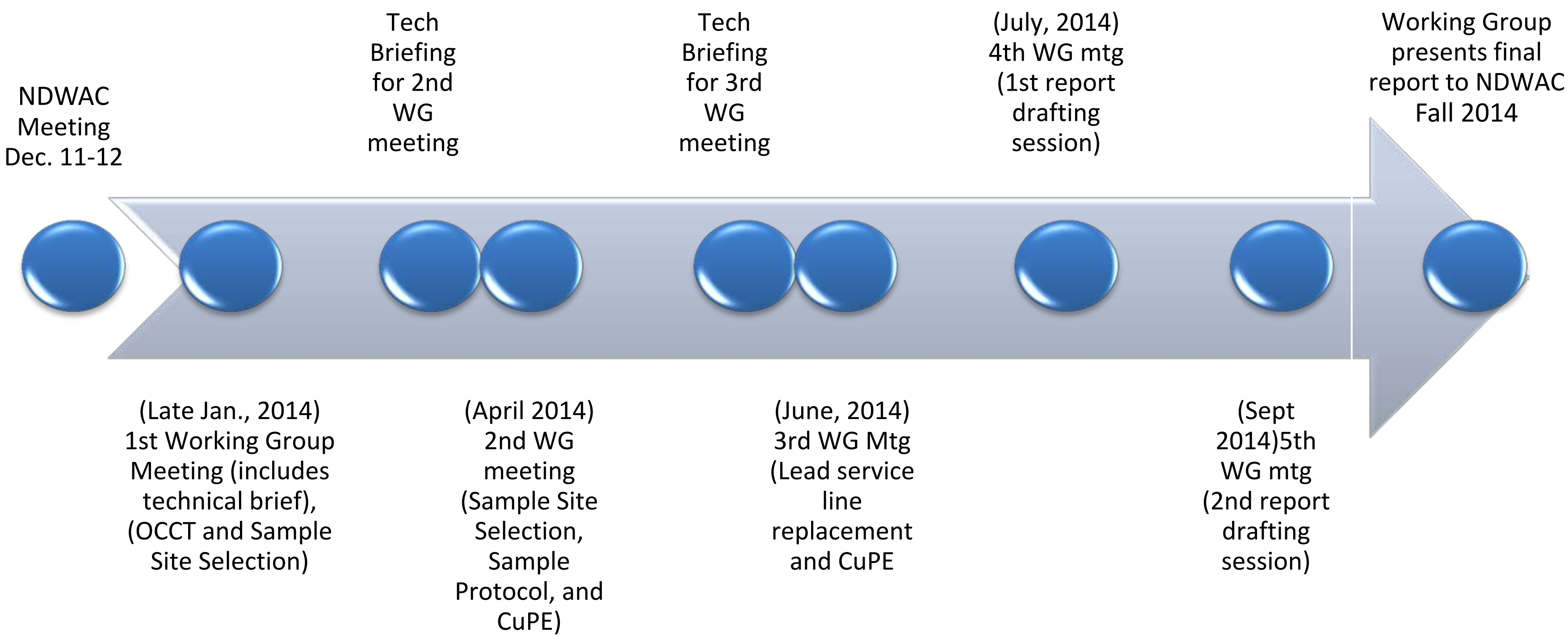
Working Group members will be selected based on the experience needed to provide balanced advice on the five issues related to Long-term revisions to the LCR

Members of the NDWAC will be selected for workgroup participation in order to facilitate the flow of information between the work group and NDWAC

EPA's Proposed Timeline

The Working Group would receive three technical briefings and meet 5-6 times to discuss the issues and write a draft report for the Fall 2014 NDWAC meeting

The NDWAC will review the report and submit to EPA their final recommendations



Comments and Feedback

Regulatory Analysis and Rule Development

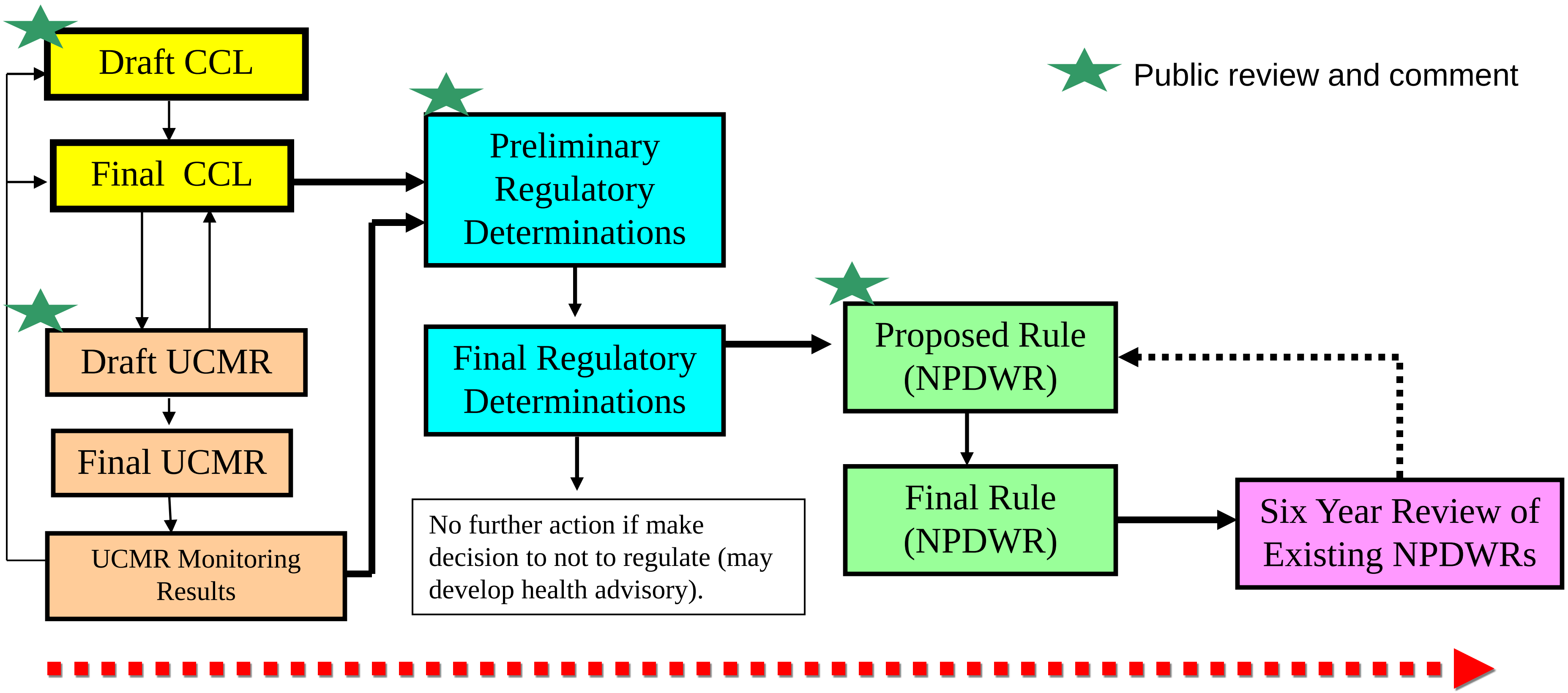
National Drinking Water Advisory Council

December 11, 2013

Office of Ground Water and Drinking Water

U.S. EPA

General Flow of SDWA Regulatory Processes



At each stage, need increased specificity and confidence in the type of supporting data used (e.g. health, occurrence, treatment).

Presentation Overview

- Contaminant Candidate List
- Unregulated Contaminant Monitoring
- Regulatory Determinations
- Rules under Development/Revision
- Six Year Review of Regulations
- Regulatory Revisions
- Reduction of Lead in Drinking Water Act

Contaminant Candidate List (CCL)

- Published Third Contaminant Candidate List (CCL 3) in Oct 2009, which listed 116 contaminants:
  - 12 microbes (e.g., viruses, bacteria)
  - 104 chemicals (pesticides, industrial chemicals, pharmaceuticals, inorganics)
- Spring 2012 - Published FR notice requesting nominations of contaminants to be considered for inclusion on CCL 4
  - 59 unique contaminants were nominated by 10 organizations and individuals
    - 5 microbes and 54 chemicals
    - 8 contaminants were nominated more than once
  - The nomination letters and web site submittals can be found in the CCL 4 docket (EPA-HQ-OW-2012-0217) at www.regulations.gov
- Expect Draft CCL 4 publication in 2014

Unregulated Contaminant Monitoring Rule ("UCMR 3")

- Final rule published May 2, 2012
- *http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/ucmr3/index.cfm*
- Monitoring taking place Jan 2013 – Dec 2015; reporting through ~mid-2016
- 28 chemicals and 2 viruses
- Chemical contaminants include hormones, perfluorinated compounds (e.g., PFOS/PFOA), VOCs, metals (including Cr-6 and total Cr), 1,4-dioxane, chlorate

UCMR 3 Preliminary Results

- Posted the first set of results 11/5/13
  - http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/data.cfm
  - Data set represents first-quarter 2013 results as well as partial second- and third-quarter results
- Results to be updated ~quarterly hereafter
- UCMR 3 minimum reporting levels (MRLs) are based on analytical method quantitation limits
  - comparably lower than UCMR 1 and UCMR 2 MRLs;
  - more frequent detection of UCMR 3 contaminants expected

UCMR 3 Preliminary Results

- UCMR 3 "reference concentrations"
  - based on published health-effects information, where available, from
    - CCL3 Contaminant Information Sheets
    - EPA Health Advisory Table
    - Human Health Benchmarks for Pesticides
  - Purpose is to aid in the interpretation of the UCMR 3 results (i.e., so that detections may be judged relative to health-based concentrations rather than method-based reporting limits)
  - Reference concentrations currently available for 20 of 28 UCMR 3 chemicals

UCMR 3 Preliminary Results

- ~1400 sample results from ~200 PWSs for hormones
- ~6700 sample results from ~1000 PWSs for metals, chlorate
- ~4000 sample results from ~1000 PWSs for other chemicals
- <15% of data that will ultimately be collected

Summary Points re Preliminary Data

– Metals
  - Many PWSs had detections of metals (i.e., above the MRL)
  - Between 0-3.5% had measurements above the Ref Conc
  - V above the Ref Conc at 3.5% of PWSs; Sr above the Ref Conc at 1.1%; other metals measured above the Ref Conc by less than 0.5% of PWSs

– Chlorate
  - Many of the PWSs (680 of ~1000) had detections of chlorate
  - 31% of the PWSs had chlorate measurements above the Ref Conc

Summary Points re Preliminary Data

- 1,4-dioxane
  - 190 of ~1000 PWSs had detections of 1,4-dioxane
  - 6% above the 10^{-6} Ref Conc of 0.35 ug/L; none above the 10^{-4} Ref Conc of 35 ug/L
- VOCs
  - One or more VOCs were detected by ~50 of the 1000 PWSs that reported data
  - Few VOC measurements above the Ref Conc
  - 1,2,3 trichloropropane measured by ~1.6% of PWSs above the 10^{-4} Ref Conc; detected above MRL by ~1.9% (MRL > 10^{-6} Ref Conc)

Summary Points re Preliminary Data

- Perfluorinated Compounds (PFCs)
  - 15 of the ~1000 PWSs detected one or more PFCs
  - 1 PWS measured PFOS above the Ref Conc
  - Ref Conc was only available for PFOA and PFOS
- Hormones
  - 8 of the ~200 PWSs detected one or more hormones
  - Ref Conc available for the 5 estrogenic hormones, not the 2 androgenic hormones
  - None of the PWSs had (estrogenic) hormone measurements above the Ref Conc

UCMR 4

- May 2013 stakeholder meeting focused on methods for unregulated contaminants
- Initiating workgroup process for UCMR 4
- Anticipated timeline:
  - Early 2014 UCMR 4 stakeholder meeting (*details TBA*)
  - Mid-2015 proposed rule
  - Late-2016 final rule
  - January 2018 monitoring start

Regulatory Determinations

SDWA requires EPA to make regulatory determinations for ≥5 CCL contaminants every 5 years. EPA must regulate if:

1) *The contaminant may have an adverse effect on the health of persons;*

2) *The contaminant is known to occur or there is substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern; and*

3) *In the sole judgment of the Administrator, regulation of such contaminant presents a meaningful opportunity for health risk reduction for persons served by public water systems*

SDWA Section 1412(b)(1)

Potential Outcome of Regulatory Determinations

- **No Regulatory Determination**
  - Insufficient data to assess contaminant against the 3 criteria
- **Positive Determination**
  - Answer “yes” for “all three” criteria
  - Begin process to develop a drinking water regulation where additional, more detailed analyses are performed
- **Negative Determination**
  - Answer “no” for “any one” of the three criteria
  - Do not develop a drinking water regulation
  - Developing a Health Advisory is a non-regulatory option
  - Negative determination is a final decision; judicially reviewable

#	Outcome
1	✔
2	✔
3	✔

#	Outcome
1	✓
2	X
3	X

Status and Next Steps for Regulatory Determinations 3 (RD 3)

- Evaluating the health and occurrence information to identify which CCL 3 contaminants have sufficient information to make to the preliminary regulatory determinations.

- Expect to publish preliminary RD 3 for public comment in 2014.

- After evaluating and considering public comments, expect to publish final RD3 early 2015.

Perchlorate

- EPA is developing a proposed perchlorate standard :
  - Continue to evaluate available data on perchlorate occurrence
  - Evaluating the feasibility of treatment technologies to remove perchlorate and examine the costs and benefits of potential standards
- Public stakeholder meeting held in September 2012
- Consulted with the National Drinking Water Advisory Council in October, 2012
- Science Advisory Board Recommendations for methodologies to derive a Maximum Contaminant Level Goal (MCLG) May 29, 2013
  - Develop a perchlorate MCLG using Physiologically Based Pharmacokinetic (or "PBPK") modeling rather than the traditional approach of using the reference dose and exposure factors.
- EPA is working with FDA to evaluate options for PBPK modeling to derive a perchlorate MCLG

Carcinogenic VOCs Group

- EPA is developing a proposed group cVOC standard
  - Considering regulated (TCE, PCE and others) and unregulated carcinogenic VOCs (cVOCs)
  - Assess potential cVOCs for the group based upon similar health effect endpoints; common analytical method(s); common treatment or control processes; and occurrence/co-occurrence in drinking water
  - Evaluate options for setting a cVOC MCL(s) and examine the feasibility of analytical methods & treatment technologies, and costs/benefits for the group
  - Any revision for currently regulated cVOCs will improve or maintain health protection
  - Hold consultations in early 2014
- Expects to propose a regulation in late 2014

Six Year Review Background

- 1996 SDWA Amendments require EPA to review and, if appropriate, revise existing National Primary Drinking Water Regulations (NPDWRs) every six years
  - In 2003, EPA completed the 1st Six Year Review of 69 NPDWRs; made decision to revise TCR
  - In 2010, EPA completed the 2nd Six Year Review of 71 NPDWRs and made decisions to revise tetrachloroethylene (PCE), trichloroethylene (TCE), acrylamide and epichlorohydrin
- Occurrence analysis is a key component in the Six Year Review process

Six Year Review 3

- We had overwhelming support from states for the Six Year Review 3 compliance monitoring data request
  - 46 states and 8 primacy agencies have supplied EPA with their compliance monitoring data
  - We are beginning the initial review of data sets and we'll work directly with the states and primacy agencies to resolve any data questions
- Expect to complete Six Year Review by 2016

Review of Long Term 2 Enhanced Surface Water Treatment (LT2) Rule

- Aug 2011 - EPA announced plans to initiate the review of LT2 in response to executive Order 13563 (Improving Regulation and Regulatory Review); this review is part of SY3.
- Like SY3, the LT2 review involves assessment and analysis of data/information on occurrence, treatment, analytical methods, health effects, and public health risks.
- Have held three stakeholder meetings to solicit/gather information on the Round 1 monitoring results/bin placement, analytical methods improvements, uncovered finished reservoirs, and microbial toolbox options.
- Expect to complete review on same schedule as SY3 (if not sooner).

Overview of the 1989 TCR

- Federal drinking water rule first established in 1989
- Only microbial drinking water rule that applies to all (~155,000) public water systems (PWSs) in the U.S. (serving >300 million Americans)
- Requirements pertain to both community and non-community systems
- Primary objectives of the rule:
    - Ensure integrity of the distribution system
    - Indicate whether treatment is effective
    - Indicate possible fecal contamination

History of 2013 RTCR

- **Six Year Review** - SDWA requires EPA to review and revise, as appropriate, each NPDWR no less often than every six years; In 2003, EPA reviewed and decided to revise the Total Coliform Rule (TCR).

- **Advisory Committee** - In July 2007, EPA convened the Total Coliform Rule Distribution System Federal Advisory Committee (TCRDSAC), consisting of 15 organizations.

- **Agreement in Principle** - In Sept 2008, TCRDSAC deliberations concluded with a signed Agreement in Principle (AIP) that included recommendations on how to revise the TCR.

- **Proposed Rule** - In July 2010, EPA proposed and solicited public comment on the RTCR, which had the same substance and effect as the TCRDSAC recommendations.

- **Final Rule** - In Feb 2013, and after considering 134 public comment letters, EPA promulgated the final RTCR.

