Assessment of Lead and Copper in Massachusetts Public School Drinking Water

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Presentation Components

- **Background and Setting**
- **MassDEP/UMass Assistance Program Description**
- **Results Summary**
- **Follow-up: what's next**

Background: Pb & Cu Health Concerns

- **Lead (Pb)**
  - **US EPA Maximum Contaminant Level Goal (MCLG) of zero (due to cancer endpoint)**
  - **Prior to 1991 US EPA Lead and Copper Rule (LCR), lead (Pb) regulated at 50 ppb at entry to distribution system.**
  - **1991 US EPA LCR set an "Action Level" (AL) of 0.015 mg/L**
  - **World Health Organization guideline value of 0.01 mg/L**
  - **The US CDC lowered the "level of concern" regarding lead in children's blood from 10 µg/dL to 5 µg/dL in 2012. Medical treatment is recommended at levels > 45 µg/dL**
  - **Frequent statements by public health officials that there is no safe level of lead exposure for children**
- **Copper (Cu)**
  - **US EPA MCLG of 1.3 mg/L and Secondary MCL = 1.0 mg/L**
  - **Cu is an essential nutrient, not evaluated as a carcinogen**
  - **1991 LCR Action Level of 1.3 mg/L for copper**

Background: Pb & Cu Sources

- **Lead (and copper) rarely occur in raw drinking water sources (naturally occurring elements, so this can occur)**

- **Human exposure to lead mostly due to lead paint, contaminated soil/dust**
  - **Lead paint was banned in 1978.**
  - **Leaded gasoline phased out in mid 1970's**

- **The source of lead and copper in consumed drinking water is almost always from some of the materials that may be used to convey water from the water main to the consumer**
  - **Service connection: lead gooseneck, lead service line, brass fittings, copper piping, solder in joints**
  - **Premise plumbing: copper piping, solder for joints, brass fittings and fixtures**

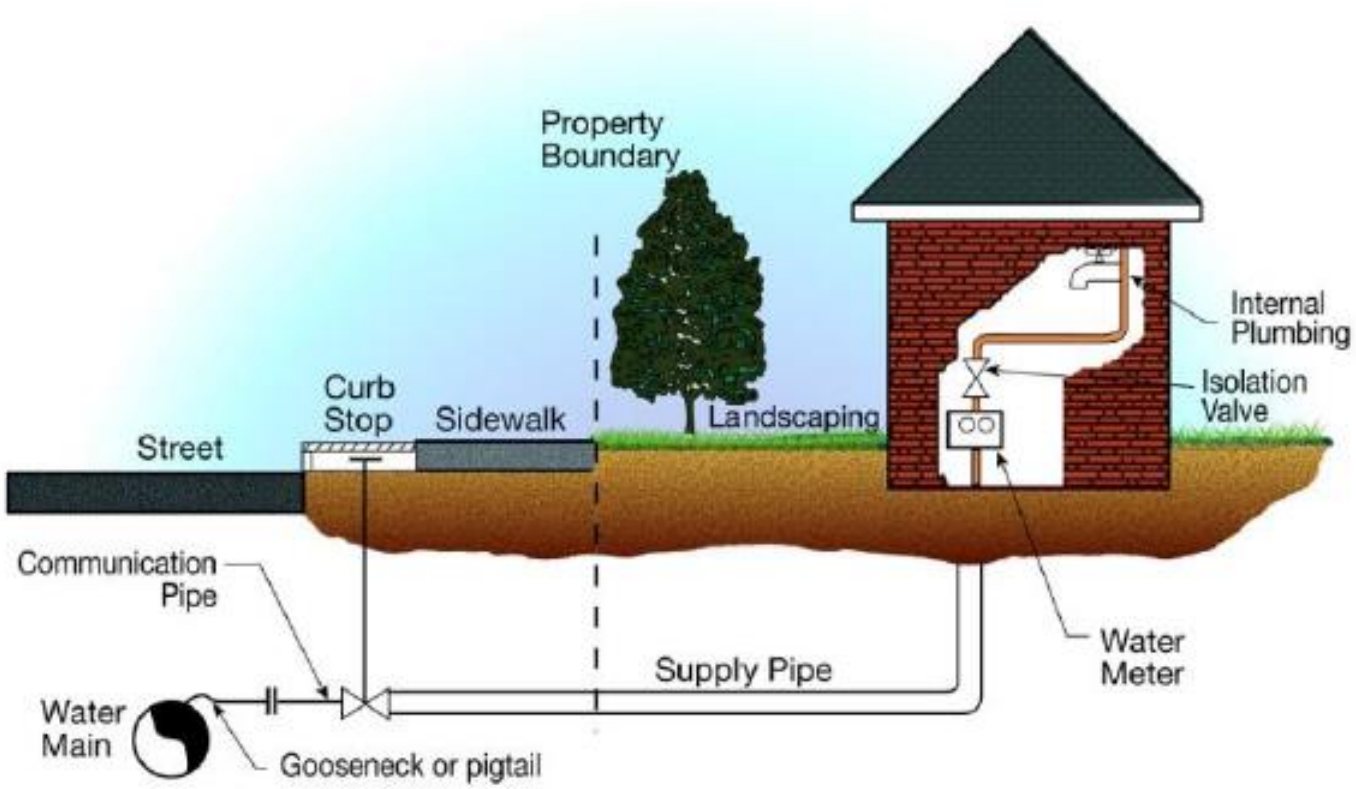
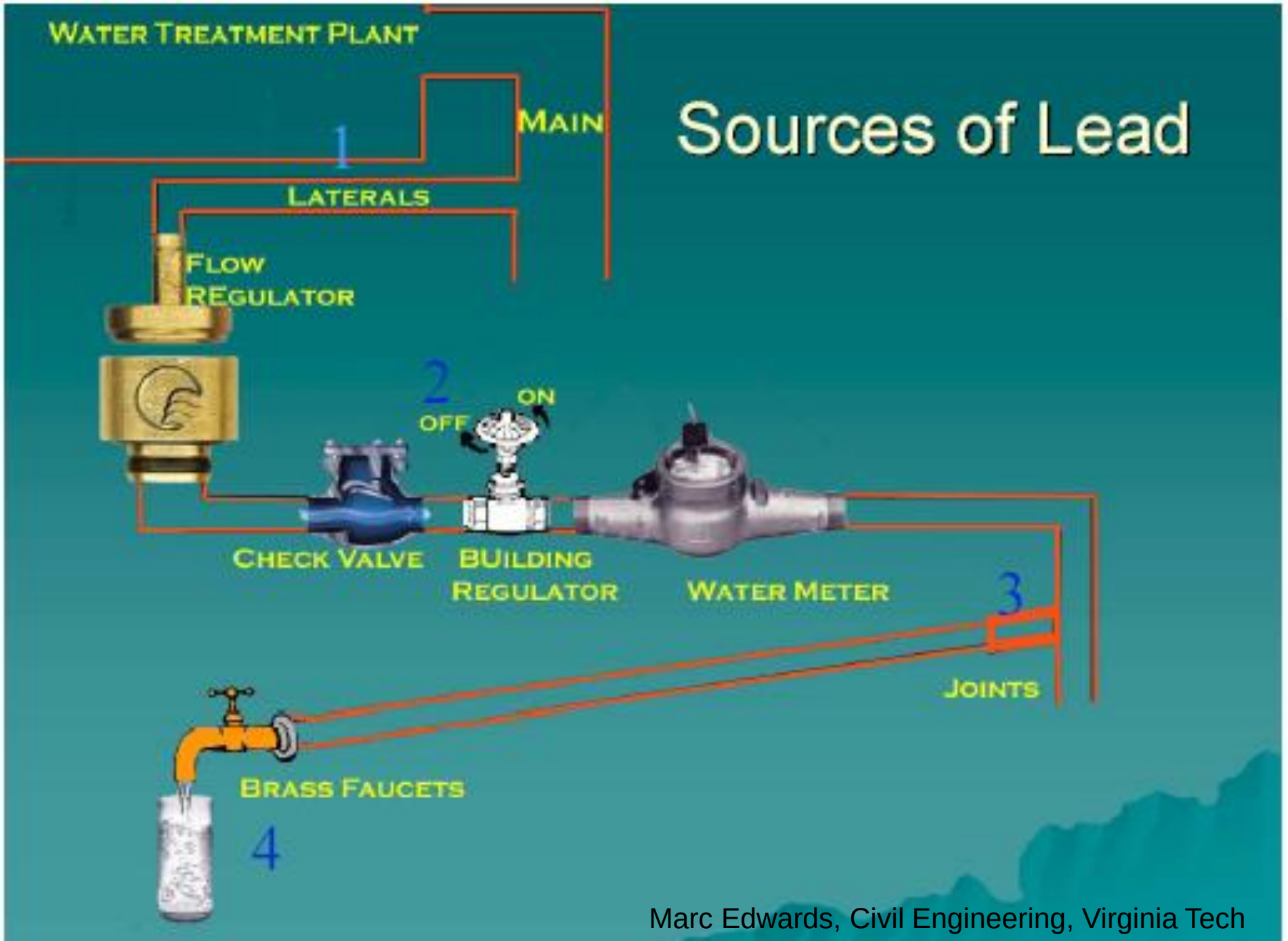