Key Provisions of RTCR (1 of 3)

Monitoring

- Maintains the routine sampling structure of TCR
- Allows systems to transition on their existing TCR monitoring frequency; re-evaluated at sanitary surveys
- Reduces the required number of follow-up samples (repeat and additional routine) for systems serving ≤1,000
- Like TCR, small systems (GW serving ≤1,000) are eligible for reduced monitoring
- Provides more stringent criteria that systems must meet to qualify and stay on reduced monitoring
- Requires small systems with problems to monitor more frequently

Key Provisions of RTCR (2 of 3)

Assessment and Corrective Action (Find and Fix)

- RTCR requires PWSs to investigate the system and correct any sanitary defects found when monitoring results show the system may be vulnerable to contamination
- Systems must conduct a basic self assessment (Level 1) or a more detailed assessment by a qualified party (Level 2) depending on the severity and frequency of contamination
- Failure to assess and correct is a Treatment Technique (TT) violation

Key Provisions of RTCR (3 of 3)

Seasonal Systems

- Defines "seasonal systems" and requires them to have start-up procedures and sampling during high vulnerability periods

Public Notification (PN)

- Notify public within 24 hours if system confirms fecal contamination (*E. coli*)
- Notify public within 30 days if system does not investigate and fix the identified problem (replaces the PN for total coliform detections, reducing system costs and consumer confusion)
- Notify public yearly if system does not monitor or report monitoring results (for CWSs, via the Consumer Confidence Report (CCR))

Guidance and Implementation

- PWSs are expected to comply three years after publication (by April 1, 2016). Some States have indicated that they may pursue early implementation.
- EPA HQ held first webinar on the rule requirements in April 2013; hosted and planning to host additional, more specific training to Regions and States for implementation through Spring 2014.
- Expect to release Guidance Manuals in the next 1-2 years:
  - Assessments and Corrective Actions Guidance ~ Early 2014
  - Small Systems Guidance (Systems ≤ 1,000) ~ Spring/Summer 2014
  - Quick Reference Guide ~ Completed and on the RTCR web page at http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation_revisions.cfm#implem
  - State Implementation Guide, primacy guidance/templates, crosswalks ~ Dec. 2013
  - Fact sheets, laboratory quick reference guide, other implementation tools in 2014

Reduction of Lead in Drinking Water Act

- Amends SDWA Section 1417 – Prohibition on Use and Introduction into Commerce of Lead Pipes, Solder and Flux
  - Modifies the applicability of the prohibitions by creating exemptions
  - Changes the definition of “lead-free” by reducing lead content from 8% to a weighted average of not more than 0.25% in the wetted surface material (primarily affects brass/bronze)
  - Eliminated provision that required certain products to comply with “voluntary” standards for lead leaching
  - Establishes statutory requirement for calculating lead content
  - Effective 3January 4, 2014
- Frequently Asked Questions
  - Developed based on Stakeholder input
  - Reassessing fire hydrants
- Will develop proposed revisions to 40 CFR 141.43

Ohio Harmful Algal Blooms

Beth Messer, Assistant Chief

Division of Drinking and Ground Waters

Ohio EPA


HARSHA
5/30/2012
surface BANK

Looking Back

- First clue Ohio had a cyanotoxin problem…
- 2007 USEPA National Lakes Assessment
  - *Ohio EPA received results in 2009*
- Results for microcystin:
  - Holiday Lake Huron Co. (0.35 μg/l)
  - Camp Seneca Lake Guernsey Co. (0.70 μg/l)
  - Aurora Pond Portage Co. (1.5 μg/l)
  - LaDue Reservoir Geauga Co. (3.5 μg/l)
  - Grand Lake St. Marys Mercer & Auglaize Co. (78 μg/l)

OhioEPA

2009 Grand Lake St. Marys

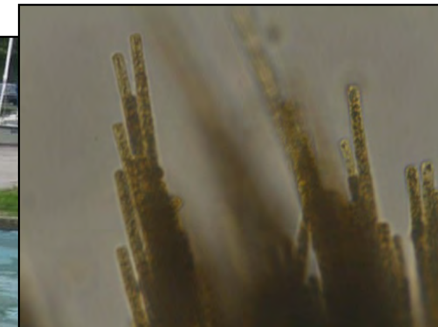
- Started sampling for microcystins due to National Lakes Assessment results
- Continued to have detections
- Issued recreational advisories

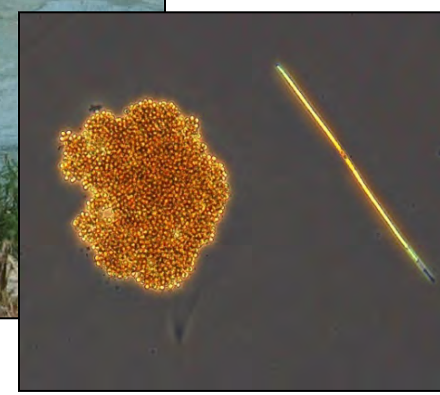
Ohio EPA

Grand Lake St. Marys

Aphanizomenon and Microcystis

Photo By Linda Merchant-Masonbrink, Grand Lake St. Marys, 2010





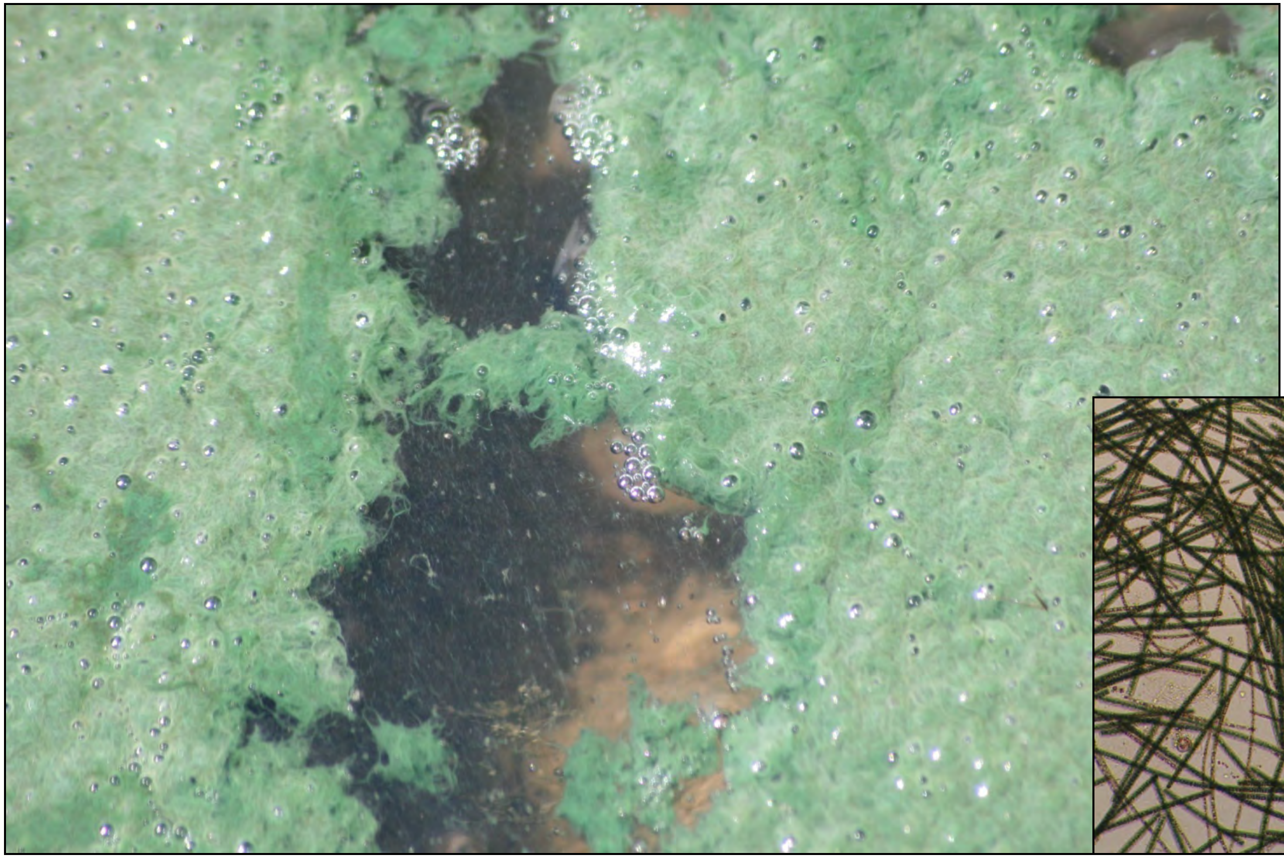
Ohio EPA

Grand Lake St. Marys

- Visually striking and overwhelming odor
- Low DO = Fish kill

Lake Mac O-Chee (Camp Wilson)

Planktothrix and *Aphanizomenon*



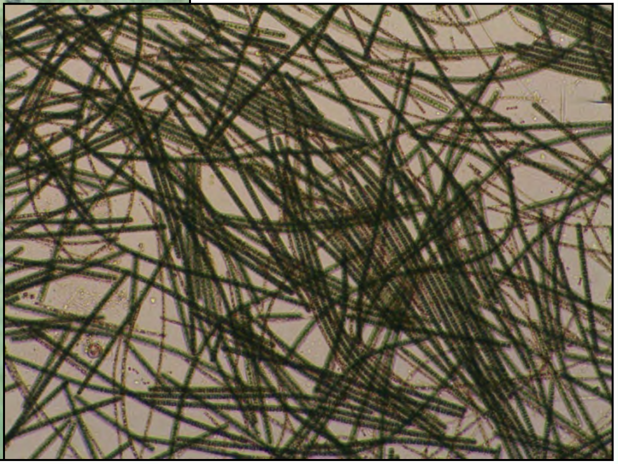


Photo By Anne Brienza, Camp Wilson, Logan County 7/2010
(Greatest human health impacts)

Ohio EPA

Woodsfield Reservoir, Sept 2010

- Microcystin
  - 360 ppb in the bloom
  - 0.68 ppb at intake
  - Below detection in finished water

Algal Toxins in the Headlines

- Columbus Dispatch
  - "The good, the bad, and the algae" (7/11/2010)
  - "Algae risk prompts YMCA to shut lake at summer camp" (7/28/2010)
  - "Lakes toxic algae might be killing pets: At least 3 dogs dead, 9 humans ill" (7/29/2010)
- Celina Daily Standard
  - "EPA: Algae toxins again in Grand Lake" (6/26/2010)
  - "Algae vapor not harmful at distance" (7/7/2010)

- Toledo Blade
  - "No Swimming: Grand Lake St. Marys water not safe" (6/28/2010)
- St. Marys Evening Leader
  - "Microcystin levels tumble" (7/23/2010)
  - "Officials Probe Illness" (7/28/2010)

OhioEPA

Lake Erie, 2011

- Worst cyanobacteria bloom in 30 years
- Western Basin
  - Microcystin >1000 ppb (dw threshold = 1 ppb)
  - PWS Raw Water >5 ppb, Finished: non-detect
  - 10 PWSs in Western Basin

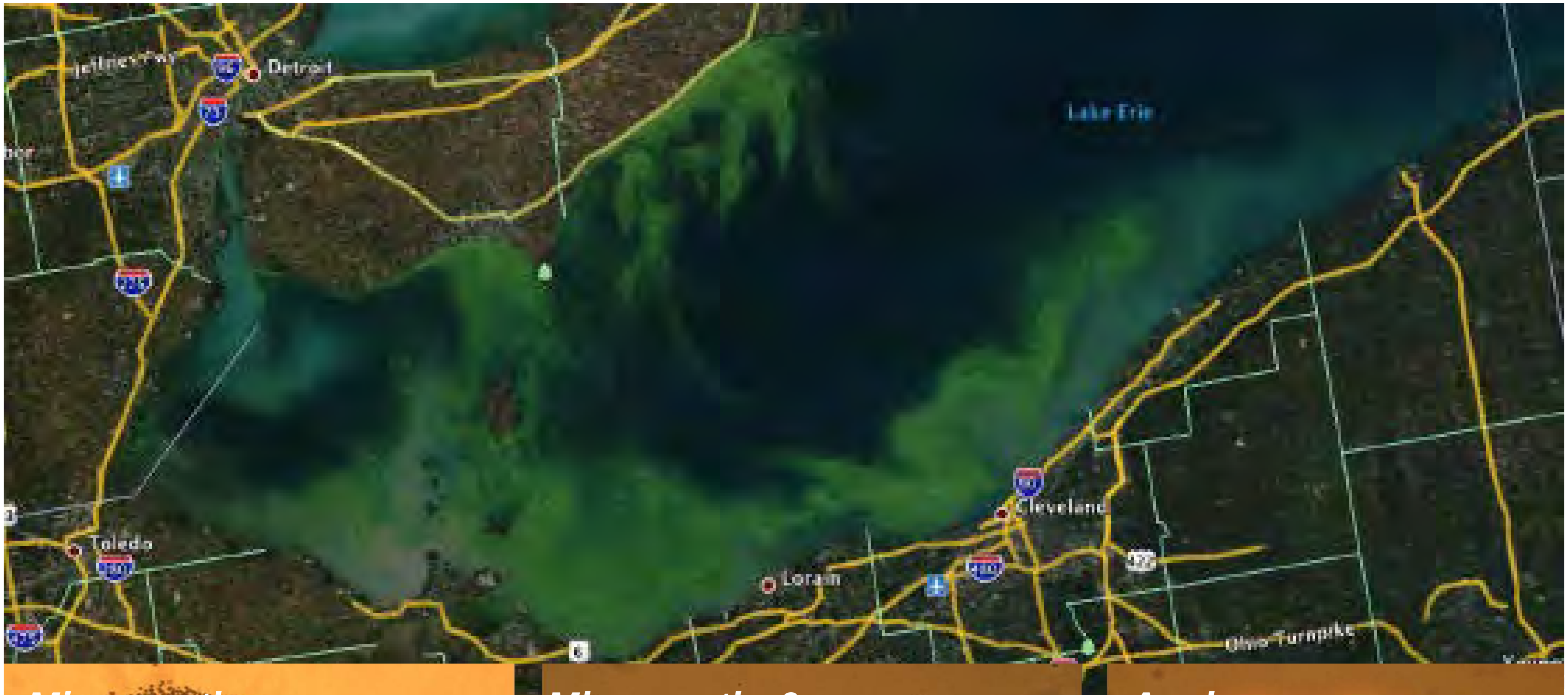
OhioEPA

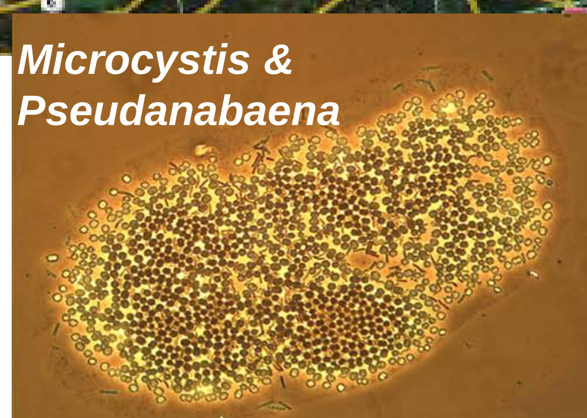
Lake Erie, 2011

- Central Basin
  - First Source Water Microcystin Detections (>100 ppb)
  - 13 PWSs in Central Basin
- No finished detects!

Ohio EPA

MODIS True Color Imagery, 10/9/2011





2011 State of Ohio Harmful Algal Bloom Response Strategy

- http://epa.ohio.gov/ddagw/HAB.aspx
- Standardized:
  - Definitions
  - Sample collection procedures
  - Public notice language
  - Cyanotoxin thresholds

- HAB reporting is voluntary because cyanotoxins are not currently regulated under SDWA
- Some systems monitor regularly (e.g., Toledo, Oregon, Ottawa County, Carroll Township, Findlay, Celina)

OhioEPA

PWS HAB Response Strategy

- Ohio EPA sampling is incident response based (for now)
- Ohio EPA will monitor for toxins if there is a likelihood of toxins breaking though treatment.
- Factors considered:
  - Bloom severity
  - Proximity to intake
  - Treatment capabilities
  - Other considerations: History of toxins, human illness, screening data

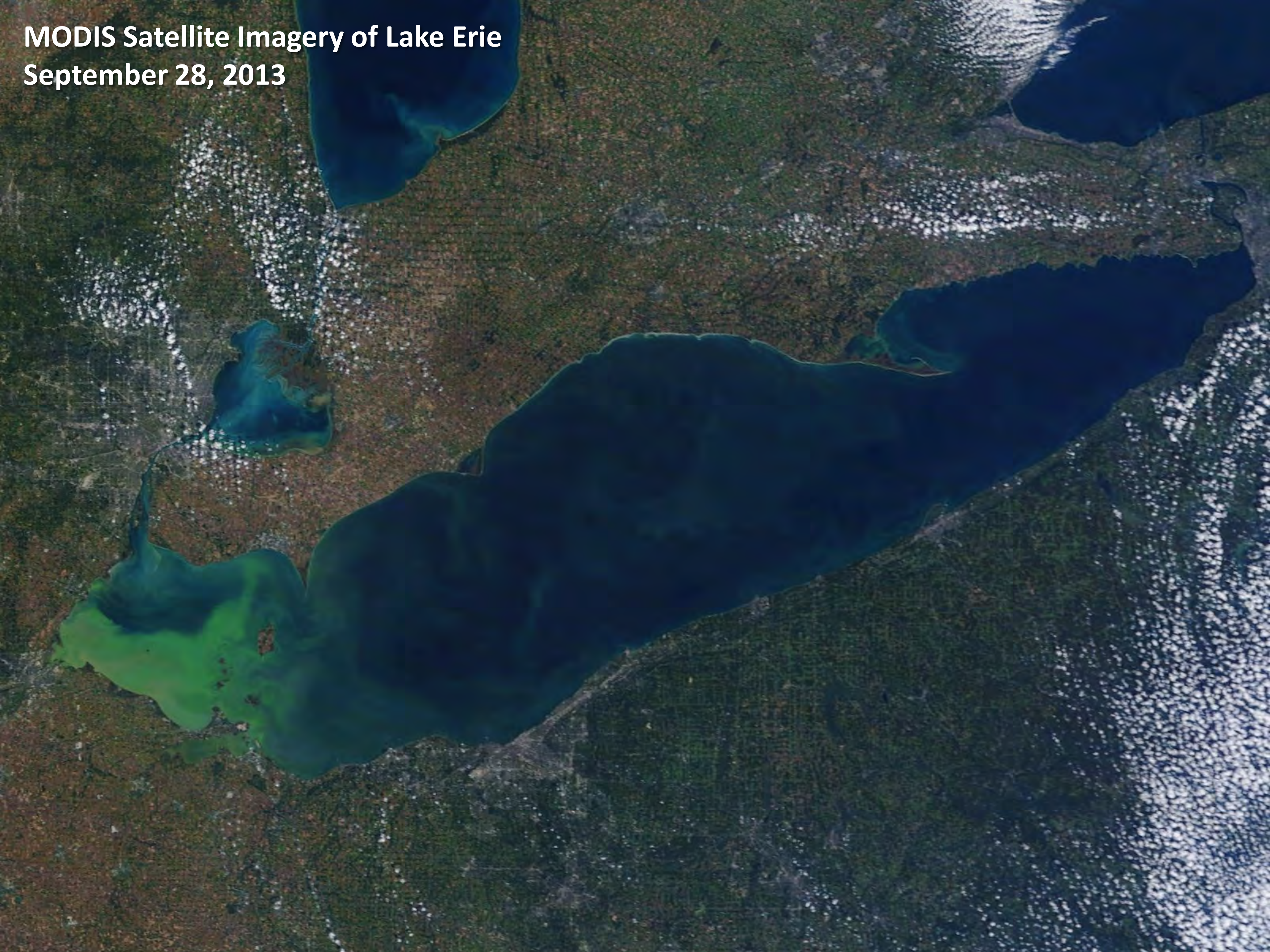
Ohio EPA

Ohio EPA Cyanotoxin Drinking Water Thresholds

Threshold (ug/L)	Microcystin**	Anatoxin-a	Cylindrospermopsin	Saxitoxin**
Do Not Drink- All consumers	**1 – 20**	**20 - 300**	**1 – 20**	**0.2 - 3**
Do Not Use- All consumers*	**> 20**	**> 300**	**> 20**	**> 3**

*These are also the concentrations for <u>recreational no-contact thresholds</u>.

** Microcystin and saxitoxin thresholds are intended to be applied to total concentrations of all reported congeners of those toxins.


MODIS Satellite Imagery of Lake Erie
September 28, 2013

Lake Erie HAB Bulletin

Produced by NOAA

September 24, 2013 Satellite Imagery

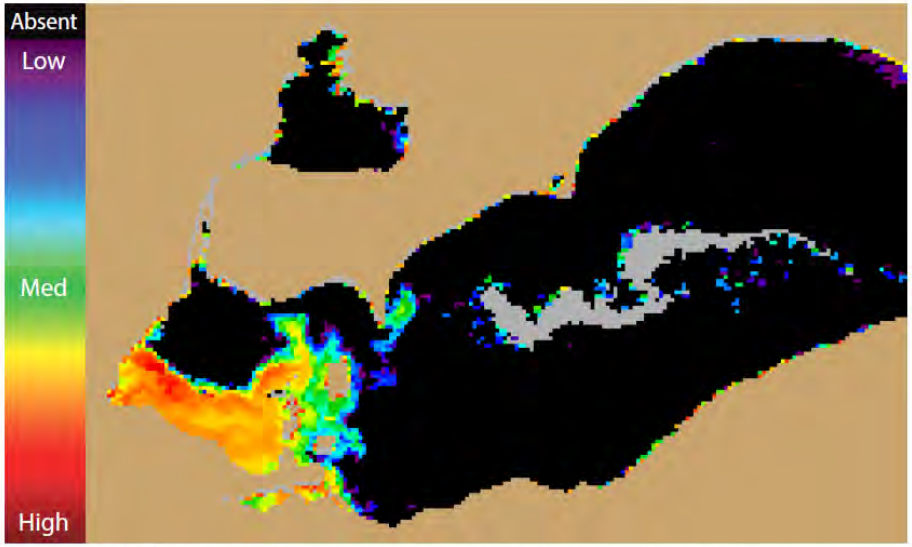


Figure 1. MODIS Cyanobacterial Index from 24 September 2013. Grey indicates clouds or missing data. Black represents no cyanobacteria detected. Colored pixels indicate the presence of cyanobacteria. Cooler colors (blue and purple) indicate low concentrations and warmer colors (red, orange, and yellow) indicate high concentrations. The estimated threshold for cyanobacteria detection is 35,000 cells/mL.

September 29, 2013 Bloom Forecast

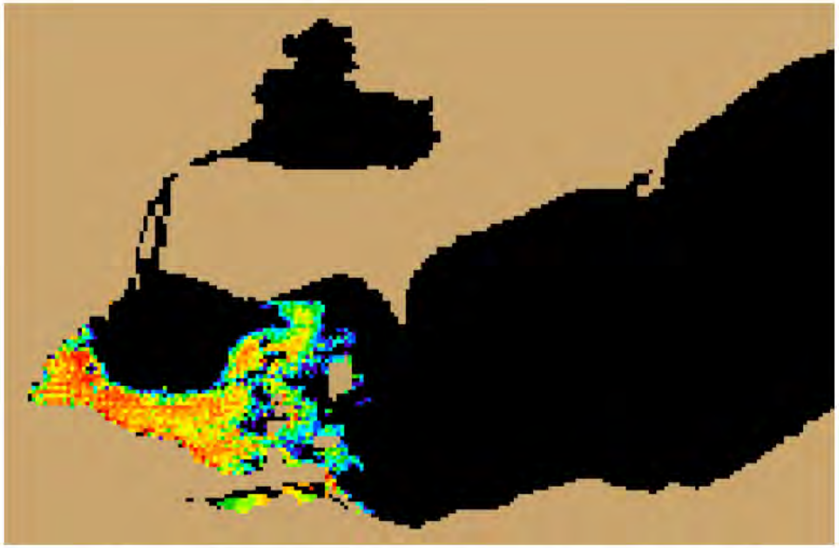
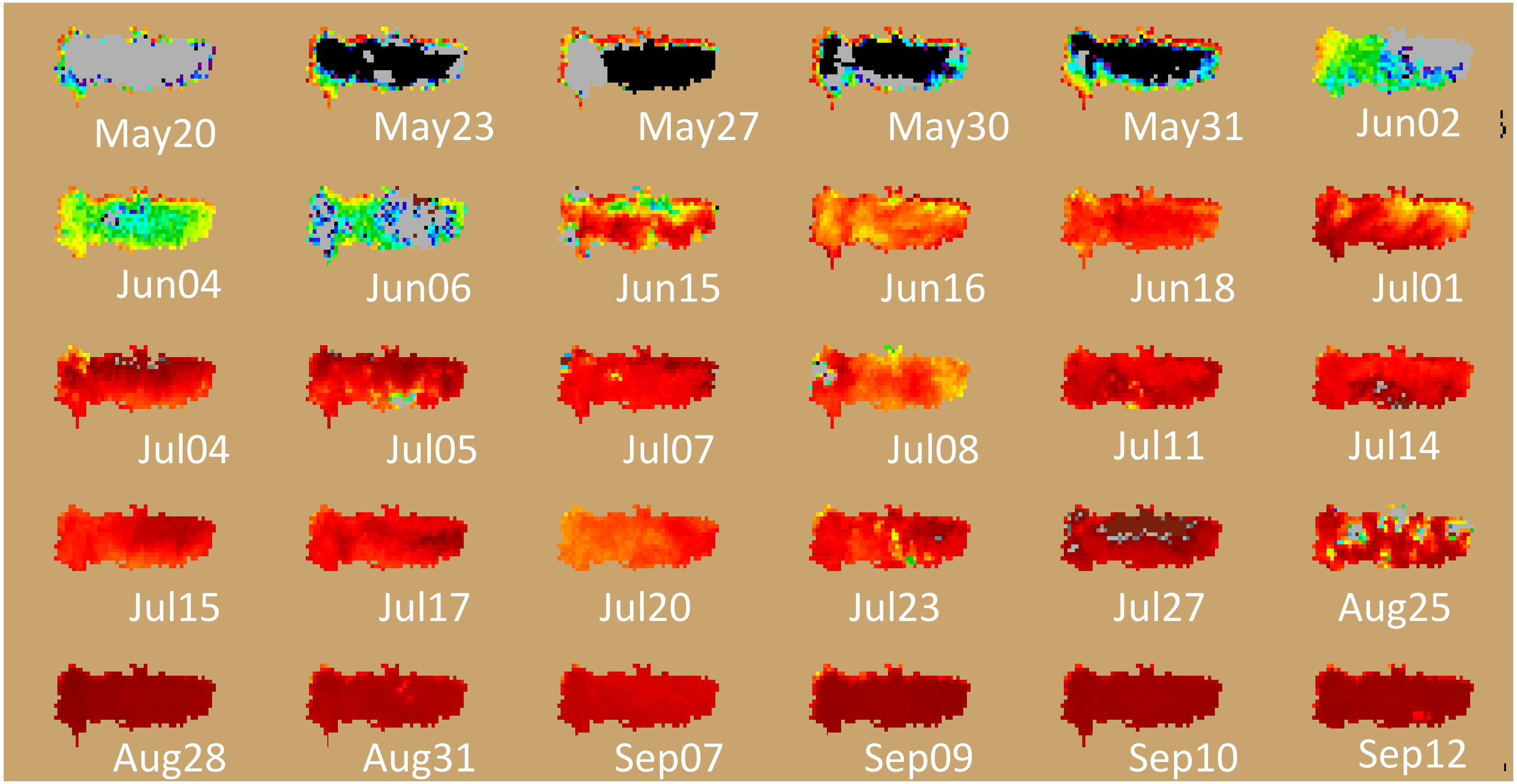


Figure 2. Nowcast position of bloom for 29 September 2013 using GLCFS modeled currents to move the bloom from the 24 September 2013 image.

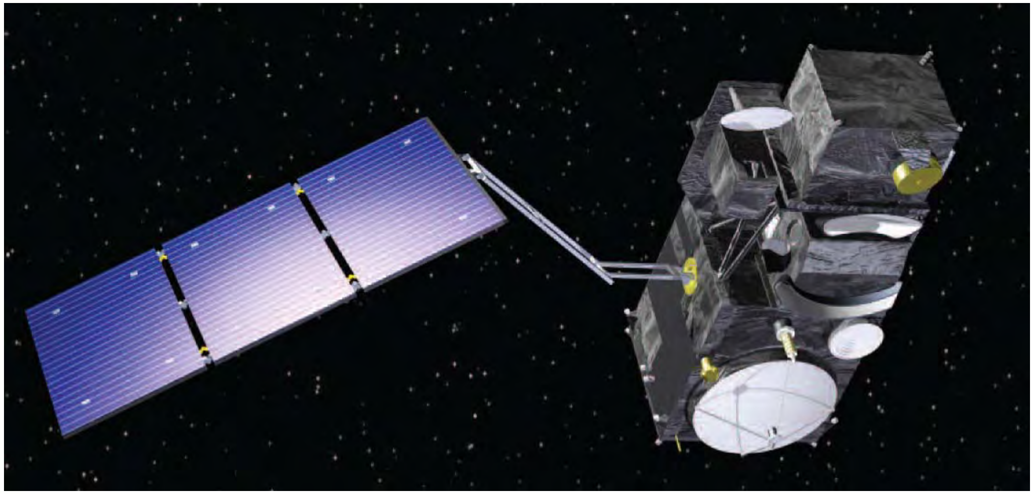
Inland Lake Satellite Data

Grand Lake St Marys 2010



New Satellite Coming

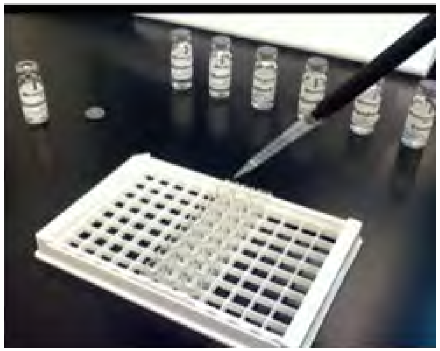
- Ocean Land Color Instrument (OLCI) on Sentinel-3
- Better resolution than MODIS (300m vs. 1 km)
- Expect to launch in winter 2014, available for use in 2015 HAB season



Ohio EPA

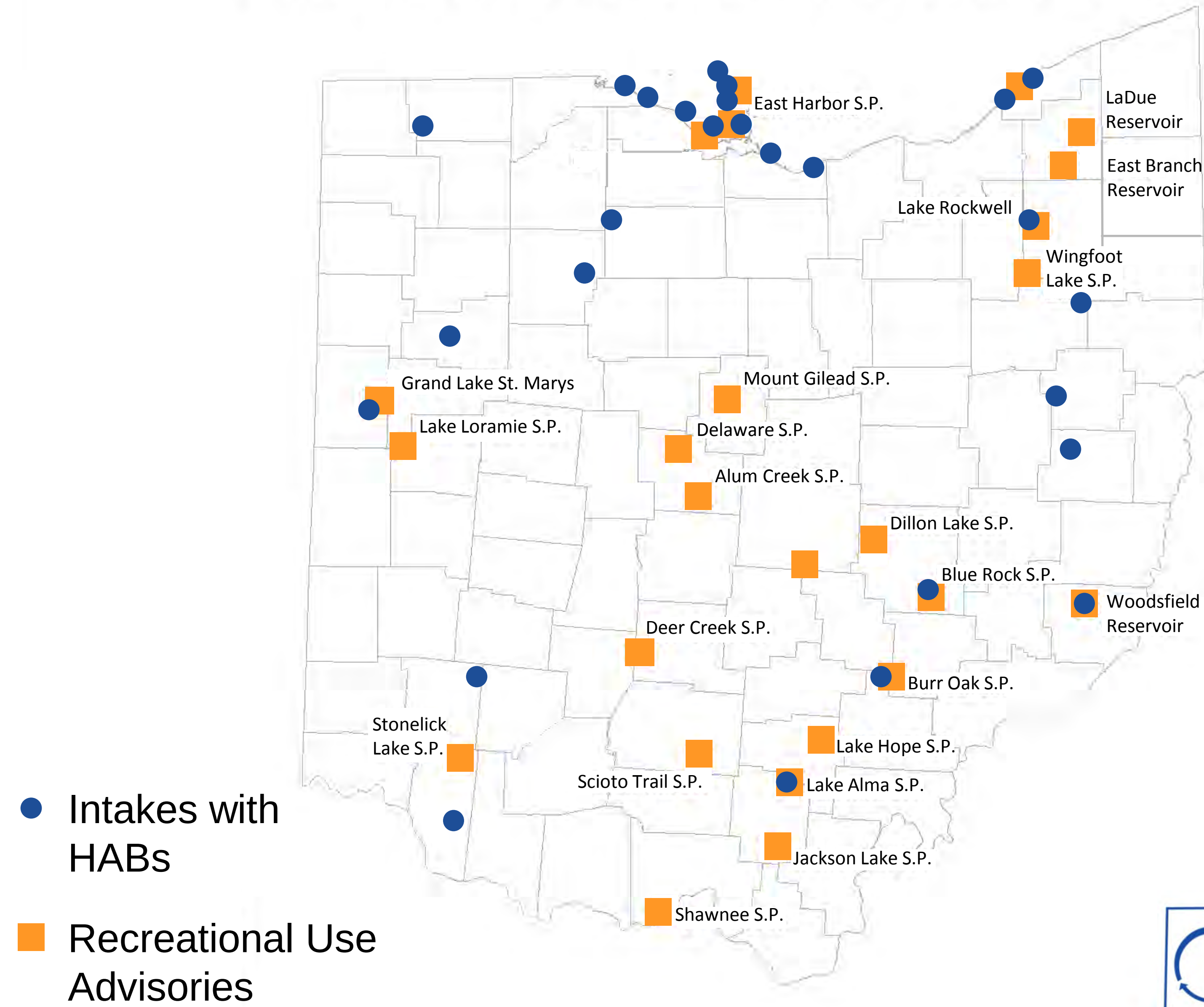
PWS HAB Monitoring

- Ohio EPA has collected 487 raw and finished water cyanotoxin samples
- PWSs have submitted results for over 455 raw and finished water cyanotoxin samples
- Cyanotoxins have been detected in the majority of the source waters sampled in Ohio
- Only three PWSs had finished water detections above reporting limit (0.30 ug/L)
  - Akron = 0.58 ug/L (2010)
  - Toledo = 0.42 ug/L (2013)
  - Carroll Township = 1.43 & 3.56 (2013)



Ohio EPA

Ohio Harmful Algal Blooms (2010-2012)

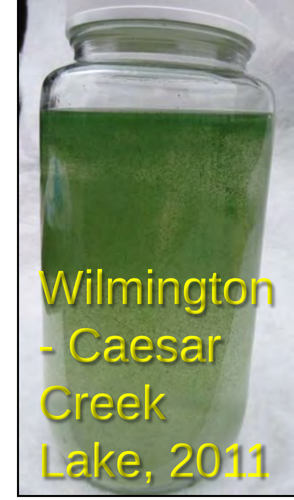


20 Public Water Systems with toxins in raw water

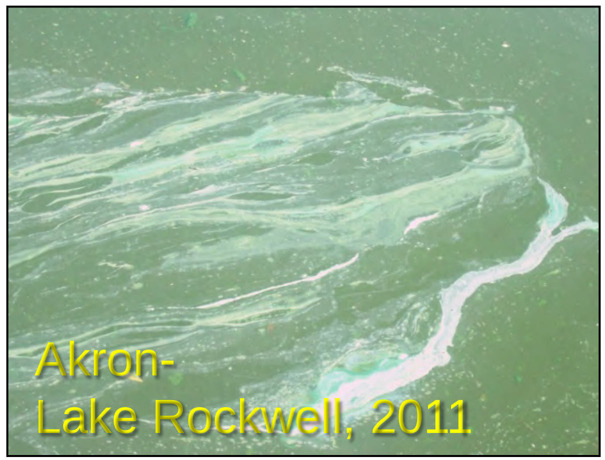
Ohio EPA


Bowling Green, 2013

Examples of Harmful Algal Bloom on Ohio's Inland Public Water Supply Lakes and Reservoirs