Exhibit 2.2: Typical Water Service Connection that May Provide Sources of Lead (Sandvig et al., 2008)



Sources of Lead

Marc Edwards, Civil Engineering, Virginia Tech

Solder containing led was banned in 1986

J.E. Tobiason, Lead in School Drinking Water, NEWWA May 2017

Background: Pb in Plumbing Materials

- **1986 SDWA prohibited use of pipes, solder or flux that were not "lead free"; at that time, "lead free" defined as < 0.2 % for solder and flux, and < 8% for pipes (by weight)**

- **1996 SDWA required plumbing fittings and fixtures to be in compliance with voluntary lead leaching standards**

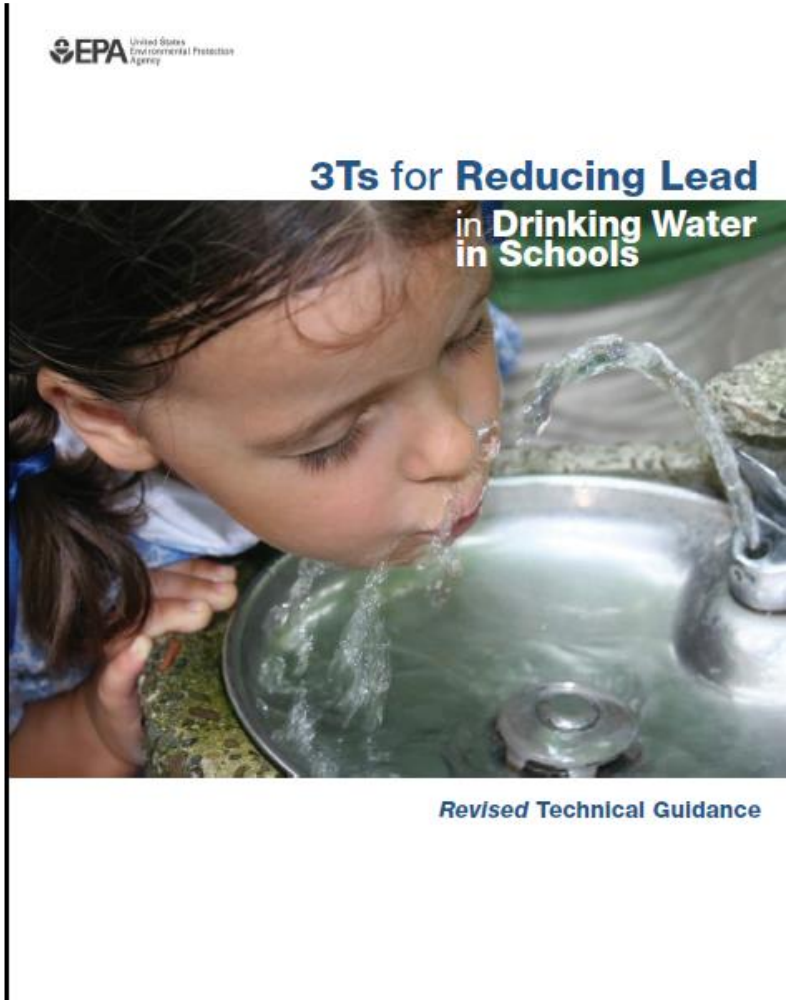
- **2011 Reduction of Lead in Drinking Water Act (RLDWA) red-defined "lead free" to be weighted average across wetted surface of < 0.25% lead by weight, but eliminated compliance with voluntary lead leaching standard**
  - **Prohibited introduction of products that are not lead free**
  - **Exemptions for variety of products not usually used to provided drinking water**

Regulatory Setting (1)

- **1991 US EPA LCR**
  - **Implemented a Treatment Technique (TT) in lieu of MCL to limit consumer exposure to Pb and Cu from drinking water**
  - **Requires sampling (1 liter) of first flush (> 6 hrs stagnation) water from household taps (specific rules for LSL cases)**
  - **Targets highest risk sites**
  - **Specific number of samples based on population**
  - **Monitoring frequency decreases from 1 per 6 months to 1 per 3 years if in compliance**
  - **The 90th percentile of measured values must be less than the "Action Level" for lead (15 ppb) and copper (1.3 ppm), so no more than 10% of values greater than the ALs**
  - **If non-compliance, institute education, LSL removal, optimum corrosion control treatment (OCCT)**
  - **No requirement to sample taps at schools or other public facilities.**

Regulatory Setting (2)

- **1988 Lead Contamination Control Act (LCCA)**
  - **US EPA established a voluntary program aimed at decreasing the lead (and copper) concentrations in school drinking water**
  - **Applies to K-12 schools and early education and care (EEC) programs**
  - **Provided a list of banned water coolers due to lead materials**
  - **Provided guidance on how and where to collect samples**
  - **US EPA "3Ts" (training, testing, telling) guidance manual provides many details on fixture sampling and follow-up actions**

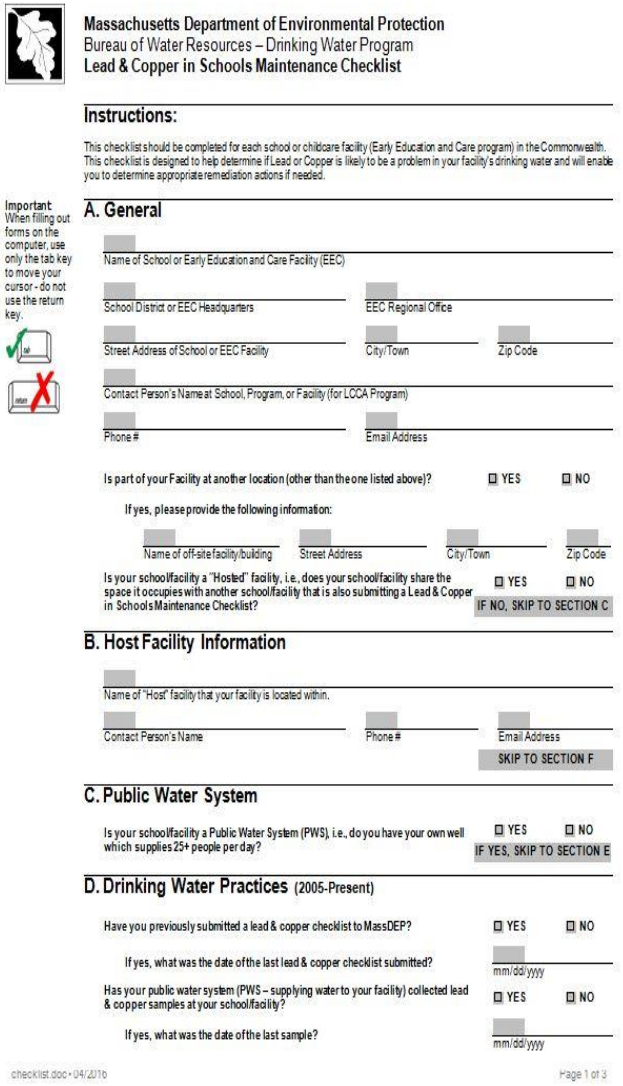


https://www.epa.gov/sites/production/files/2015-09/documents/toolkit_leadschools_guide_3ts_leadschools.pdf

Testing of School DW in Massachusetts

- **MassDEP & the Lead Contamination Control Act (LCCA)**
  - **MassDEP has long history of providing guidance and advice to schools for implementing the LCCA program components**
  - **Periodically (~ 5 yrs) asks all school systems to complete a "Maintenance Checklist" to provide information about school buildings (age, renovations), contact person, results of lead and copper testing, and actions taken (latest request Jan 2016)**
  - **Extensive guidance information on MassDEP website**
- **DEP required limited sampling and analysis during routine LCR compliance monitoring by public water systems (PWS)**
  - **Two taps at two schools served by PWS for each LCR monitoring period**
  - **LCCA based sampling, not part of compliance determination**
- **Schools that are public water systems**
  - **Conduct LCR based compliance monitoring (sampling, Pb & Cu analyses)**

Maintenance Checklist



Massachusetts Department of Environmental Protection
Bureau of Water Resources – Drinking Water Program
Lead & Copper in Schools Maintenance Checklist

Instructions:

This checklist should be completed for each school or childcare facility (Early Education and Care program) in the Commonwealth. This checklist is designed to help determine if Lead or Copper is likely to be a problem in your facility's drinking water and will enable you to determine appropriate remediation actions if needed.

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A. General

Name of School or Early Education and Care Facility (EEC)

School District or EEC Headquarters | EEC Regional Office

Street Address of School or EEC Facility | City/Town | Zip Code

Contact Person's Name at School, Program, or Facility (for LCCA Program)

Phone # | Email Address

Is part of your Facility at another location (other than the one listed above)? ☐ YES ☐ NO

If yes, please provide the following information:

Name of off-site facility/building | Street Address | City/Town | Zip Code

Is your school/facility a "Hosted" facility, i.e., does your school/facility share the space it occupies with another school/facility that is also submitting a Lead & Copper in Schools Maintenance Checklist? ☐ YES ☐ NO

IF NO, SKIP TO SECTION C

B. Host Facility Information

Name of "Host" facility that your facility is located within.