Wilmington - Caesar Creek Lake, 2011


Wellston- Lake Alma, 2010


Akron- Lake Rockwell, 2011


Findlay, 2012


Burr Oak, 2010


Lima, 2011


Clermont CO- Harsha Lake, 2012

2013 – Carroll Township

- First Do Not Drink Advisory
- Carroll Township finished water:
  - September 4, 2013 = 1.43 ug/L
  - September 5, 2013 = 3.56 ug/L
    - Issued Do Not Drink Advisory
    - Switched to emergency connection with Ottawa County
    - Began flushing distribution system
- Increased monitoring frequency
- Eventually switched back to Carroll's WTP and tested water prior to providing to public
- Continued to monitor multiple times per week until bloom senesced

OhioEPA

HABs aren't always blue or green

Apple Valley Lake, December, 2011

William's Reservoir (Lima)
November, 2012

Microcystin Concentration:
1400 ug/L

Dillon State Park, July, 2012 - Euglena Bloom

Toxin Producing Cyanobacteria

Cyanobacteria	Toxins Produced*	Type	Geosmin	MIB
Anabaena	Anatoxins, Saxitoxins, BMAA	Neurotoxin		
	Microcystins, Cylindrospermopsin	Hepatotoxin	Yes	
Aphanizomenon	Anatoxins, Saxitoxins, BMAA	Neurotoxin		
	Cylindrospermopsin, Microcystins ?	Hepatotoxin	Yes	
Cylindrospermopsis	Saxitoxins, BMAA	Neurotoxin		
	Cylindrospermopsin	Hepatotoxin		
Microcystis	BMAA	Neurotoxin		
	Microcystins	Hepatotoxin		
Planktothrix **(*Oscillatoria*)**	Anatoxins, BMAA	Neurotoxin		
	Microcystins, Cylindrospermopsin	Hepatotoxin	Yes	Yes
Lyngbya	Saxitoxins, BMAA	Neurotoxin		
	Cylindrospermopsin	Hepatotoxin	Yes	Yes

*All listed cyanobacteria produce lipopolysaccharides. *Lyngbya* and *Planktothrix* also produce Lyngbyatoxin-a and aplysiatoxins (all are dermal toxins)

HAB Reservoir Management Strategies

- **Watershed Management Plan**
  - Manage for Nutrients (primarily phosphorus for cyanobacteria control)
  - Monitor: Algae/Cyanobacteria ID, Cell Counts, Nutrients
- **Physical controls**
  - Manipulation of the intake location or depth, aerators, mechanical mixers, scum removal

- **Biological controls**
  - Manipulation of the lake ecology to favor cyanobacteria grazers (top-down) and increased competition for nutrients (bottom up)
- **Chemical controls**
  - Phosphorus treatments (e.g. lime, aluminum sulfate, ferric chloride, and clay particles)
  - Algaecides (e.g., copper-sulfate, hydrogen peroxide)

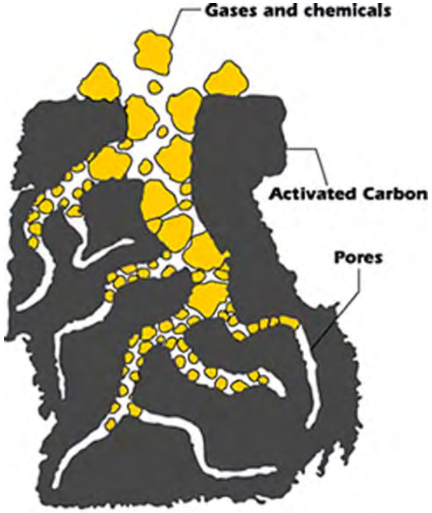
Algaecides are an important management tool, but they should be used with caution!

Ohio EPA

Advanced Treatment

- **GAC** – Can be effective, but costly if persistent or severe blooms.

- **PAC -** Effectiveness varies based on:
  - Type of Carbon (size of pores)
    - Wood Based (mesopores) - microcystin
    - Coconut Based (micropores)- saxitoxin and taste & odor compounds
  - Dose
  - Contact time
  - Natural Organic Matter (NOM) Interference
  - PAC dosages in excess of 20 mg/L may be necessary



- **Ozone** – Very effective at destroying microcystins, nodularin and anatoxin-a, but not saxitoxin.

- **Membranes** – RO & NF are effective at microcystin removal. MF & UF are not effective at cyanotoxin removal but can remove intact cells. Caution: Cells can stick to membranes and release toxins during backwash.

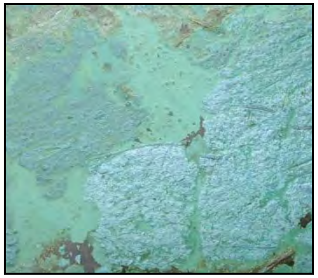
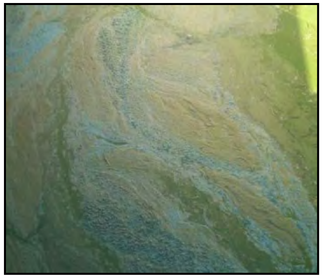
- **UV** – Not effective at typical light intensities, but can be effective at removing multiple toxins given proper dosage and contact time.

OhioEPA

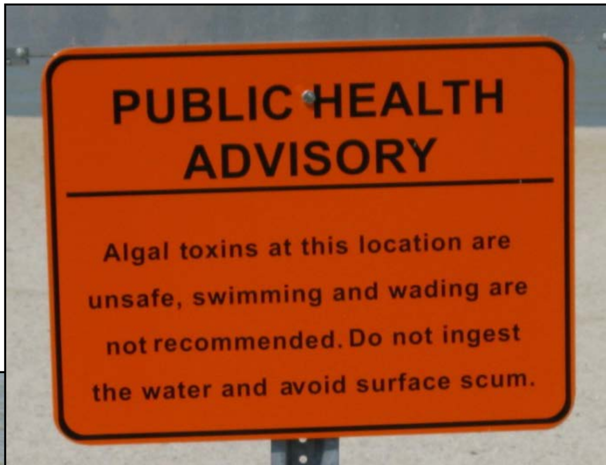
Sampling Triggers

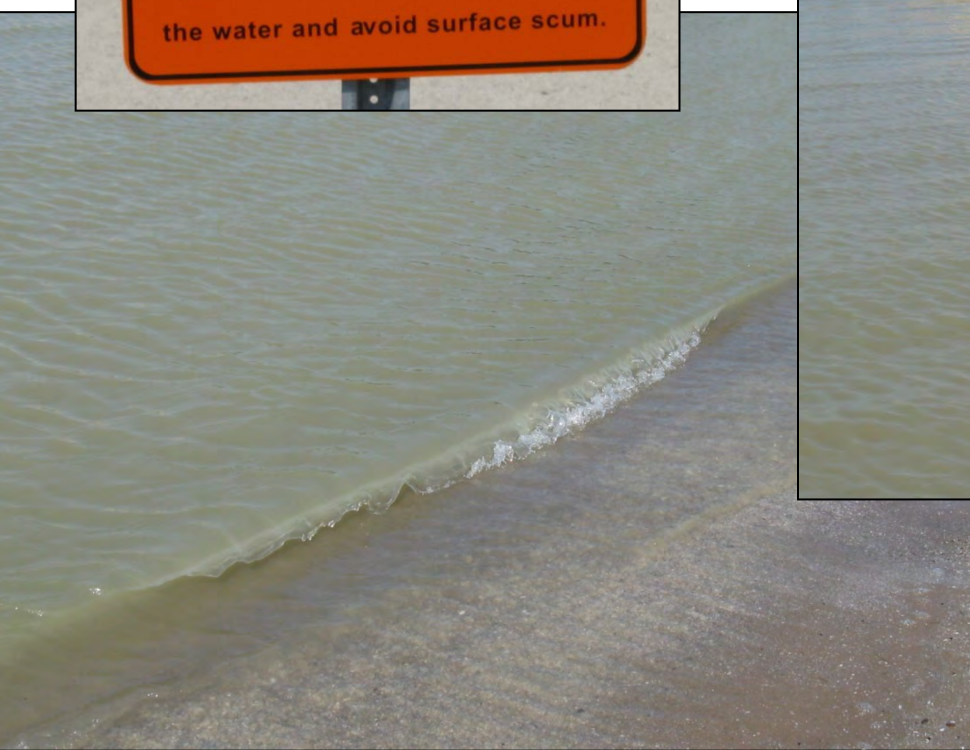
Scums do not always coincide with high toxin concentrations at the intake

- Multiple instances when scums at surface = reduced toxin concentrations at intake depth (e.g., Celina, Lake Erie, Akron)
- Planktothrix blooms generally do not produce scums, but can have very high toxin concentrations at intake depths.
- **Complicates Monitoring Programs!**


Example of Source Water with High Toxin Concentration (>100 ug/L)





Microcystin concentrations exceeded drinking water thresholds in raw water at all four area public water systems

HAB Workshops at OSU's Stone Laboratory

- **Dealing with Cyanobacteria, Algal Toxins and Taste & Odor Compounds (Aug. 13-14, 2014)**
  – Geared to PWS Managers/Employees
- **Algae ID (Aug. 11-12, 2014)**
- Offered by Ohio Sea Grant, OSU & Ohio EPA
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Letter to the
National Drinking Water Advisory Council
LCR Long-Term Revisions Meeting
EPA East Building – Room 1117 A
December 11 and 12, 2013

Dear Chair Morales,

We are presenting this paper to the National Drinking Water Advisory Committee (NDWAC) for your consideration, as you deliberate potential long-term revisions to the EPA federal Lead and Copper Rule (LCR) of 1991. All our statements of fact are based on cited primary materials and peer-reviewed scientific studies that were published since the LCR's promulgation. Attention to these primary materials and studies is important, for they sometimes diverge from, or even contradict, widespread assumptions about the LCR and authoritative statements of public officials with presumed regulatory expertise.

In light of the fact that NDWAC is charged with providing EPA with recommendations likely to have broad and serious public health implications, we would like to ensure that your advice is premised on documented and verifiable facts, accurate understandings, and sound science. In the name of public health, which is EPA's goal for the long-term revisions,[1] we believe that the first step toward constructive deliberation must be acknowledgment of the following critical fact to which the science points clearly and indisputably:

Lead service lines (LSLs), whether intact or partially replaced, can pose a serious public health risk, especially to the populations most vulnerable to lead (i.e., developing fetuses, infants, and young children), even when public water systems meet the LCR Lead Action Level (LAL) of 15 ppb.

Once this fact is accepted, NDWAC, EPA officials, public water systems, the public health community, and the public at large can have a productive dialogue about best ways to revise the LCR in order to mitigate or eliminate LSLs as a health risk. The advantage we have today as compared to two decades ago is that sound science is readily available and real solutions are within reach. Our central challenge is to steer clear of legally, historically, and scientifically unsubstantiated understandings of the issue that serve narrow interests and hardened positions other than the public's health.

The information we are providing herein highlights that:

- Twenty-two years after the LCR's promulgation, lead-contaminated drinking water is a) far more prevalent than often assumed, and b) a significantly greater contributor to children's total blood lead levels than usually acknowledged (and possibly the primary source of lead for many fetuses, infants, and young children across the US).

[1] US EPA. 2012. Lead and Copper Rule Long-term Revisions SBREFA Background Document (8/29), http://www.ruralwater.org/lcr4.pdf.

- Acute exposure to lead particles with concentrations like those detected in Washington, DC (multiple samples >700 ppb, with the highest measurement at 20,000 ppb in 2007;[2] 200 ppb in 2011[3]) and "City B" (580 ppb in 2011[4]) during periods of compliance with the LAL, can expose pregnant women to a daily lead dose exceeding that in 1900's abortion pills.

- Sampling under the LCR does not reflect "worst case" conditions as stipulated by the Rule. In public water systems where samples of water sitting in LSLs have been collected (a practice that goes above and beyond current LCR monitoring requirements), lead levels tend to be significantly higher than those reported by public water systems to the EPA's federal compliance database, the Safe Drinking Water Information System (SDWIS). As a result, LCR-mandated monitoring can mislead water utilities, their customers, and state and federal officials into believing that lead corrosion is successfully minimized, when in fact taps in consumer homes dispense significant concentrations of lead and place communities, especially vulnerable people, at high risk of exposure.

- Although developing fetuses, infants, and young children may be exposed to lead in drinking water on a daily basis, the monitoring practices in place for the detection of a) lead in water and b) lead in blood are not well-designed to capture links between the two. In fact, it can be argued that these practices are designed to miss such links.

- The LCR currently does not address a major potential cause of elevated lead levels in drinking water. Evidence increasingly suggests that physical disturbances to LSLs, which occur on a daily basis in public water systems throughout the US, can cause significant increases in drinking water lead levels for undetermined periods of time.

- NDWAC's LCR recommendations of 2011 include advice that, if adopted, would prolong the public's exposure to lead in drinking water.

In the attached paper, we expand on the above statements and provide the literature that substantiates them. We ask that NDWAC give proper consideration to this information. We also ask that information provided to NDWAC by others be subject to the same evidentiary criteria, so that the recommendations made by NDWAC are informed by actual historical evidence, accurate interpretations of regulatory language, and sound science, rather than wishful thinking, unsubstantiated statements or conjecture.

Should you have any questions, please don't hesitate to contact us.

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[2] Lambrinidou, Y. Documents obtained from DC Public Schools (available upon request).
[3] DC Water, LCR compliance monitoring results, 2011 (semester 2), http://www.dcwater.com/lead/lcr_pdf/LCR%202011_Semester%202.pdf
[4] Del Toral, M. A., et al. 2013. Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study. *Environmental Science & Technology* 47(16):9300-9307.

Respectfully,

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Background

1. **The LCR is a *public health* law.**

The LCR was promulgated to protect the public from lead and copper in drinking water. ***The LCR is, by definition, a public health law***. It was enacted as a regulatory program under the Safe Drinking Water Act (SDWA) of 1974, which required regulation of drinking water contaminants *deemed harmful to human health*. As the US Environmental Protection Agency (EPA) explains in the final Rule:

> The Safe Drinking Water Act (42 U.S.C. 300f et seq.) (SDWA or the Act) requires EPA to establish maximum contaminant level goals (MCLGs) and national primary drinking water regulations (NPDWRs) *for contaminants that, in the judgment of the Administrator, may have any adverse effect on the health of persons and that are known or anticipated to occur in public water systems*.[1] (emphasis added)

2. **Lead in drinking water poses a well-documented and serious public health risk, especially to fetuses, infants, and young children.**

- Recent investigations in the US have shown that lead in water used for drinking or cooking can be the primary source of lead for children with elevated blood lead levels.[2]

- Research on the Washington, DC 2001-2004 lead-in-water crisis found that hundreds (and probably thousands) of children 2.5 years of age and younger developed elevated blood lead levels from concentrations of lead in water that may very well be present (but untested and/or undetected) in tap water across the country, and the most severe consequences occurred when the city's lead-in-water levels still met LCR requirements.[3]

- Recent research in Washington, DC found that children in homes with a partially replaced lead service line were twice as likely to have elevated blood lead levels as compared to children in homes with an intact lead service line, and four times as likely to have elevated blood lead levels as compared to children in homes with no lead service line.[4] This association stood even when the city's drinking water met LCR requirements. Today, thousands of US homes receive their water through a partially replaced LSL. Although tens of thousands of these replacements were mandated by the LCR, a far greater number was carried out during water main and other repair and maintenance work.[5]

- Prenatal exposure to lead and lead in drinking water has been linked to spontaneous abortion, stillbirth, and infant mortality at concentrations commonly detected at US taps (i.e., in lead particles, which are pieces of lead solder or rust that tend to leach into water on a periodic but unpredictable basis).[6,7,8] Acute exposure to lead particles with concentrations like those detected in Washington, DC (multiple samples >700 ppb, with the highest measurement at 20,000 ppb in 2007;[*] 200 ppb in 2011[†]) and "City B" (580 ppb in 2011[‡]) during periods of compliance with the LAL, can expose pregnant women to a daily lead dose exceeding that in 1900's abortion pills. In infants and young children lead exposure can result in physical and mental delays.

3. **The LCR's Maximum Contaminant Level Goal (MCLG) for lead *is* health-based and is set at zero.**

   The SDWA required EPA to set an MCLG for every drinking water contaminant it regulated. An MCLG is "the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety."[9] MCLGs are based *solely* on public health considerations. The LCR's "health-based"[10] MCLG for lead was set at zero "based on the best available science which shows there is no safe level of exposure to lead."[11]

4. **The LCR's Lead Action Level (LAL) is *not* health-based, is set at 15 ppb, and should *never* be presented (or implicated) as a "threshold" below which lead-in-water levels are "safe" to drink.**

   The LCR's LAL was set at 15 ppb as a result of technological and financial considerations. According to EPA: "The action level for lead has been set at 15 parts per billion (ppb) because EPA believes, given present technology and resources, this is the lowest level to which water systems can reasonably be required to control this contaminant should it occur in drinking water at their customers [*sic*] home taps."[12] Yet public water systems issue claims of safety merely on the basis of a LAL non-exceedance,[§] EPA has publicly stated that

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[*] Lambrinidou, Y. Documents obtained from DC Public Schools (available upon request).
[†] DC Water, LCR compliance monitoring results, 2011 (semester 2), http://www.dcwater.com/lead/lcr_pdf/LCR%202011_Semester%202.pdf
[‡] Del Toral, M. A., et al. 2013. Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study. *Environmental Science & Technology* 47(16):9300-9307.

[§] **Chicago 2013:** In the 6/1/12-9/30/12 lead-in-water monitoring period, the 90th percentile measurement for lead was 6.6 ppb and 1 of 50 samples tested >15 ppb. *Letter from Chicago Department of Water Management (CDWM) Commissioner to City Council members*: **"*Chicago drinking water is safe and meets or exceeds all standards*** set by the USEPA and IEPA" (emphasis added). Sources: http://www.cityofchicago.org/content/dam/city/depts/water/ConsumerConfidenceReports/2012_WaterQualityReport.pdf; http://aldermanmoreno.tumblr.com/post/63001379365/just-received-this-letter-from-water-dept-commissioner.