Contact Person's Name | Phone # | Email Address

SKIP TO SECTION F

C. Public Water System

Is your school/facility a Public Water System (PWS), i.e., do you have your own well which supplies 25+ people per day? ☐ YES ☐ NO

IF YES, SKIP TO SECTION E

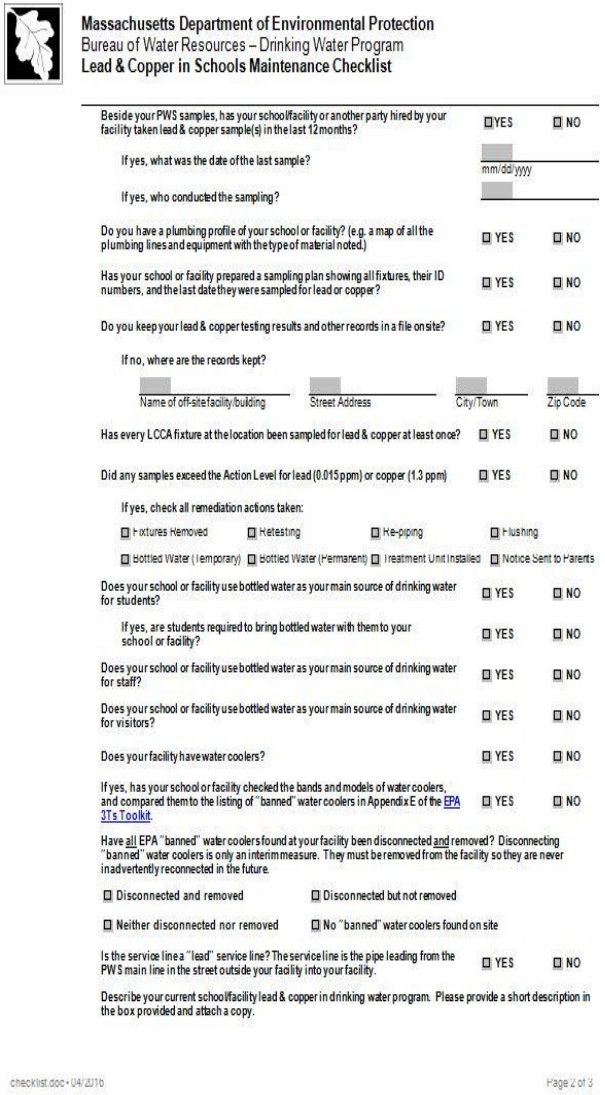
D. Drinking Water Practices (2005-Present)

Have you previously submitted a lead & copper checklist to MassDEP? ☐ YES ☐ NO

If yes, what was the date of the last lead & copper checklist submitted? mm/dd/yyyy

Has your public water system (PWS – supplying water to your facility) collected lead & copper samples at your school/facility? ☐ YES ☐ NO

If yes, what was the date of the last sample? mm/dd/yyyy



Massachusetts Department of Environmental Protection
Bureau of Water Resources – Drinking Water Program
Lead & Copper in Schools Maintenance Checklist

Beside your PWS samples, has your school/facility or another party hired by your facility taken lead & copper sample(s) in the last 12 months? ☐ YES ☐ NO

If yes, what was the date of the last sample? mm/dd/yyyy

If yes, who conducted the sampling?

Do you have a plumbing profile of your school or facility? (e.g. a map of all the plumbing lines and equipment with the type of material noted.) ☐ YES ☐ NO

Has your school or facility prepared a sampling plan showing all fixtures, their ID numbers, and the last date they were sampled for lead or copper? ☐ YES ☐ NO

Do you keep your lead & copper testing results and other records in a file on site? ☐ YES ☐ NO

If no, where are the records kept?

Name of off-site facility/building | Street Address | City/Town | Zip Code

Has every LCCA fixture at the location been sampled for lead & copper at least once? ☐ YES ☐ NO

Did any samples exceed the Action Level for lead (0.015 ppm) or copper (1.3 ppm) ☐ YES ☐ NO

If yes, check all remediation actions taken:

☐ Fixtures Removed ☐ Retesting ☐ Re-piping ☐ Flushing

☐ Bottled Water (Temporary) ☐ Bottled Water (Permanent) ☐ Treatment Unit Installed ☐ Notice Sent to Parents

Does your school or facility use bottled water as your main source of drinking water for students? ☐ YES ☐ NO

If yes, are students required to bring bottled water with them to your school or facility? ☐ YES ☐ NO

Does your school or facility use bottled water as your main source of drinking water for staff? ☐ YES ☐ NO

Does your school or facility use bottled water as your main source of drinking water for visitors? ☐ YES ☐ NO

Does your facility have water coolers? ☐ YES ☐ NO

If yes, has your school or facility checked the bands and models of water coolers, and compared them to the listing of "banned" water coolers in Appendix E of the EPA 3Ts Toolkit. ☐ YES ☐ NO

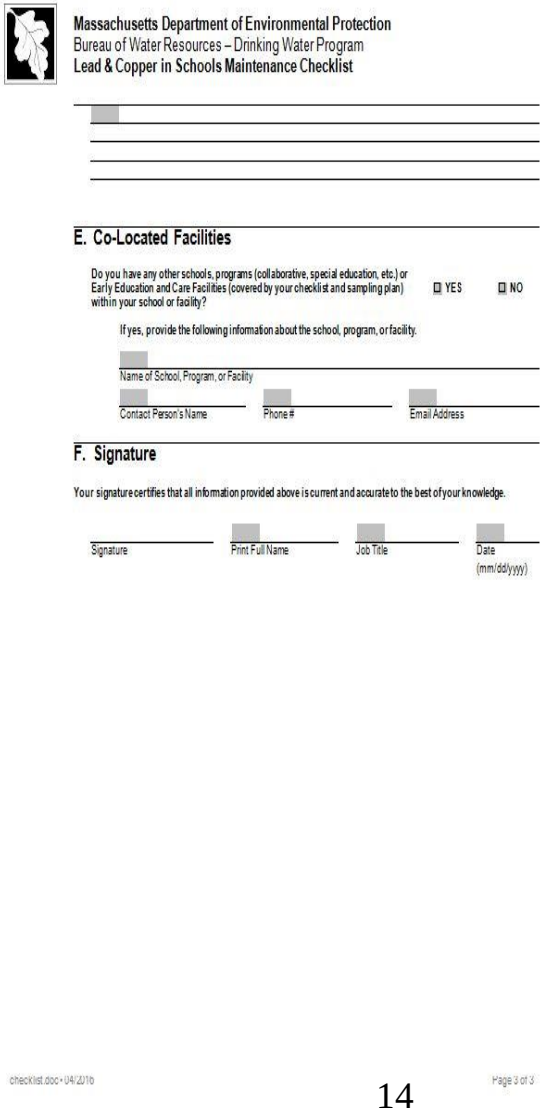
Have all EPA "banned" water coolers found at your facility been disconnected and removed? Disconnecting "banned" water coolers is only an interim measure. They must be removed from the facility so they are never inadvertently reconnected in the future.

☐ Disconnected and removed ☐ Disconnected but not removed

☐ Neither disconnected nor removed ☐ No "banned" water coolers found on site

Is the service line a "lead" service line? The service line is the pipe leading from the PWS main line in the street outside your facility into your facility. ☐ YES ☐ NO

Describe your current school/facility lead & copper in drinking water program. Please provide a short description in the box provided and attach a copy.



Massachusetts Department of Environmental Protection
Bureau of Water Resources – Drinking Water Program
Lead & Copper in Schools Maintenance Checklist

E. Co-Located Facilities

Do you have any other schools, programs (collaborative, special education, etc.) or Early Education and Care Facilities (covered by your checklist and sampling plan) within your school or facility? ☐ YES ☐ NO

If yes, provide the following information about the school, program, or facility.

Name of School, Program, or Facility

Contact Person's Name | Phone # | Email Address

F. Signature

Your signature certifies that all information provided above is current and accurate to the best of your knowledge.

Signature | Print Full Name | Job Title | Date (mm/dd/yyyy)

MassDEP/UMass 2016-2017 Assistance Program

- **Late April 2016: Governor Baker administration announces the "Massachusetts Assistance Program for Lead in School Drinking Water" to fund implementation of LCCA based sampling of taps at K-12 public schools and EECs in Massachusetts**
  - **$2.75 M from the Massachusetts Clean Water Trust**
  - **Implemented by MassDEP and UMass Amherst**
  - **Extensive involvement of MWRA**
  - **Supported by MassDPH, MassDESE, MassDEEC, PWSs**

- **UMass Project Managers and Technical Assistance Providers worked closely with DEP staff to develop & implement program**

- **Final report on Assistance Program issued 2 May 2017**

http://www.mass.gov/eea/agencies/massdep/water/drinking/testing-assistance-for-lead-in-school-drinking-water.html

Agency/Entity Roles

- Program partners included: MassDEP, UMass, MWRA Mass DPH, the MassDESE, MassDEEC & others

- DEP - Program development, materials, communications, website, interagency, providing data, fiscal and overall Program management.

- UMass – Program development and operational field staff (direct hire & subcontract)

UMass Amherst
The Commonwealth's Flagship Campus

MassDEP

Water Resources Authority
Massachusetts

*** **Slides in this style are courtesy of Michael Maynard, MassDEP**

Press Interest/Coverage

- DEP promoted transparency
- Between April 2016 and March 2017

  82 press clippings from 39 media outlets

- Media continue to express interest in the Program
  - Focus on sampling results
  - Focus on what local school districts are doing to address lead and copper exceedances

Program Components

- **Existing DEP LCCA Program**
- **Forms and information materials (see DEP Website)**
- **Request for Interest (RFI) responses**
- **Informational Meeting w/ Community**
- **Sample Plan/Fixture Map**
- **Web-Based Lead and Copper Reporting Tool**
- **Sampling**
- **Laboratory Analysis**
- **Reporting of Lab Results to DEP and Schools**
- **Follow-up Steps**

Request for Interest (RFI) by Schools/EECs

- **May 1-21, 2016: School systems submitted Request for Interest (RFI) forms to indicate desire to participate in Program**
  - **Approximately 170 systems submitted RFIs representing approximately 950 school buildings**
- **Grew to potential ~180 systems, ~1060 buildings**
  - **Total participation through March 2017: ~ 170 systems, ~ 815 buildings**
- **RFI data compiled in Excel file, basis for future datafile**
  - **System data: name, contact person, location(s), # of schools**
  - **MWRA (22) versus non-MWRA**
  - **served by PWS versus school is a PWS (16)**
  - **School data: system, name, location, level, etc.**

Informational Meeting (IM)

- **Most arranged and lead by UMass staff**
  - **Program manager contacts school system**
  - **IM lead by a Technical Assistance Provider (TAP) (~ 12 different TAPs worked for Program)**
  - **147 IMs were conducted**
- **Partnership between many groups/people:**
  - **School: Superintendent, Principals, Facilities Personnel**
  - **UMass-Amherst Technical Assistance Team**
  - **MassDEP**
  - **Public Water System**
- **Describe the Program**
  - **Components, tasks, timeline, information available**

Sample Plan Development

- The sample plan (SP) and map of the fixture locations are essential
- The SP identifies all locations where students/staff had access to drinking water, or where water was withdrawn for food preparation
- The most common type of fixture that was sampled was a typical classroom sink with both a faucet and a bubbler for drinking
- Other fixtures included kitchen kettles, produce wash sinks, ice machines and hallway bubblers
- SP and maps created during a comprehensive walk-through of a school by TAP and school facilities personnel