Chicago 2012: In the 6/1/09-9/30/09 lead-in-water monitoring period, the 90th percentile measurement for lead was 6.07 ppb and 1 of 50 samples tested >15 ppb. *Chicago Tribune*: "A representative from the Chicago Department of Water Management, which tests tap water under current procedures, said it was aware of and analyzing the results of the research, and is serving as an active partner with the EPA in its review. *'**Chicago water is safe and meets or exceeds all standards**'* set by the agency, the statement said" (emphasis added). Sources: http://www.cityofchicago.org/content/dam/city/depts/water/ConsumerConfidenceReports/2010WaterQualityReport.pdf systems complying with the LCR are providing water that is "safe to drink,"[**] and the Centers for Disease Control and Prevention (CDC) in its guidelines for environmental risk assessments at the homes of children with elevated blood lead levels advises against investigating water as a potential source of lead, if the child resides in a jurisdiction that meets the LAL (see discussion below, page 8).[13] Perversely, even as hundreds of Washington, DC children were being lead poisoned from elevated lead in water, EPA Region 3 claimed that much higher levels of lead in water were necessary to be a health concern, and EPA stood silent and assisted public health officials in asserting the 15 ppb standard had a high safety factor.

5. **All evidence suggests that 22 years after the LCR's promulgation, lead-contaminated drinking water is a) far more prevalent than often assumed, and b) a significantly greater contributor to children's total blood lead levels than usually acknowledged (and possibly the primary source of lead for many fetuses, infants, and young children across the US).**

   There is no doubt that lead-in-water levels in the US have dropped markedly since the early 1990s as a result of the LCR requirement for corrosion control treatment. However, to date there is *no evidence* to support the widespread claim that in general drinking water poses a far lesser health risk than paint, dust, and soil as a source of lead for US children. Here is why:

   - **Lead-bearing plumbing materials, the main source of lead in water, exist in the vast majority of US homes.**

     Lead leaches into water from lead service lines (intact or partially replaced), lead solder, leaded brass fixtures, and galvanized iron pipes that have come into contact with lead-contaminated water (e.g., in homes with

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; http://articles.chicagotribune.com/2012-01-31/health/ct-met-epa-lead-tests-20120131_1_lead-levels-high-levels-round-of-water-testing.

It is worth noting that some water utilities have made claims of "safety" even while *in exceedance* of the LAL [e.g., Washington, DC 2003 (see Holder, E. H., Jr. 2004. "Summary of Investigation Reported to the Board of Directors of the District of Columbia Water and Sewer Authority," Covington & Burling, 7/16); Providence, RI 2010 (http://www.provwater.com/news/faq/lsr_faq.htm)].

[**] **Burneson, E. (EPA Headquarters)**, "Lead and Copper Rule" meeting, Oct. 14-15, 2008, Washington, DC (Stated that: EPA's position is that water systems in compliance with the LCR are providing water that is safe to drink); **Jon M. Capacasa (EPA Region 3)**, April 15, 2008, Congressional hearing (Stated under oath that: "EPA can report that the drinking water serving the District of Columbia meets all federal health based standards and the system is in compliance with all National Primary Drinking Water Regulations," http://www.epa.gov/ocir/hearings/testimony/110_2007_2008/2008_0415_jmc.pdf; **Voltaggio, T. C. (EPA Region 3)**, Washington DC City Council Hearing, April 1, 2004, Washington DC (Stated that: The 15 ppb LAL is not necessarily based upon a risk assessment indicating that consumers drinking above this level would have a "particular health level"; 15 ppb is a "low" level of lead in drinking water; If EPA were to find that people were drinking water with 15 ppb lead, it would not take action, and that's appropriate because 15 ppb lead is not necessarily a number you shouldn't exceed to prevent health harm; A 90th percentile lead-in-water level that exceeds 15 ppb is merely a "bell" ringing that tells you to reduce corrosion, and not necessarily an indication that someone is being hurt from lead in water); **Rogers, R. (EPA Region 3)**, Washington DC City Council Hearing, April 1, 2004, Washington DC (Stated that: 15 ppb is a level that is both attainable and health-protective).

an intact, fully replaced, or partially replaced lead service line). Most homes across the country have at least one of these plumbing materials, while many have a combination of two or more.

- **Today, the main method for detecting lead-in-water contamination in jurisdictions across the country is the LCR-mandated monitoring program that water utilities are required to implement as often as twice a year to once every nine years in order to capture worse-case lead levels at the tap.[14] Studies by EPA and others have shown that this program is not reliable for identifying the true extent of lead-in-water contamination, even when implemented appropriately.[††] As a result, LCR-mandated monitoring can mislead both water utilities and their customers into believing that lead corrosion is successfully minimized, when in fact taps in customer homes dispense significant concentrations of lead and place consumers at high risk of exposure.**

  Many questions have been raised about the integrity of the LCR-mandated lead-in-water monitoring program in terms of reliability, validity, and accuracy of results. In Washington, DC, for example, concerned safe drinking water and environmental health organizations have raised repeated concerns about a) the time of the year LCR-monitoring samples are taken, in light of the fact that temperature can affect lead-in-water levels, b) the chemistry of the water when LCR-monitoring samples are taken, in light of the fact that temporary annual water treatment switches (e.g., from chloramine to free chlorine) can result in dramatic but temporary drops in lead, c) the sample pool of targeted homes, in light of the fact that many of these homes may not satisfy the LCR requirement of posing "the greatest risk of lead leaching,"[15] and d) water sample invalidation practices, in light of the fact that sometimes samples are discarded prior to analysis when deemed to have stagnated too long prior to collection (despite the fact that EPA has made it clear that there is no cap on stagnation prior to sampling collection) or for other unspecified reasons.[16,17]

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†† The LCR-mandated monitoring program is sometimes implemented in ways known to temporarily reduce worst-case lead-in-water levels [see, the Chicago Department of Water Management LCR sampling protocol that was in use until 2009, which included a) flushing of taps prior to stagnation, b) aerator removal, and c) manual removal of particles prior to sampling. To date, Chicago has never exceeded the LCR LAL. However, a 1993 sampling round in the city of Chicago by Consumer Reports indicated a LAL exceedance, even though the taps sampled were random, and did not necessarily come from the city's highest-risk homes (Consumer Reports. 1993. Is there Lead in Your Water? 58:73-78.)]. Similarly, in Washington, DC in late 2005, non-LCR-monitoring samples collected by concerned residents in homes with a LSL indicated a LAL exceedance, even though at the time the city was officially under the LAL (Edwards, M. 2013. Personal communication). Other times, water utilities do not report lead-in-water levels accurately, even when they discover significant contamination (see, Leonnig, C. et al. 2004. Lead Levels in Water Misrepresented Across US. *Washington Post* (10/5); Holder, E. H., Jr. 2004. "Summary of Investigation Reported to the Board of Directors of the District of Columbia Water and Sewer Authority," Covington & Burling, 7/16).

Several recent studies, moreover, have shown that the LCR sampling protocol, by design, does not have the capacity to capture an accurate picture of lead corrosion in US distribution systems because:

a. It requires collection of only 1st liter samples, despite the fact that peak lead-in-water levels can appear in subsequent draws (especially when lead in particulate – versus soluble – form is involved, as particles tend to leach into water erratically and unpredictably).[18],[19] This limitation can become stark when one compares lead-in-water concentrations measured for LCR compliance (1st draw only) to lead-in-water concentrations measured for non-compliance purposes (subsequent draws) in the same jurisdiction. For example, a new EPA study reported that in "City B" lead levels were tested in water that had been sitting in lead service lines (or sometimes possibly in internal plumbing) and revealed a LAL exceedance, even though "City B" was officially under the LAL at the time based on 1st liter compliance samples. Levels above 15 ppb ranged from 16 ppb to 580 ppb, with many exceeding 50 ppb.[20] The same situation is true of the lead service line sampling done in Chicago, compared to using the 1st liter samples. In addition, if 2nd draw samples counted for LCR compliance, in 2007 the Washington, DC water utility would have exceeded the LAL.[‡‡] An internationally renowned lead corrosion expert at the EPA Office of Research and Development (ORD) who conducted a review of studies in which multiple samples were taken at each targeted tap estimates that if the highest lead-in-water measurements were counted toward LCR compliance, 90th percentile lead-in-water levels would be 4-7 times higher than they are today, especially in public water systems that do not use an effective lead corrosion inhibitor such as orthophosphate.[21]

b. It allows for steps of sample preparation prior to analysis that can fail to dissolve lead particles enough to render them measurable. This can result in gross under-detection of actual lead levels at the tap and miss lead-in-water concentrations high enough to exceed the Consumer Product Safety Commission's (CPSC) "acute health threat" for lead.[7,22,23]

- **Although the populations most vulnerable to harm from lead – fetuses, infants, and young children – ingest drinking water on a daily basis,**

[‡‡] In 2007, Washington, DC's official 90th percentile lead value for LCR compliance was 10 ppb during the January-June monitoring cycle and 11 ppb during the July-December monitoring cycle. In contrast, Washington, DC's 90th percentile lead value of 2nd draw samples was >15 ppb (DC WASA, Drinking Water Quality Report 2007, http://www.dcwater.com/news/publications/2007%20Water%20Quality%20Report.pdf).

the monitoring practices in place for the detection of a) lead in water and b) lead in blood are not well-designed to capture links between the two. In fact, it can be argued that these practices are designed to miss such links.

In the final Rule, EPA estimated that:

> The total drinking water contribution to overall lead levels may range from as little as 5 percent to more than 50 percent of children's total lead exposure. Infants dependent on formula may receive more than 85% of their lead from drinking water. As exposures decline to sources of lead other than drinking water, such as gasoline and soldered food cans, drinking water will account for a larger proportion of total intake.[24]

More recently, CDC estimated that "≥30% of current EBLs [elevated blood lead levels] do not have an immediate lead paint source" and studies suggest that "lead exposures result from multiple sources."[25] Moreover, studies in Washington, DC and Chicago, IL – two cities with a high concentration of lead service lines and partially replaced lead service lines – raise serious questions about children's current exposures to lead in water across the US. Specifically:

a. An award-winning 2009 paper about the public health impact of Washington, DC's historic lead-in-water contamination of 2001-2004 found that a) hundreds and probably thousands of children 2.5 years of age and younger developed elevated blood lead levels from concentrations of lead in water that may very well be dispensed (but untested and/or undetected) at taps across the country, and b) the most severe adverse effects occurred in the second half of 2001, when the city's lead-in-water levels rose suddenly and dramatically but the water utility had not yet officially exceeded the LCR's Lead Action Level (LAL) of 15 ppb and consumers were not aware of the contamination.[3] This suggests that, even when the LCR is implemented properly and honestly (in Washington, DC it was not), there can be a critical lag between the time of consumer exposure to high levels of lead at the tap and water utility dissemination of LCR-mandated health alerts (if a LAL exceedance is even captured and reported).

b. A 2011 paper by the CDC found that in Washington, DC, children in homes with a partially replaced lead service line were twice as likely to have elevated blood lead levels as compared to children in homes with an intact lead service line, and four times as likely to have elevated blood lead levels as compared to children in homes with no lead service line.[26] This association stood even when the city's drinking water tested under the LCR LAL and corrected for confounders, such as lead paint risk. The potential public health implications of this finding can be grave given the fact that in the US there are tens (and possibly even hundreds) of thousands of residences with partially replaced lead service lines. The majority of these replacements have been forced on consumers by their water utilities, as part of routine or emergency water main and other work rather than the LCR.[27]

c. A 2013 EPA study in Chicago found that the most severe lead leaching often occurred in lead service lines that had been physically disturbed due to street excavation, service line repairs, water meter and shut-off valve work, days, months, or even years before the sampling.[18] Prior disturbance of a lead service line is not among the LCR criteria that deem a home at increased risk of lead in water and would render such a home especially appropriate for inclusion in a water utility's LCR compliance sampling pool. The study also indicates that lower than average water use may also potentially be a factor in high lead levels. It is, therefore, possible that the compliance monitoring currently occurring across the country in jurisdictions with lead service lines misses (partly or wholly) a universe of homes with severe lead-in-water problems.

Evidence that US children today may be routinely exposed to elevated levels of lead in drinking water that LCR-compliance monitoring can miss becomes more troubling when one considers the following:

a. **Federal blood lead screening recommendations neglect two highly vulnerable to lead populations**: Based on the assumption that lead paint, dust, and soil constitute the primary sources of lead in a child's environment, the CDC considers children between the ages of 1 and 6 at highest risk of lead exposure. This is because children at this stage of development are usually old enough to crawl or walk independently; touch floors, objects, and other surfaces such as paint chips that may be contaminated with lead; and place their hands into their mouths. The CDC recommends blood lead testing for children at 12 *and* 24 months of age. For children who have not been screened by the age of 2, CDC recommends a blood lead test between 36-72 months.[28] Two extremely high-risk populations that are highly vulnerable to lead and that can be exposed to the contaminant routinely via drinking water are, for all intents and purposes, left out of CDC's recommendations: fetuses and infants dependent on formula. CDC does not recommend routine blood lead screening for pregnant women, unless such women are deemed at high risk for lead exposure, a subjective assessment which rarely emphasizes drinking water as a potential source (see, for example, 2010 CDC podcast).[29] Infants dependent on formula also fall through the blood lead screening "cracks," despite the 1991 EPA estimate that they "may receive more than 85% of their lead from drinking water" (*Federal Register*, Vol. 56, No. 110, June 7, 1991, p. 26470).[See also 3.] To date, there has been no systematic screening of this population group for lead in blood.

b. **Environmental risk assessment guidelines for detection of lead at the homes of children with elevated blood lead levels are not designed to find lead in drinking water, even if this constitutes a child's primary source of exposure**: CDC's case management guidelines for environmental risk assessment at the homes of children with elevated blood lead levels recommend a focus on "immediate lead hazards" and point to deteriorating paint, dust, and soil.[13] The same guidelines insinuate that federal regulations to minimize lead in drinking water and keep the public informed about lead levels at the tap (i.e., the Lead Ban of 1986, the LCR, and the SDWA amendments of 1996) offer adequate public health protection to consumers served by public water utilities:

> Exposure to lead in tap water has been reduced by measures taken during the last two decades under the requirements of the 1986 and 1996 amendments to the Safe Drinking Water Act and a subsequent EPA regulation (the Lead and Copper Rule). The latter regulation, which only applies to public water systems, requires those systems to monitor tap water for lead and to implement public education and other measures to reduce lead levels in drinking water if they exceed 15 ug/L in more than 10% of household samples. *Lead levels are reduced by treating the supplied water to make it less corrosive and, in some cases, by replacing lead water-service lines.* These regulations do not apply to the more than 40 million households supplied by private well water that can have elevated levels of lead if the water is corrosive and lead is present in the well pump or household plumbing system. In most jurisdictions, there is no monitoring for lead in the drinking water supplied by private wells (emphasis added).[13]

CDC suggests that environmental risk assessments at the homes of children with elevated blood lead levels forgo lead-in-water sampling unless:

- The 90th percentile LCR-compliance level in the child's jurisdiction exceeds the LAL, or
- No non-water source of lead can be found, or
- The child's drinking water comes from a well.

Given this guidance, and the limitations and flaws of LCR-compliance monitoring, it becomes clear that lead in water can be missed both as a primary and secondary contributor to a child's elevated blood lead levels. This weakness may be exacerbated by recent trends in lead poisoning prevention laws that presume any non-intact paint in or on pre-1978 residences to be lead-based.

In summary, although it does seem to have reduced lead-in-water levels in the US, the LCR in its current form cannot be considered adequately protective of public health. Evidence suggests that a) 90th percentile lead-in-water levels are often higher than reported and possibly in exceedance of the LAL, b) lead service line replacement – the LCR's main remedy for LAL exceedances – may place consumers at greater risk of health harm from lead, and c) generations of fetuses, infants, and young children may still be ingesting high concentrations of lead through their drinking water, but with little chance of ever finding out.

6. The National Drinking Water Advisory Council (NDWAC) LCR recommendations of 2011 include advice that, if adopted, would prolong the public's exposure to lead in drinking water.

NDWAC's 2011 recommendations to EPA (http://water.epa.gov/drink/ndwac/upload/ndwaclettertoepadec2011.pdf) include two actions that would be protective of public health vis-à-vis exposure to lead at the tap. These are: a) "EPA should issue immediate guidance on the possible negative health impacts related to compliance with the current lead service line replacement provision of the LCR"; b) "EPA should revise the LCR to include provisions to notify the homeowner if a lead service line is repaired or replaced for any reason, not just reasons triggered under the current LCR."

Three of NDWAC's recommendations, however, lack any public health justification. These are:

a. "EPA should not require either partial or full lead service line replacement under the revised LCR"

LSLs have long been established as a primary source of lead in drinking water.[30] For this reason, the LCR water-monitoring requirement mandates that water systems make it their priority to target homes with a LSL in order to increase the likelihood of finding worst-case lead-in-water levels. The LCR of 1991 states explicitly that:

> While corrosion control can be an effective treatment for preventing or slowing the dissolution of lead from lead service, [*sic*] in many cases it will not be sufficient to reduce lead levels below the action levels [*sic*]. […] [Systems] with lead service lines have substantially higher lead levels than those without. […] [Lead] levels in homes with lead service lines compared to homes without lead service lines, in the same system, had higher lead levels. EPA believes that the information presented in Tables 7 and 10 suggests that lead service lines can contribute significant amounts of lead at consumers' taps.[31]

Today there is scientific consensus that, "The most effective way to reduce the total mass of lead measured at the tap is to replace the entire lead service line."[24,32]

b. "EPA should suspend enforcement of the lead service line replacement requirement"

LSLs pose a significant health risk to the public as long as they are in use. Water treatment changes, physical disturbances due to street work or other events, partial lead service line replacement, and changes in water use or outside temperature can all result in accelerated lead corrosion, *even when a water utility does not exceed the LAL. The LCR's LSL replacement requirement, when it results in full LSL replacement, is the rule's only requirement that eliminates permanently the primary source of lead in drinking water*.