Sampling Plan: Field Form

Sampling Plan for LCCA Taps at: ORG CODE:_____ SCHOOL NAME:_____

DATE:___/___/___ STREET ADDRESS: _____ CONTACT NAME:_____

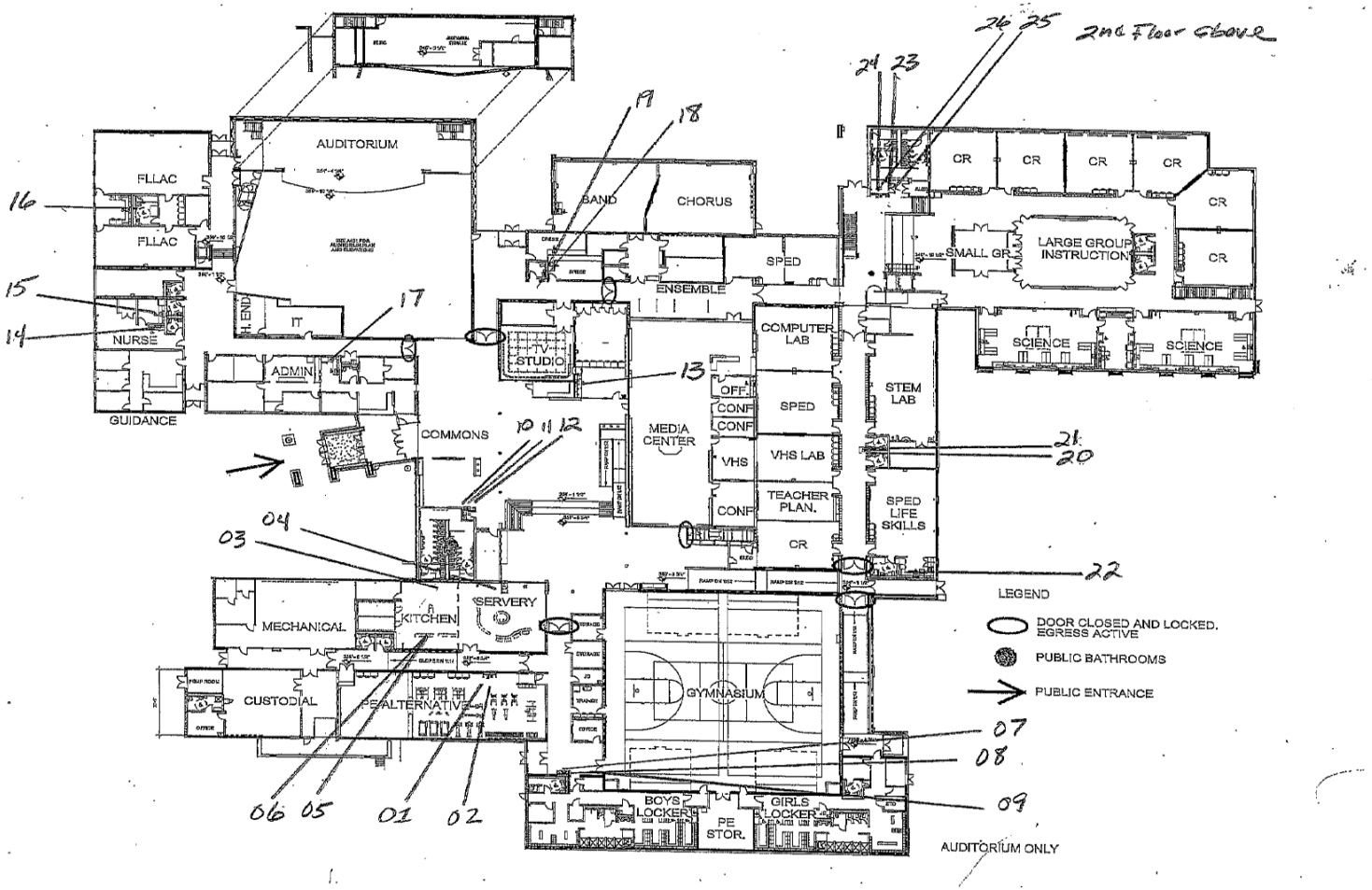
Location Code#	Location Type	Location Name	Comments	

Page ___ of ___

Sampling Map

- **The LCCA Map identifies all LCCA taps**
- **Each LCCA Tap is given a sequential "Location Code"**
- **The LCCA Map corresponds with the Sampling Plan**
- **Bathroom and classroom sinks do not need to be identified as an LCCA Tap IF posted with a "For Hand Washing Only" sign.**

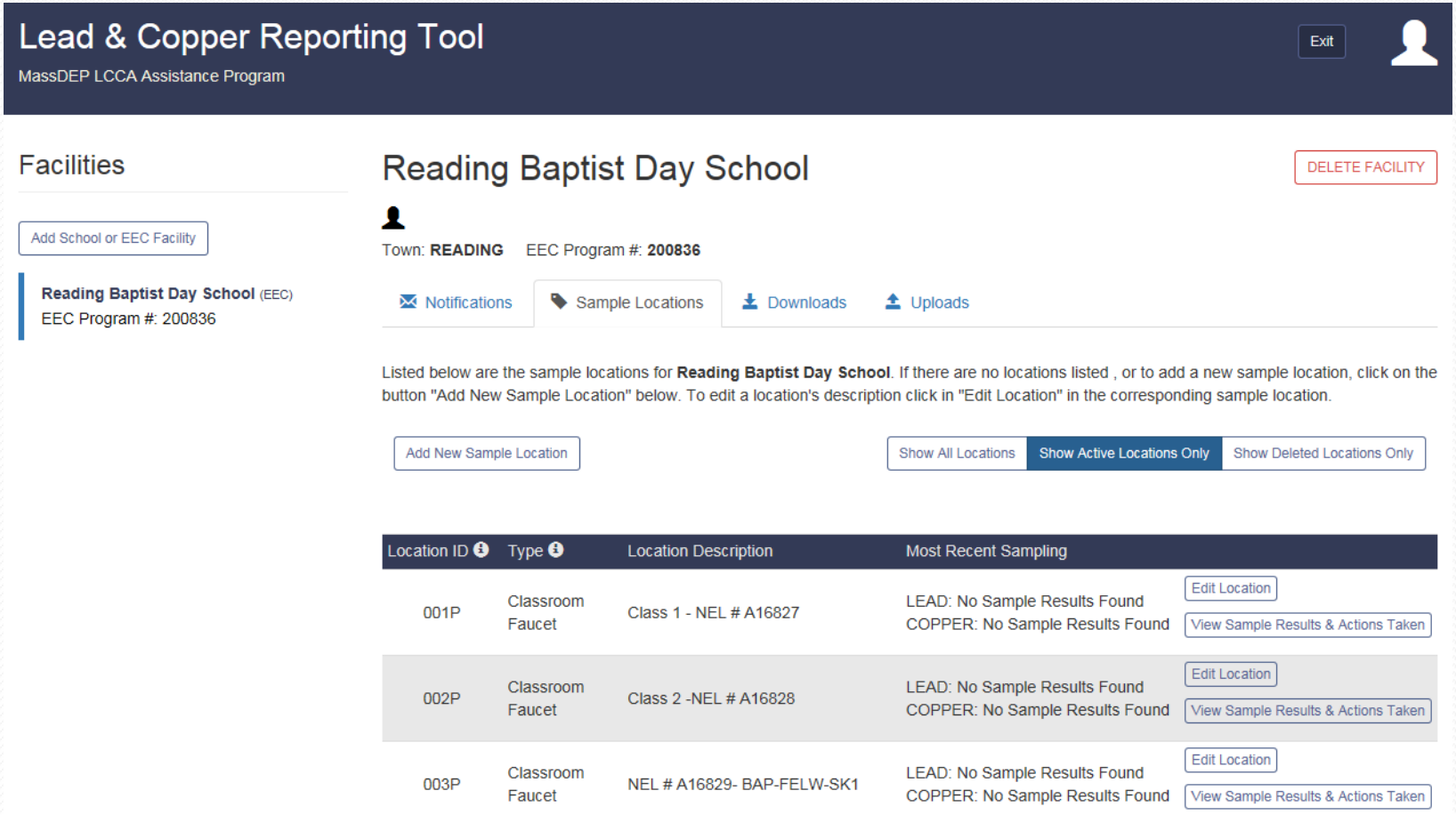
Sampling Map Example for LCCA Taps



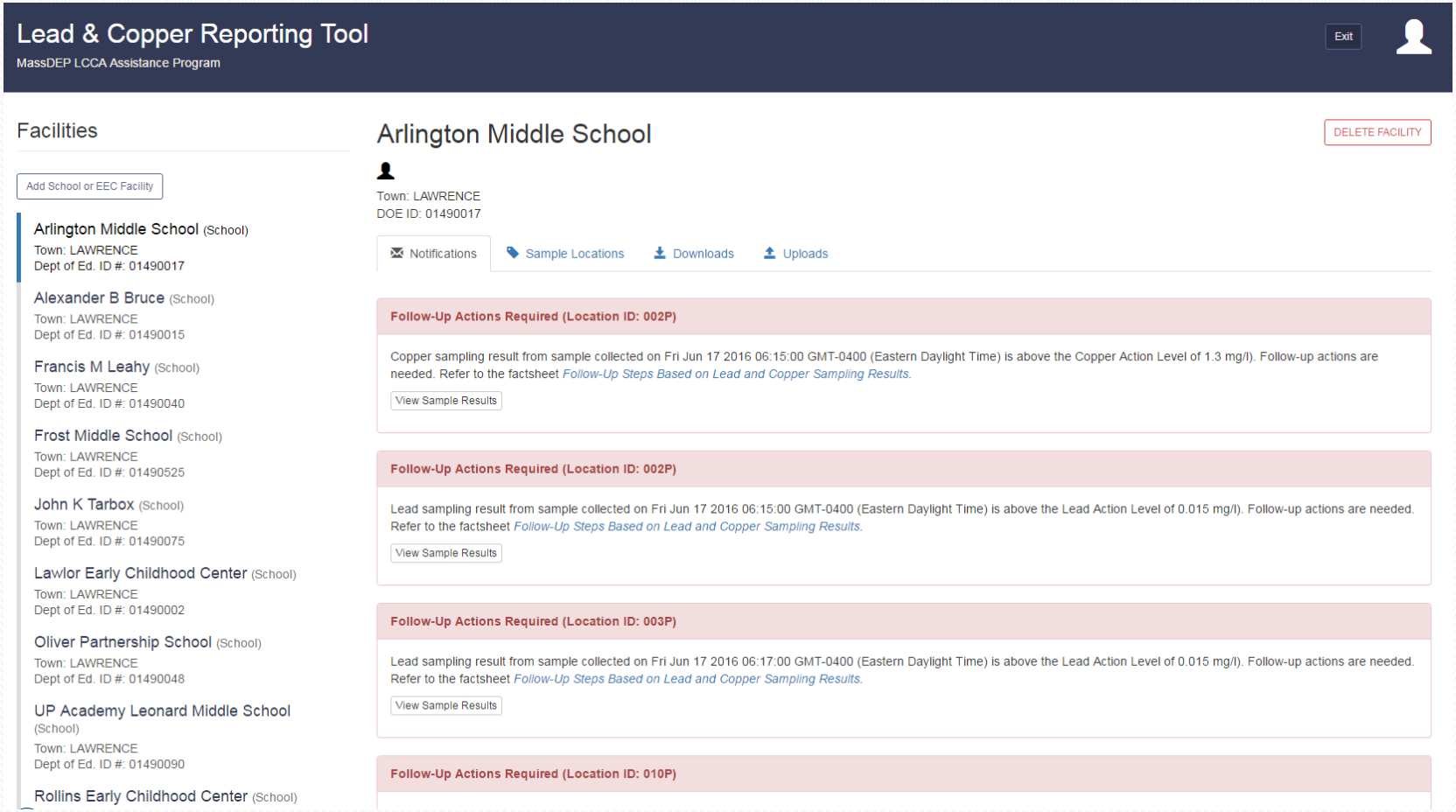
Lead & Copper Reporting Tool

- **Web-based online application created by DEP**
- **Functions of the "Tool" include**
  - **Entry & creation of sampling location record (the sample plan)**
  - **Download forms (chain of custody (CoC), sample bottle labels file, sampling plan);**
  - **Upload documents (sample location map, field CoC)**
  - **View sample analysis results;**
  - **Report remediation actions taken**
- **Each school system is assigned a unique PIN code for access to the Tool for their system**