The LCR of 1991 required water utilities in exceedance of the LAL to conduct full LSL replacement, unless they could show that they neither owned nor "controlled" some portion of the LSL.[§§] In response to a legal challenge by the American Water Works Association (AWWA) [*AWWA v. EPA*, 40 F.3d 1266 (D.C. Cir. 1994)], EPA's definition of "control" was remanded to EPA. *The court ruled not that the definition fell outside EPA's authority under the SDWA, but that EPA had not provided adequate opportunity for the public to comment on*

§§ The Rule did not specify how the cost of the full LSL replacement would be covered.

the definition. Following a public comment period, EPA proceeded to equate "control" with "ownership" "in order to eliminate potential legal confusion and delays in implementing the Rule."[33] In practice, this decision changed the LCR's LSL replacement requirement from a full LSL replacement requirement to a partial LSL replacement requirement, despite the fact that EPA made it explicit that full LSL replacement was always preferable to partial LSL replacement for the protection of public health.[33]

Although disadvantages of partial LSL replacement are well documented, the absence of a LSL replacement requirement all together would turn the LCR into a law that stops short of eliminating the main source of lead in drinking water, even in jurisdictions with widespread and severe contamination. Under such a Rule, the responsibility to protect the public from lead at the tap would be left *almost entirely* to consumers, most likely through recommendations for routine water-use precautions. In light of the fact that such precautions can be costly, complex, and time-consuming, such a regulatory development would give rise to serious public health, legal, moral, and environmental justice concerns.

c. "EPA should not require homeowner sampling after the lead service line replacement"

According to the LCR minor revisions of 2000, within 72 hours after a partial LSL replacement water systems are required to collect one water sample that is representative of water sitting in the service line (prior to 2000, this requirement mandated sample collection within 14 days after partial LSL replacement) (http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/upload/2000_4_25_lcrmr_guidance_lcmr_lead_line_requirements.pdf). The LCR of 1991 specifies that, "[The] purpose of collecting the follow-up sample is to inform residents of precautions that may be needed temporarily such as flushing water at taps to avoid potential increases in lead levels."[34] In other words, *the purpose of the follow-up sample is purely health-protective*. If the LCR is going to continue to allow partial LSL replacement (a practice we strongly oppose), a one-time sample 72 hours after the replacement indeed has little meaning. Whether high or low, the result of this sample offers no information about lead-in-water levels in the short-term or long-term after the replacement. If EPA removes homeowner sampling after partial LSL replacement, then it must ensure that residents in homes with such a replacement are fully protected from lead-in-water spikes in the short- and long-term. *Full protection, however, must not depend on measures that place undue burden – in terms of cost, time, and complexity – on residents, because such measures are not likely to be followed properly, if at all.*

RECOMMENDATIONS

GENERAL

- *All proposed revisions to the LCR should have a health-protective rationale and should be based on current scientific understandings about lead in drinking water.*

- The LCR's approach to lead in drinking water should constitute what is called "Science-Based Adaptive Management." This is an approach that allows timely updating of regulatory strategies to accommodate new insights, knowledge, and technologies that better address lead in drinking water.

DEFINITIONS

- In light of the clear and permanent public-health protective effect of full LSL replacement, the LCR's definition of "control" should be changed back to the 1991 definition. Only a return to the original definition will ensure that a) LAL exceedances in jurisdictions with LSLs trigger a full LSL replacement requirement, and b) the LCR's mandatory LSL replacement requirement is in fact the *remedial* measure it was intended to be.

INVENTORY REQUIREMENTS

- All public water systems should complete an inventory of intact LSLs and partially replaced LSLs in their jurisdictions, and submit this inventory to the State. The State should then report to EPA the number of intact LSLs and partially replaced LSLs for every public water system it oversees. *The State should also enter these numbers in a publicly accessible and easily searchable database.* For public water systems with LSLs, the number of reported intact LSLs and partially replaced LSLs should be updated annually to reflect any changes (due to new full and partial LSL replacements, regardless of whether these replacements occurred for LCR-compliance purposes or routine infrastructure work, *but the distinction should be indicated clearly*).

LCR-COMPLIANCE LEAD-IN-WATER MONITORING SCHEDULE

- Public water systems with intact LSLs and/or partially replaced LSLs should not be allowed to reduce monitoring to every three years unless those systems have 90^{th} percentile lead <5 ppb.
- All reduced monitoring should require State approval.

LCR-COMPLIANCE LEAD-IN-WATER SAMPLING

- To capture worst-case lead-in-water levels:

- All samples should be taken during the three warmest months of the year *by all public water systems*, regardless of their monitoring schedule.
- No samples should be taken during temporary water treatment switches that are known to minimize lead corrosion and lead-in-water levels (e.g., annual month-long switches from chloramine to free chlorine).
- Site selection in jurisdictions with LSLs should consist 100% of single-family homes with intact LSLs and partially replaced LSLs. The pool of target homes must be listed on a publicly accessible database, and the type of service line these homes are believed to have should be clearly indicated. Changes to this pool from one monitoring cycle to the next, should be indicated and explained in the same database.
- No pre-stagnation flushing should be allowed (this practice is well-known as a remedial measure that reduces lead-in-water levels temporarily; in a 9/12/08 letter to Washington, DC residents, EPA made it clear that pre-stagnation flushing "goes against the intent of the monitoring protocol," letter available upon request).
- No aerator removal should be allowed (such removal would go against existing EPA guidance, http://www.epa.gov/safewater/lcrmr/pdfs/memo_tapsamples-aerators_10202006.pdf).
- No ceiling on stagnation time should be allowed (EPA's LCR guidance states explicitly that there is no cap on stagnation prior to sampling collection, http://web.archive.org/web/20080326160910/http://www.epa.gov/OGWDW/lcrmr/memo_nov23-2004.html).
- Sequential samples should be taken at each sampling site and the highest result should be used for the LCR-compliance 90th percentile calculation.
- *All* LCR-compliance samples collected should be analyzed and used in the 90th percentile calculation, unless they meet the invalidation criteria in the rule.
- *Every public water system's LCR-monitoring sampling protocol should be available online and easily accessible for public view.*

• Public education:

- Public water systems should provide homeowners in the LCR sampling pool with:
    - ♦ All lead-in-water measurements corresponding to their property.

        - ♦ A clear explanation about the meaning of these measurements in relation to public health (with an emphasis on the LCR's health-based MCLG of zero).
        - ♦ A complete list of possible remedial measures available to residents, with a clear discussion about the pros and cons of each.

    - Public water systems should make publicly available on their websites:

        - ♦ All LCR-monitoring lead-in-water measurements.
        - ♦ A clear explanation about the meaning for a jurisdiction as a whole of lead-in-water values >15 ppb in a) <10% of target homes and b) >10% of target homes.
        - ♦ A clear explanation about the meaning of these measurements in relation to public health (with an emphasis on the LCR's health-based MCLG of zero).
        - ♦ A clear explanation about all the sources of lead in drinking water.
        - ♦ A clear explanation of the fact that the LCR a) allows up to 10% of target taps to dispense any concentration of lead in drinking water, and b) requires public water system intervention when over 10% of taps test >15 ppb.
        - ♦ A clear explanation about the difference between soluble and particulate lead, and the health risks posed by the latter, even when lead-in-water measurements at a specific time and in a specific home are low.
        - ♦ A clear explanation about short- and long-term lead-in-water risks posed by LSLs (intact and partially replaced).
        - ♦ A clear explanation about lead-in-water risks posed by physically disturbed LSLs (intact or partially replaced).
        - ♦ A complete list of possible remedial measures available to residents, with a clear discussion about the pros and cons of each.

NON LCR-COMPLIANCE LEAD-IN-WATER SAMPLING

- On an annual basis, public water systems should post online any and all lead-in-water sampling results from homes sampled for non-LCR compliance purposes (e.g., "voluntary" samples sent by residents to the public water system for testing).

LSL REPLACEMENT REQUIREMENT

- The LSL replacement requirement should be triggered when the LAL is exceeded following corrosion control "optimization."

- When the LAL is exceeded, public water systems should be required to replace fully a certain percent of LSLs in their jurisdiction (e.g., 7%).
- "Testing-out" of LSLs should be prohibited.
- Homeowners should be given clear, complete, and scientifically accurate information about a) the health benefits of full LSL replacement, b) the health risks (short- and long-term) of intact LSLs and partially replaced LSLs; c) the health risks and erratic release of lead particles following partial LSL replacement; and d) financing options for full LSL replacement (*full LSL replacement should be financially accessible to all homeowners regardless of income and race*).[35]
- During LSL replacement, LSLs should be fully removed.
- All residents who have a full LSL replacement should be given clear and complete information about steps they can take to protect themselves from any lead-in-water spikes following replacement.
- In cases of scheduled infrastructure work, LSLs should be fully removed. In cases of emergency infrastructure work involving partial LSL replacement, when possible, residents should be given the option to have the private side of their LSL replaced (with the same menu of financing options as the one offered in cases of a LAL exceedance), and if they decline, they should be given a flow-through pitcher with a 6-month filter supply.

PUBLIC EDUCATION

ANNUAL CONSUMER CONFIDENCE REPORTS

- Public water systems should explain briefly and accessibly:
    - The LCR's treatment-technique requirement and 90th percentile trigger.
    - The number of homes last sampled.
    - For public water systems with LSLs, how many target homes had an intact LSL and how many had a partially replaced LSL.
    - The 90th percentile value.
    - How many samples exceeded the LAL.
    - The values of all samples >15 ppb.
    - A clear explanation about the meaning for a jurisdiction as a whole of lead-in-water values >15 ppb in a) <10% of target homes and b) >10% of target homes.
    - A clear explanation about the meaning of these measurements in relation to public health (with an emphasis on the LCR's health-based MCLG of zero).
    - A clear explanation about all the sources of lead in drinking water.
    - A clear explanation of the fact that the LCR a) allows up to 10% of target taps to dispense any concentration of lead in

drinking water, and b) requires public water system intervention when over 10% of taps test >15 ppb.

- A clear explanation about the difference between soluble and particulate lead, and the health risks posed by the latter, even when lead-in-water measurements at a specific time and in a specific home are low.
- A clear explanation about short- and long-term lead-in-water risks posed by LSLs (intact and partially replaced).
- A clear explanation about lead-in-water risks posed by physically disturbed LSLs (intact or partially replaced).
- A complete list of possible remedial measures available to residents, with a clear discussion about the pros and cons of each.

ADDITIONAL REQUIREMENT

- Public water systems should be required to:

  - Provide mandatory notification to residents in homes with an intact or partially replaced LSL that their service line is likely to be physically disturbed (or was recently disturbed) due to a clear routine (or emergency) infrastructure work. This notification should include explanation of what such a disturbance might mean in terms of lead-in-water spikes, and what remedial measures residents can take, including flushing out the loosened scale and sediment.

  - Provide mandatory notification to residents in homes with a known partially replaced LSL about short- and long-term spikes associated with such replacements and a complete list of possible remedial measures residents can take (including private-side replacement, accompanied by financing options), with a clear discussion about the pros and cons of each.

All public education materials must be accessible at all times through the public water system's website

ACKNOWLEDGMENTS

Yanna Lambrinidou was supported by the Robert Wood Johnson Foundation (RWJF) under the Public Health Law Research (PHLR) program grant ID#68391 and DC Water.

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LCR Long-Term Revisions

Background & Recommendations

Yanna Lambrinidou, PhD
Parents for Nontoxic Alternatives

Paul Schwartz, BA
Water Alliance

LCR Long-Term Revisions Meeting • Dec. 11-12, 2013 • Washington, DC

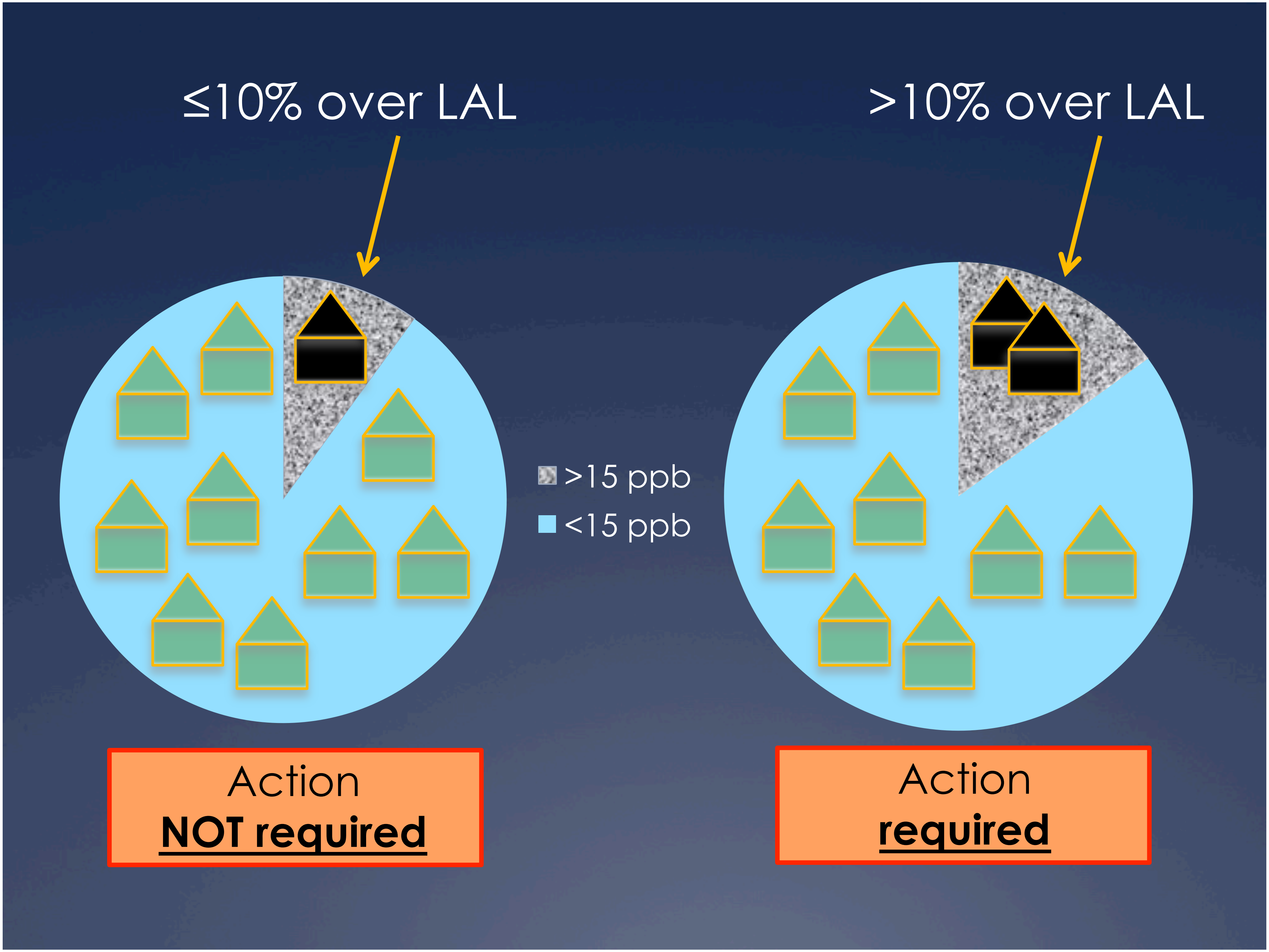
Lead Service Lines

* Estimates:
  * 10 million (EPA LCR 1991)
  * 3-5 million (other estimates)
* Associated with:
  * EBLLs (CDC 2011)
  * Fetal deaths (Edwards 2013)
  * Long-term lead spikes following physical disturbance (Del Toral, Porter, Schock 2013)
  * Short- and long-term lead spikes following partial LSL replacement (e.g., Triantafyllidou & Edwards 2011; Cartier et al. 2012)

Lead Action Level (LAL)

Standard	Designation	Enforceability
0 ppb	Maximum Contaminant Level Goal (MCLG)	Non-enforceable
15 ppb	Lead Action Level (LAL)	Enforceable

Although NOT a violation of the law


≤10% over LAL
>10% over LAL
>15 ppb
<15 ppb
Action NOT required
Action required

Prevalence of Lead in Water

* Lead-plumbing materials present in vast majority US homes
* Mandated LCR monitoring for lead is not capturing worst-case levels, as it is supposed to
* Public water systems use their own sampling protocols that often include steps known to miss lead

LEAD AND COPPER SAMPLING FORM

Instructions for Sampling Lead and Copper at Customer Tap

Please follow directions below to help us determine the lead and copper content of your drinking water.

1 2

1. The night before sampling, clean the aeration screen, if possible, and run cold water through the kitchen or bathroom tap (the kitchen faucet is the preferred choice). The cold-water should be run until you can feel a temperature change. This will take approximately 1 to 3 minutes. **Allow the water sit in the plumbing for a period of 6 to 8 hours. Use this faucet to obtain your water sample.**

3

2. On the morning of the sampling, do not run the water before sampling. The very first water to be used in the house should be the water to be collected in the 1-liter plastic bottle.

3. 4 Slowly open the cold-water faucet and fill the 1-liter bottle to the top and put the lid on tight. There is no need to refrigerate the sample.

4. Please answer the questions below and fill out the bottom of the sheet and sign your name. Please put the filled sample bottle, along with the paper work in the plastic bag provided.

Independent monitoring in US city with highest concentration of LSLs => consistently >LAL

Prevalence of Lead in Blood

Recent studies documenting large scale harm:

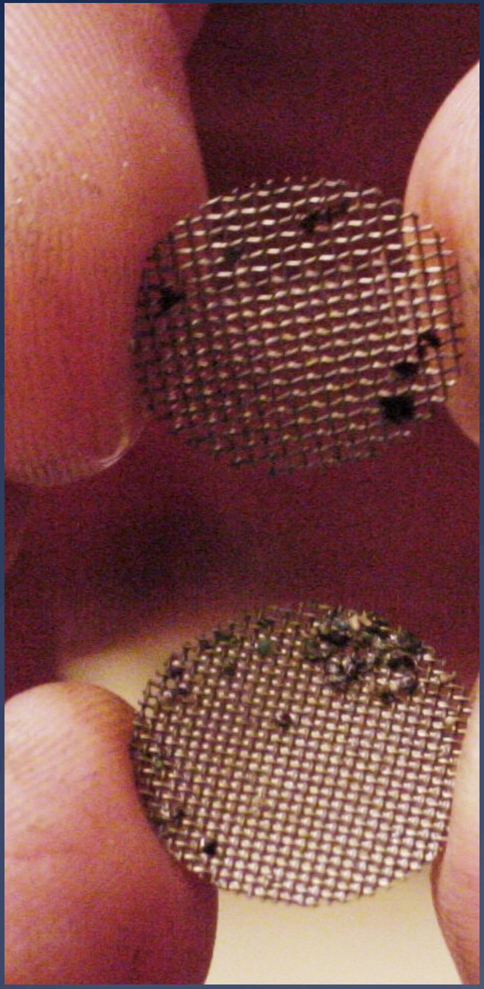
* Edwards 2013
* CDC 2011
* Edwards, Triantafyllidou, Best 2009

Routinely overlooked on a national scale:

* Fetuses (pregnant women)
* Infants dependent on formula
* Lead in water in EBL children’s homes

Challenge of Lead Particles

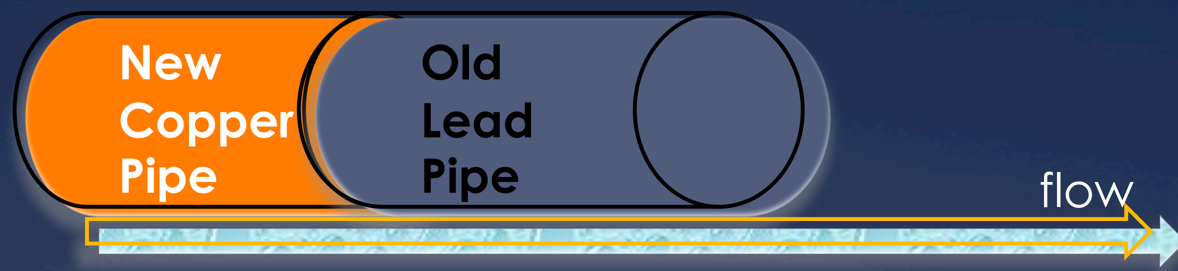
* Pieces of lead solder or rust
* Unpredictable and erratic release (Russian Roulette phenomenon) => NOT EASY TO CAPTURE AND DETECT
* Can pose acute health threat



Actual Lead Particles from Building with Child Lead Poisoning

Slide from Triantafyllidou et al. 2007

Why accelerated lead leaching?



Physical disturbance of old lead pipe

- Lead shavings and disturbed lead rust can fall into the water

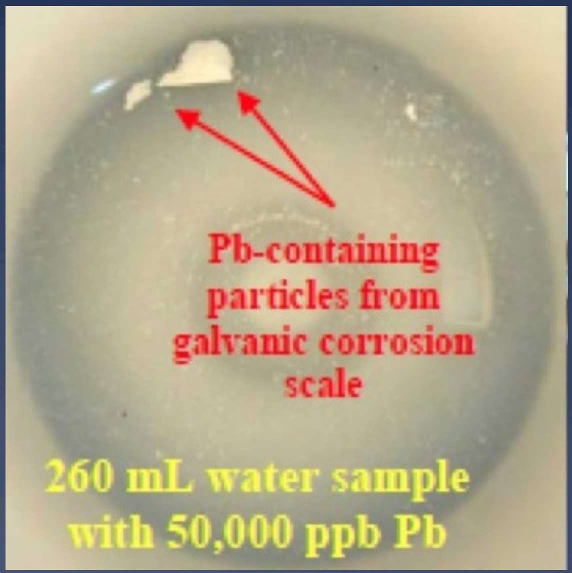
Galvanic corrosion of old lead

- In some waters, contact between old lead pipe and new copper pipe can create battery effect that accelerates corrosion of lead pipe above what would normally occur for lead pipe alone

Deposition corrosion of old lead

- As the water flows from copper to lead, copper can attach to the old lead pipe and create small galvanic batteries that result in accelerated lead corrosion

2011: Triantafyllidou, S. and M. Edwards. Galvanic Corrosion after Simulated Small-Scale Partial Lead Service Line Replacements. *JAWWA* 103:9, pp. 85-99.



Lead pipe area adjacent to copper junction after 1+ year of experimentation

Lead dose in one glass of water exceeding the CPSC "acute health threat" for lead 71 times

Recommendations

* ‘First, do no harm.’
* Remember, above all, both the Safe Drinking Water Act (SDWA) and the Lead and Copper Rule (LCR) are about protecting public health.
* Every step of the way the LCR must protect, not harm, public health.

Get the Lead Out

- Full lead service line removal under LCR
- Stop "voluntary" partial lead service line removal (e.g. when infrastructure work is being done)

LCR Monitoring Must be Health Protective

- Develop a mandated monitoring schedule and sampling protocol that are designed to capture worst-case lead levels, *as is intended by the LCR*
- Close loop-holes that allow sampling protocols that both miss lead and mislead

Follow Sound Science

Look for lead particles,

not just soluble lead

Right to Know

* Disclose challenges and long-term health risk of partial lead service line replacement
* Educate about the new science on physical disturbances of lead service lines
* Give people full disclosure regarding tools for self protection

Thank You

December 12, 2013

ADDENDUM

NOTE TO NDWAC:

This addendum consists of 12 points about key issues discussed in the December 11, 2013 NDWAC meeting concerning long-term revisions to the federal Lead and Copper Rule (LCR). We are submitting this addendum in conformance with the NDWAC process, which states: *"Consistent with the Federal Advisory Committee Act, the Council holds open meetings and provides opportunities for interested persons to make statements within a designated time period at the two meetings or to file statements/comments before or after such meetings."*[1] Our points add to, clarify, disagree with, or reinforce some of the statements made at the meeting.

We hope NDWAC finds this addendum informative and takes it into consideration during its deliberations.

We are available to answer any questions.

Sincerely,

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1. The LCR is a public health law, *not* a corrosion control law

The LCR was enacted as a regulatory program under the Safe Drinking Water Act (SDWA) of 1974, which required regulation of drinking water contaminants *deemed harmful to human health*. Regulatory programs under the SDWA are required to specify:

- A Maximum Contaminant Level (MCL) for the contaminant(s) they target, "if it is economically and technologically feasible to ascertain the level of such contaminant in public water systems"[2]

or

- If it is not "economically and technologically feasible to ascertain the level of such contaminant in public water systems," a "treatment technique," "which leads to a reduction in the level of such contaminant sufficient to satisfy the requirements of section 1412."[1] Section 1412 specifies that regulatory programs under the SDWA *"shall protect health to the extent feasible, using technology, treatment techniques, and other means, which the Administrator determines are generally available (taking costs into consideration)…"*[3] (emphasis added).

For a variety of reasons, the LCR of 1991 regulated lead in drinking water through a "treatment technique." It is critically important to keep in mind two of the most central aspects of this approach:

a. **The treatment technique mandated by the LCR is *NOT* the LCR's end goal, as was stated by EPA during the NDWAC meeting. The LCR's treatment technique is simply a regulatory "mediator" aimed at leading to the LCR's end goal: *the protection of public health*. The LCR of 1991 states clearly that, "A treatment technique must 'prevent known or anticipated adverse effects on the health of persons to the extent feasible.'"[4] <u>No discussion about the LCR's treatment technique should ever be divorced from the rule's clear, indisputable, and ultimate purpose: public health protection</u>.**

b. **The LCR's "treatment technique" comprises a multi-pronged approach to the protection of the public from lead in drinking water. *Corrosion control is only one of four components of the LCR's treatment technique*. The other three components are:**

   - **Source water treatment (when lead is detected in source water);**

- **Lead service line replacement (when a jurisdiction has lead service lines); and**
- **Public education.**

Along with proper site selection at the highest risk sites and sampling procedures that capture worst-case lead levels, all of these regulatory components serve as synergistic "vehicles" for preventing consumer exposures to lead at the tap. The LCR of 1991 spells out clearly EPA's intent for the rule's treatment technique: "The Agency believes that the treatment technique approach contained in the final rule will achieve the public health goals of the SDWA…"[5] No discussion about the LCR's treatment technique should ever focus so narrowly on one component of this technique, that the health-protective intent of the rule's multi-pronged approach gets lost. By extension, any characterization of the LCR as a "corrosion control" rule is inaccurate and misleading.

2. **To date, there is no scientific basis for the frequently-made argument that drinking water constitutes a "secondary" source of exposure to lead**

The statement that lead-contaminated drinking water contributes, ***on average***, 10%-20% to a child's total lead intake is made frequently by experts in the field of public health. However, the use of an ***average*** total lead intake does not make sense for risk characterization. There are children that live in homes with lead service lines that will have a much higher lead-in-water intake, and there are children that live in homes without lead service lines that will have a lower lead-in-water intake, comparatively. By combining these two groups and presenting the lead intake from drinking water as an ***average*** intake, those who live in homes with lead service lines are given a false sense of security regarding the safety of their water. Even EPA's estimate that *"Infants who consume mostly formula mixed with lead-containing water can receive 40 to 60 percent of their exposure to lead from drinking water"*[6] does not make logical sense. For example, where would the other 60 to 40 percent of the assumed lead intake come from for infants that range in age from 0 to 6 months and a) are not consuming solid foods, and b) are not yet mobile enough to be in contact with lead-containing paint, dust, or dirt? It stands to reason that many infants from 0 to 6 months doing little more than drinking and sleeping would have a total lead exposure closer to 100 percent from the drinking water.

It is time for these estimates – as well as the data and analysis behind them – to be closely scrutinized and reassessed. Since the promulgation of the LCR, numerous technical presentations have been made at international conferences, and papers have been published suggesting that older estimates are largely based on inappropriate sampling protocols that would likely underestimate actual lead levels and exposure potential.[7] Furthermore, as we discussed in the paper we submitted to NDWAC at the December 11, 2013 meeting, a) national blood lead screening requirements, and b) environmental risk assessment protocols for identifying sources of lead in homes of children with elevated blood lead levels, *are not designed to detect drinking water as a source of lead among the most vulnerable populations, even when drinking water may be the primary source of exposure*. Specifically, pregnant women (and, therefore, developing fetuses) and infants dependent on formula are rarely screened for lead in blood. Moreover, when young children (most often over the age of 1) are diagnosed with elevated blood lead levels, environmental risk assessments in their homes rarely sample drinking water. When they do, the sampling is almost always inadequate for capturing potential contamination, (e.g., due to inadequate stagnation prior to sampling, lack of sequential samples for the detection of lead particles). Coupling these facts with the latest science on lead in drinking water (e.g., concerning partially replaced lead service lines, acute health risks posed by ingestion of particulate lead, long-term lead spiking following physical disturbances to lead service lines outlined in our paper), suggests very significant exposures that have systematically gone undetected. **Consequently, it would be a mistake for anyone considering revisions to the LCR to presume that lead in drinking water poses a relatively minor threat to public health, and there is little or no modern data supporting that assertion.**

3. **Lead service lines were legally mandated in many US cities and homeowners had no choice but to accept them**

Municipal codes requiring the use of lead service lines were commonplace, starting in the mid-1800s.[8] Chicago, for example, the city with the largest known concentration of lead service lines, mandated the installation of lead pipes until 1986 (i.e., the year of the SDWA amendments that banned lead plumbing materials). In jurisdictions with plumbing codes requiring the use of lead pipe, homeowners could not request alternative materials, even if they were aware and concerned about lead's toxicity.[5,9] In *The Great Lead Water Pipe Disaster* (2008), professor of economics Werner Troesken explains that erroneous understandings about the safety of lead service lines were widespread not only among plumbers, but also among several groups of professionals, including public officials and medical experts. These erroneous understandings were often used to "educate" consumers and even dispel public fears about lead in plumbing. **This history raises serious moral and social justice questions about perpetuating a federal lead-in-drinking water law that places partial (or full) responsibility on the public for preventing exposures to lead at the tap, especially given that many of these exposures are rooted in legal mandates for which consumers had no recourse but to comply with the law.**

4. A trend may have started among public water systems to "gift" lead service lines entirely to homeowners

Recently and without a public announcement, the Washington, DC water utility began to claim that it owns no portion of any of the District's service lines. This occurred after many years of official agency statements (and a massive partial lead service line replacement program that cost over $100 million in ratepayer money) confirming the utility's partial ownership of service lines. Washington, DC does not seem to be an isolated case in this regard. In a 2011 survey of public water systems by the American Water Works Association (AWWA), 69% of the 805 water utilities that responded claimed that *they own no part of a service line in their jurisdiction* (AWWA presented these results at the 2011 AWWA Water Quality Technology Conference but did not post them in the conference proceedings and, to our knowledge, has not yet made them public).[10] This percentage dramatically exceeds the results from an earlier survey, as discussed in a 2007 paper,[11] which revealed that only 20% of water utilities claimed to own no part of a service line. A 2012 investigation about lead in US drinking water quotes an environmental engineer from Massachusetts, saying:

> We have had that occur in Massachusetts. [Some communities around the nation] have passed bylaws saying this city or town is no longer responsible for the pipe. It's now the responsibility of the homeowner.

However, the basis upon which public water systems are making determinations about ownership is not always clear. The LCR of 1991 stated that,

> A water system is presumed to control the entire lead service line (up to the building inlet) unless the system demonstrates to the satisfaction of the State, […] that it does not have any of the following forms of control over the entire line (*as defined by state statutes, municipal ordinances, public service contracts or other applicable legal authority*): authority to set standards for construction, repair, or maintenance of the line, authority to replace, repair, or maintain the service line, or ownership of the service line[12] (emphasis added).

Just as water utilities were initially required to support through legal documentation claims that they lacked "control" of service lines, water utilities claiming lack of ownership of such lines should also be required to support this claim through legal documentation that they present to the States and post online for public viewing.

5. Public water systems frequently interpret the meaning of service line "ownership" and "control" inconsistently and in a way that jeopardizes the public's health

Public water systems frequently claim that they do not own the privately-owned portion of a lead service line and, as a result, have no authority to replace it. At the same time, however, when engaged in routine infrastructure work (e.g., replacing or repairing water mains), public water systems replace the portion of a lead service line that starts at the main and ends at the property line, *even when they claim to own no part of a service line*. Such partial lead service line replacements occur on a daily basis, and far outnumber the partial lead service line replacements that occur during LAL exceedances. This practice reveals a serious inconsistency in the meaning that public water systems assign to the terms "ownership" and "control" of service lines. If public water systems must *own* the portion of the service line that they replace, then public water systems that do not own *any* part of a service line should not be able to conduct *any* lead service line replacement during routine infrastructure work. On the other hand, if public water systems that do not own any part of a lead service line have the authority to conduct partial lead service line replacement during routine infrastructure work because they "control" service lines, then the same systems should have the authority to replace lead service lines fully during both infrastructure work and LAL exceedances (given that in most cases they have "control" of both the public and private portion of a service line). **In light of the serious public health risk posed by partial lead service line replacement, we urge NDWAC to look closely into this issue and consider recommending consistent and public-health protective interpretations by public water systems of the terms "ownership" and "control" vis-à-vis service lines.**

6. The Centers for Disease Control and Prevention (CDC) recommends a) mandated full lead service line replacement and b) the creation of a "threshold concentration" that, when exceeded, would render a water utility out of compliance with the LCR

In January 2011, the Centers for Disease Control and Prevention (CDC) sent to the EPA Office of Ground Water and Drinking Water a set of recommendations for revisions to the LCR (letter attached). The CDC letter said:

> CDC believes that leaving any part of the lead service line in place during remediation results in an unavoidable risk and we suggest you explore ways to facilitate full lead service line replacement.

In the same letter, the CDC also recommended that the LCR's 90^{th} percentile trigger point be coupled with an enforceable "threshold concentration," to protect residents living in homes with high concentrations of lead in water, but in jurisdictions that meet the LAL:

> CDC believes that a 90th percentile action level should be combined with a threshold concentration above which the utility would be out of compliance. If the water sample from any high-risk home has a lead concentration that exceeds the threshold, the system would be considered out of compliance.

During the NDWAC meeting, EPA stated that the purpose of the LCR was to control corrosion, which is a clear misinterpretation and direct contradiction of the rule (see point #1 above). Even if that were the case, however, a review of the optimal water quality control parameter (OWQCP) treatment technique violations and LAL exceedances in EPA's Safe Drinking Water Information System compliance database highlights the futility of using the current OWQCP methodology for controlling lead levels. Since the promulgation of the LCR, there have been 6,375 LAL exceedances in community water systems (the total number of LAL exceedances in EPA's compliance database is actually much higher if non-transient non-community water system LAL exceedances are included). Yet over that same 20+ year period there have been only 157 OWQCP treatment technique violations across all community public water systems.[*] The concomitant small number of treatment technique violations suggests that the current LCR structure is grossly ineffective at ensuring effective corrosion control. **As a result, we urge NDWAC to take into serious consideration the need to a) strengthen all four components of the LCR's treatment technique and b) examine closely, and consider promoting, CDC's recommendations.**

7. Lead corrosion experts assert that Madison, WI demonstrates the public-health benefit of full lead service line replacement

Following the December 11, 2013 statement by EPA that Madison, WI exceeded the LAL after fully replacing the majority of the city's lead service lines, we contacted lead corrosion experts familiar with the case to learn more about it. We learned the following:

Madison, WI:

- Exceeded the LAL in 1992
- Exceeded the LAL again in 1997
- Undertook a city-wide full lead service line replacement program in 2001-2010
- In 2003, a researcher's non-LCR monitoring at 60 homes revealed a 90th percentile value >LAL (22 ppb)

[*] These numbers include LAL exceedances and treatment technique violations that occurred more than once in a single community public water system over the 20+ year period.

Additional research detected erratic release of lead particles, in some homes for over four years after full lead service line replacement. It also revealed that prior to lead service line removal, due to the presence of high levels of iron and manganese in the water, lead from the service lines attached to the iron and manganese and deposited internally in home plumbing. This created a reservoir of lead deposits. Subsequent to the complete removal of the lead service lines, these lead deposits leached into the water on an erratic basis, even though the principal lead source (the lead service line) had been fully removed. The experts explained that full lead service line replacement in plumbing systems that contain high levels of iron and/or manganese can be followed by lead spikes, until the lead that is attached to the manganese or iron releases fully. This process can be lengthy. However, they also cited the Madison, WI 2011 LCR-monitoring results as clear support for full lead service line replacement for two reasons:

- The 90th percentile value in two consecutive 2011 LCR-monitoring rounds was 2.6 ppb and 3.6 ppb respectively, and the average lead level for the 202 compliance samples collected was 1.75 ppb.
- Three years after the completion of the city's full lead service line replacement program, most Madison, WI homes are permanently free both of the principal lead source (the lead service line) and of lead residual in internal plumbing.

In a forthcoming paper, the authors assert that the Madison, WI case supports the EPA SAB's 2011 call for full lead service line replacement,[13] and that the long-term health benefits of such replacement must not be underestimated.[14]

8. Qualitative research in Washington, DC and Providence, RI suggests that the LCR's lead service line replacement provision today raises serious environmental justice concerns

Research conducted under a grant by the Robert Wood Johnson Foundation's (RWJF) Public Health Law Research (PHLR) program and DC Water revealed the following trends: a) cost is the primary obstacle preventing homeowners from agreeing to replace the private portion of their lead service line, b) full lead service line replacement is more prevalent among higher income and Caucasian homeowners, and c) 80% of homeowners who had a partial lead service line replacement would agree to full replacement if the cost were covered by the water utility (see attached slides)[15].

9. Qualitative research in Washington, DC and Providence, RI suggests that the LCR's required notification requirement concerning planned lead service line replacement lacks basic, relevant-to-public-health information

that would encourage homeowners to opt for full lead service line replacement

The aforementioned research revealed that 50% of homeowners who declined full lead service line replacement would be more inclined to pay for full replacement (or, at least, consider it more seriously) if the short- and long-term health risks associated with partial lead service line replacement had been made known to them.[10]

10. To date, lead in water in US schools and day care centers remains unregulated

Despite increasing efforts on a national scale to promote the consumption of tap water in US schools and day care centers, lead in water in the vast majority of US schools/day care centers is not regulated. Schools and day care centers test, analyze, report, and remediate lead-in-water problems on an entirely voluntary basis. Case study after case study show that, overall, US children are inadequately protected from lead in water available in the educational institutions they attend, *even in jurisdictions that meet the LCR LAL*.[16][17] Yet the LCR is designed to address lead-in-water in single-family homes, which differ markedly from schools in relation to plumbing configurations and water use patterns. **We, therefore, recommend that NDWAC consider recommendations to EPA on the development of a separate federal lead-in-water regulation that covers specifically schools and day care centers.**

11. EPA has experts in lead corrosion, epidemiology, the LCR, and policy implementation, as well as an LCR workgroup, all of whom could play a critical role in supporting NDWAC to develop sound recommendations

At EPA, internationally renowned researchers in lead corrosion and epidemiology can bring NDWAC up to date on the latest scientific understandings about lead in drinking water. Similarly, experts on the LCR and on policy implementation issues can offer NDWAC both clarifying information and practical insights that can support the Council in its deliberations.

As part of the LCR long-term revisions process, EPA convened a workgroup of agency experts to develop recommendations for a proposed regulation. At the December 11, 2013 meeting, a member of NDWAC asked if the Council could obtain the workgroup's recommendations. In light of the fact that the EPA workgroup has been discussing proposed revisions for over two years, it seems to us of critical importance that workgroup members should be made available to NDWAC for consultation.

The LCR is a complex rule with strengths but also serious weaknesses and loopholes. As we explain in our paper, these weaknesses and loopholes have failed and are failing the public's health. Consideration of insights by agency experts seems like a potentially important step toward the creation of sound recommendations by NDWAC. Lines of communication between NDWAC and EPA's scientific and policy experts must be open and active throughout NDWAC's deliberation process. **To ensure the development of sound and public health protective recommendations by NDWAC, we strongly encourage NDWAC to request frequent and uncensored exchange of information with EPA's experts.**

12. **We strongly recommend that NDWAC consider including in its LCR-revisions workgroup a member of a grassroots, community-based organization that has been actively involved in protecting the public from lead in drinking water**

    On December 11, 2013, EPA invited NDWAC to suggest additional constituencies for inclusion in the Council's deliberations about the LCR. Although NDWAC includes members of NGO's with expertise on lead in drinking water, we believe that it lacks voices of community advocates with extensive experience working with communities to protect the public from lead at the tap. We encourage NDWAC to consider including such voices to the deliberating table.

ACKNOWLEDGMENTS

Yanna Lambrinidou was supported by the Robert Wood Johnson Foundation (RWJF) under the Public Health Law Research (PHLR) program grant ID#68391 and by DC Water.

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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
and Prevention (CDC)
Atlanta, GA 30341-3724

January 19. 2011

Mr. Eric Burneson
Acting Deputy Director
Office of Ground Water and Drinking water
United States Environmental Protection Agency
USEPA Headquarters
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1200 Pennsylvania Avenue, N. W.
Mail Code: 4607M
Washington, DC 20460

Dear Mr. Burneson:

One of our goals at the National Center for Environmental Health (NCEH) of the Centers for Disease Control and Prevention (CDC) is the elimination of childhood lead poisoning in the United States. CDC and its funded programs conduct surveillance of the occurrence of childhood lead poisoning, establish guidelines for case-management of children with elevated blood lead levels, and make recommendations for the prevention of lead exposures from all possible sources. Our understanding of the current scientific literature on the effects of lead in children, and on the role of lead in water distribution systems -- including conclusions in a recently published study by CDC -- suggest changes are needed in the current "Lead and Copper Rule" (LCR). This letter provides CDC's recommendations for revisions to the LCR.

As you are well aware, CDC, EPA and our other Federal and state partners have spearheaded significant reductions in both the occurrence of lead poisoning and exposures to lead. EPA has promulgated effective regulations that have reduced lead emissions in air, water, and solid waste. During the past three decades, the percent of American children having blood lead levels above 10 micrograms per deciliter have been reduced from 88% to less than 1 percent. The EPA's LCR has had a significant impact on reducing lead poisoning via plumbing in the United States. The opportunity exists to further strengthen the rule and perhaps to simplify it.

We understand that EPA currently is reviewing its "Lead and Copper Rule" (LCR). This rule has formed the foundation of the national strategy to prevent drinking water exposures to lead.[1] We have supported the goals of this rule over the years.

[1] Lead and Cooper Rule: A quick Reference Guide. ISEPA Office of Water. EPA 816-F- 04-009. www.epa.gov/safewater

We believe that the LCR can and should be strengthened to further reduce exposures to lead through drinking water. The discussion below addresses three components of the LCR that CDC believes should be modified:

1. The EPA action level.
2. Lead service line (LSL) replacements.
3. Public information.

The EPA action level:

EPA currently sets the LCR action level as a 90th percentile sample (among high-risk homes) of 15 ppb lead or higher. The action level allows children and pregnant and breast-feeding women living in as much as ten percent of the high-risk homes to be exposed to levels of lead in drinking water in excess of 15 ppb. Under the current LCR, a utility is compliant if no more than one out of ten connections in the high-risk community exceeds 15 ppb or higher. Because the action level is based on a percentile rather than a tolerable limit, the LCR considers equally compliant two utilities having a 95th percentile level of 20 ppb or 2000 ppb - as long as the 90th percentile is below 15 ppb. CDC believes that a 90th percentile action level should be combined with a threshold concentration above which the utility would be out of compliance. If the water sample from any high-risk home has a lead concentration that exceeds the threshold, the system would be considered out of compliance. Under a combination of a 90th percentile action level and a threshold value, a system would be out of compliance if the 90th percentile exceeded the action level or any test exceeded the threshold value. Under these conditions, EPA would consider requiring the utility to notify the community, provide an alternative drinking water source or filtration, identify and mitigate lead sources, and/or conduct additional sampling.

CDC also believes that the 90th percentile threshold should be based on the concentration of lead in drinking water that results in an increase in blood lead levels of children and pregnant or breast-feeding women. However, EPA should not use the CDC blood level of concern for children (i.e.,10ug/dL) to establish its 90th percentile action level. We are currently reviewing this level at this time and are likely to make changes to it in the next few months. The size of the increase in the distribution of blood lead levels associated with a 90th percentile action level should be as small as possible and my staff and I are available to provide you with guidance on choosing an appropriate level.

Lead service line replacement

CDC has shared with EPA our analyses concerning partial lead pipe replacement since the fall of 2009. In December 2010, our analyses were published in the journal *Environmental Research*. We believe there is sufficient evidence to recommend that EPA halt partial lead service line replacement until it has further assessed the efficacy of this remediation technique. CDC believes that leaving any part of the lead service line in place during remediation results in an avoidable risk and we suggest you explore ways to facilitate full lead service line replacement. Finally, if any section of a lead service line is replaced, CDC recommends that an alternative source of drinking water or filtration be provided until sampling documents that lead concentrations fall below the EPA action level.

Public information

We suggest EPA take steps to ensure that utilities inform customers about the location of lead service lines and the options for replacement. This information could be provided to customers with their billing statements or notices of water quality. Disclosing information about lead service lines would improve the public's understanding of the hazards of lead in water. Providing information to the public has proven a successful strategy in reducing exposures to hazardous substances. For example, section 1018 of the Residential Lead-Based Paint Hazard Reduction Act of 1992 directed HUD and EPA to require the disclosure of known information on lead-based paint and lead-based paint hazards before the sale or lease of housing built before 1978. These disclosures have led property owners to identify and mitigate existing lead hazards.

Finally, NCEH would like to offer two additional suggestions regarding lead exposures. First, as EPA considers modifications to the LCR, we ask that you carefully review the sampling strategies for home drinking water to ensure that the samples are collected uniformly and are directly pertinent to how people use water in the home. In addition, we ask that EPA coordinate across the various offices dealing with lead in water, soil, dust and paint so that every office uses the same risk assessment and relative source contribution information when they develop policies that prevent exposures to lead. NCEH is available to assist EPA as it deliberates the changes needed in the LCR. Should EPA wish to contact us further on this issue, our point of contact is Dr. Mary Jean Brown, Chief, Healthy Homes and Lead Poisoning Prevention Branch (phone (770) 488-7492; email: MJB5@cdc.gov).

Sincerely yours,

Christopher J. Portier, Ph.D.
Director, National Center for
Environmental Health, and
Agency for Toxic Substances and
Disease Registry

Empirical and Legal Evaluation of Public Health Protection Under the Federal Lead and Copper Rule

Yanna Lambrinidou, PhD
Parents for Nontoxic Alternatives

Submitted to EPA's National Drinking Water Advisory Council (NDWAC)
December 16, 2013

Homeowner Interviews

Type of LSLR

	Washington, DC	Providence, RI	Total
Full LSLR	18	1	**19**
Partial LSLR	13	7	**20**
Total	**31**	**8**	**39**

Demographics

	Washington, DC	Providence, RI	Total
White/Caucasian	17	6	**23**
Black/African American	10		**10**
Hispanic/Latino	2	2	**4**
Other	2		**2**
Total	**31**	**8**	**39**

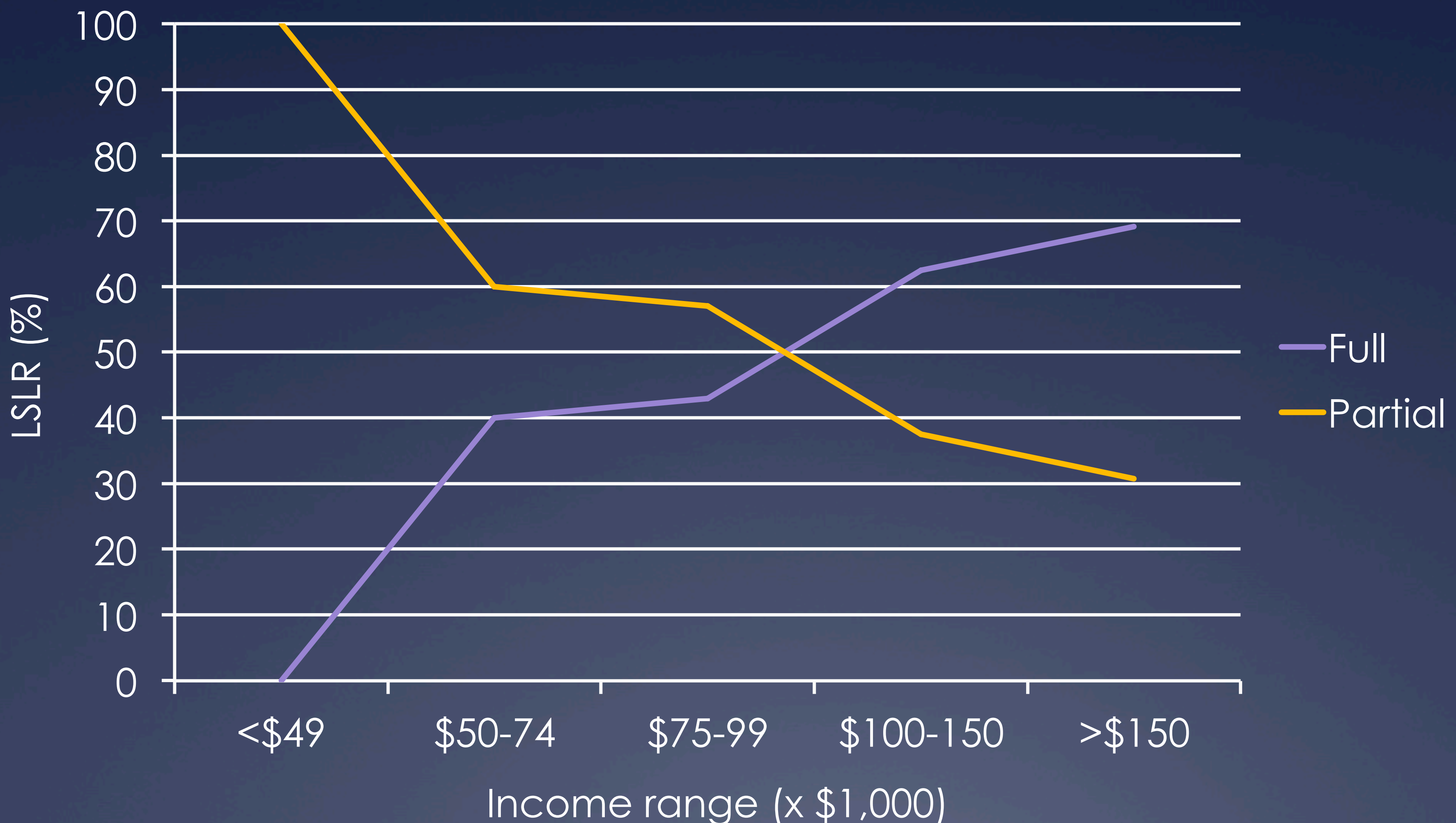
Reasons homeowners "opted out" of private-side LSLR:

COST

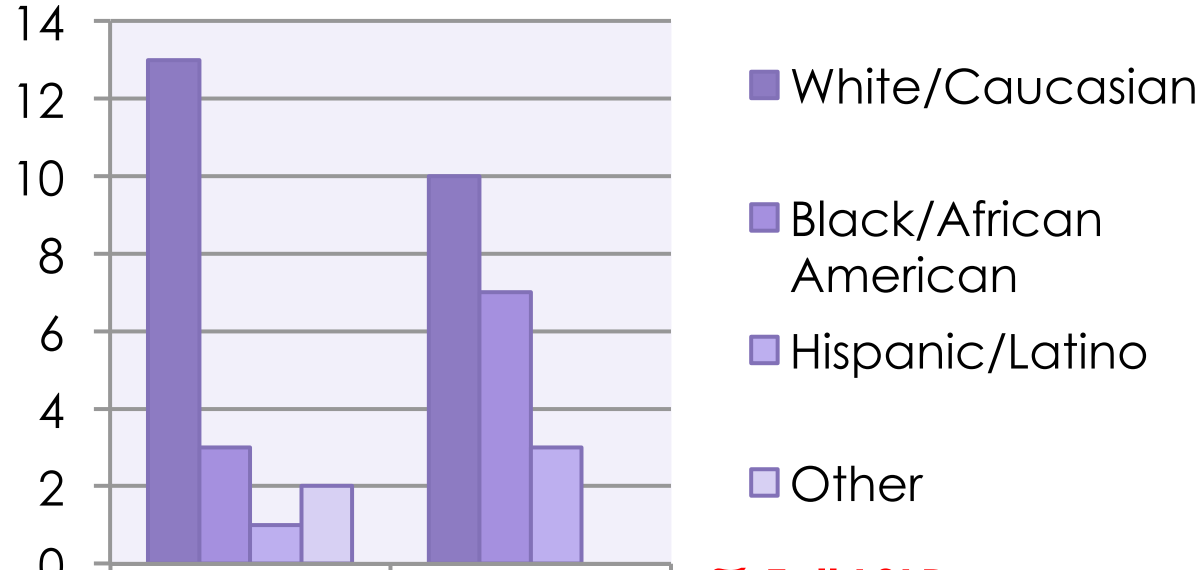
* Concern across income levels
* Recalled estimate range: $1,000-$7,000

* If cost covered by utility:
    * 80% would agree to full LSLR
    * 20% would agree to a full LSLR if it were recommended for preventing *known* (rather than speculative) health harm

Type of LSLR by Income Level



Type of LSLR by Race



	Full	Partial	**% Full LSLR**
White/Caucasian	13	10	**56%**
Black/African American	3	7	**30%**
Hispanic/Latino	1	3	**25%**
Other	2		

Acknowledgments

Research conducted under a grant from:

* The Robert Wood Johnson Foundation's (RWJF) Public Health Law Research program, and
* DC Water