Lead & Copper Reporting Tool



Lead & Copper Reporting Tool



Reporting Tool Sample Plan Example

Location ID	Type	Location Description	Most Recent Sampling	
001P	Classroom Faucet	Class 1 - NEL # A16827	LEAD: No Sample Results Found COPPER: No Sample Results Found	Edit Location View Sample Results & Actions Taken
002P	Classroom Faucet	Class 2 -NEL # A16828	LEAD: No Sample Results Found COPPER: No Sample Results Found	Edit Location View Sample Results & Actions Taken
003P	Classroom Faucet	NEL # A16829- BAP-FELW-SK1	LEAD: No Sample Results Found COPPER: No Sample Results Found	Edit Location View Sample Results & Actions Taken

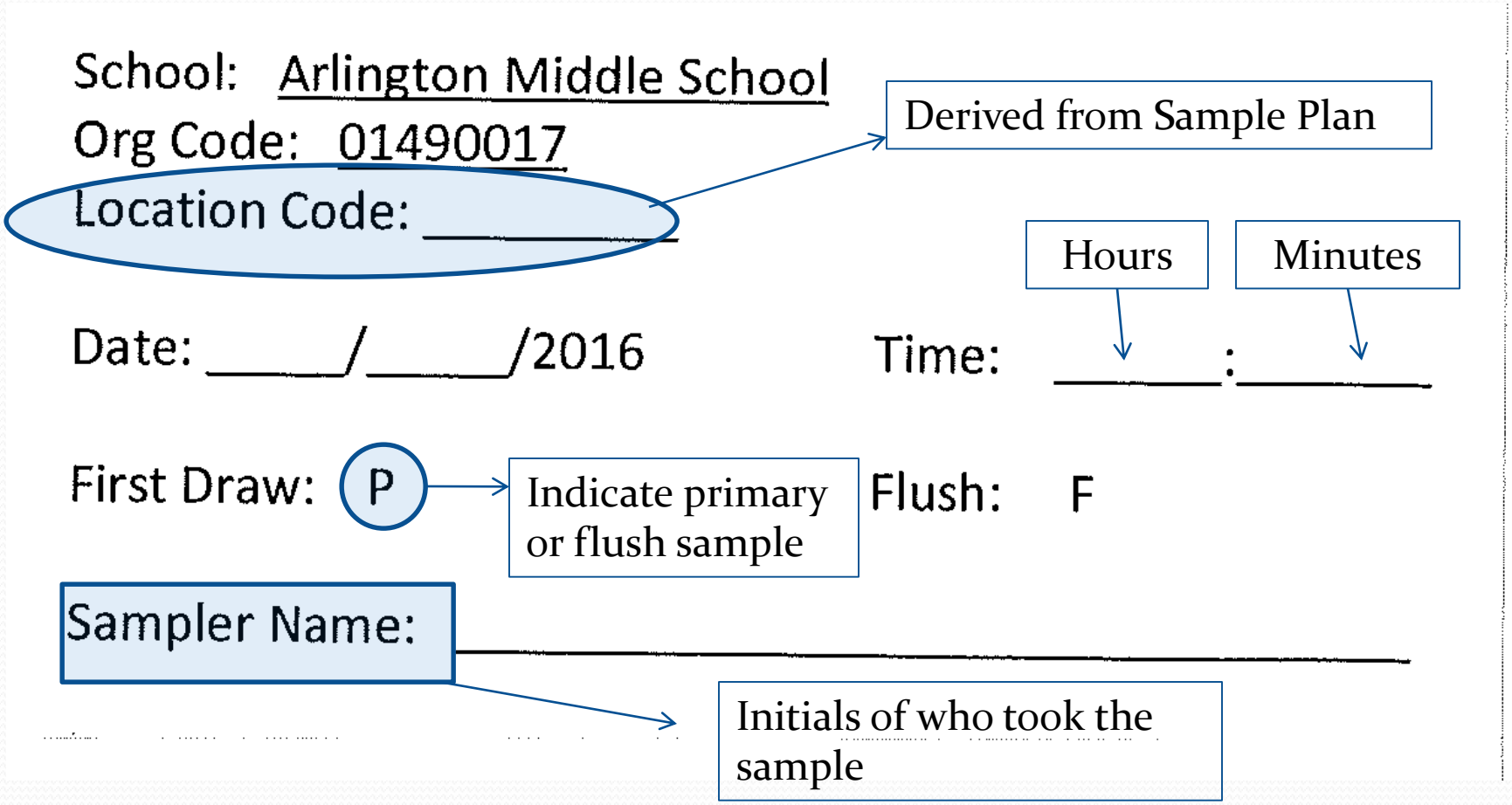
Sample Collection (1)

- **LCCA sampling protocol largely followed**
- **Required 8 to 18 hour stagnation period (no water use) prior to sampling**
  - **Samples typical collected very early morning (5 to 7 am often)**
  - **Tuesday through Saturday only**
  - **UMass, School, DEP, PWS personnel involved in sampling**
- **State certified analytical laboratory identified prior to sampling**
  - **UMass Program Manager identified lab; labs provided sample bottles**
  - **Bottle labels and Chain of Custody forms prepared prior to sampling**
  - **UMass contracted with 12 different commercial labs; samples analyzed per lab ranged from 270 to 10,000.**
  - **MWRA Deer Island laboratory analyzed samples for member communities (~ 6000 samples for the Assistance Program)**

Sample Collection (2)

- **First Draw (or Primary (P)) Sample, each fixture (location)**
  - **Begin closest to service connection, work into building**
  - **250 mL sample, wide mouth bottle**
  - **Represents fixture (5 to 200 mL) plus closest attached piping & fittings**
  - **250 mL ~ 5 ft ½ inch copper, 2.5 ft ¾ inch copper**
  - **Fill times ~ 2 to 10 seconds (normal water use, 0.4 to 2 gal/min)**
  - **Program average of 39 fixtures per building (1 to over 200)**
- **Flush (F) Sample: collect 250 mL after 30 second flush period following primary sample collection (continuous)**
  - **DEP decided to collect and analyze flush samples for most taps (versus USEPA 3T guidance for flush samples only if primary > AL)**
  - **For some sinks/bubblers with multiple adjacent taps (e.g., faucet & bubbler), only one flush sample collected**
  - **~ 75% of fixtures had flush samples; Program average of 69 total samples per building (range of 2 to 430)**
  - **Flush period plus sample ~ 1 to 5 liters volume, additional 20 – 100 ft ½ inch, 10 to 50 ft of ¾ inch piping**

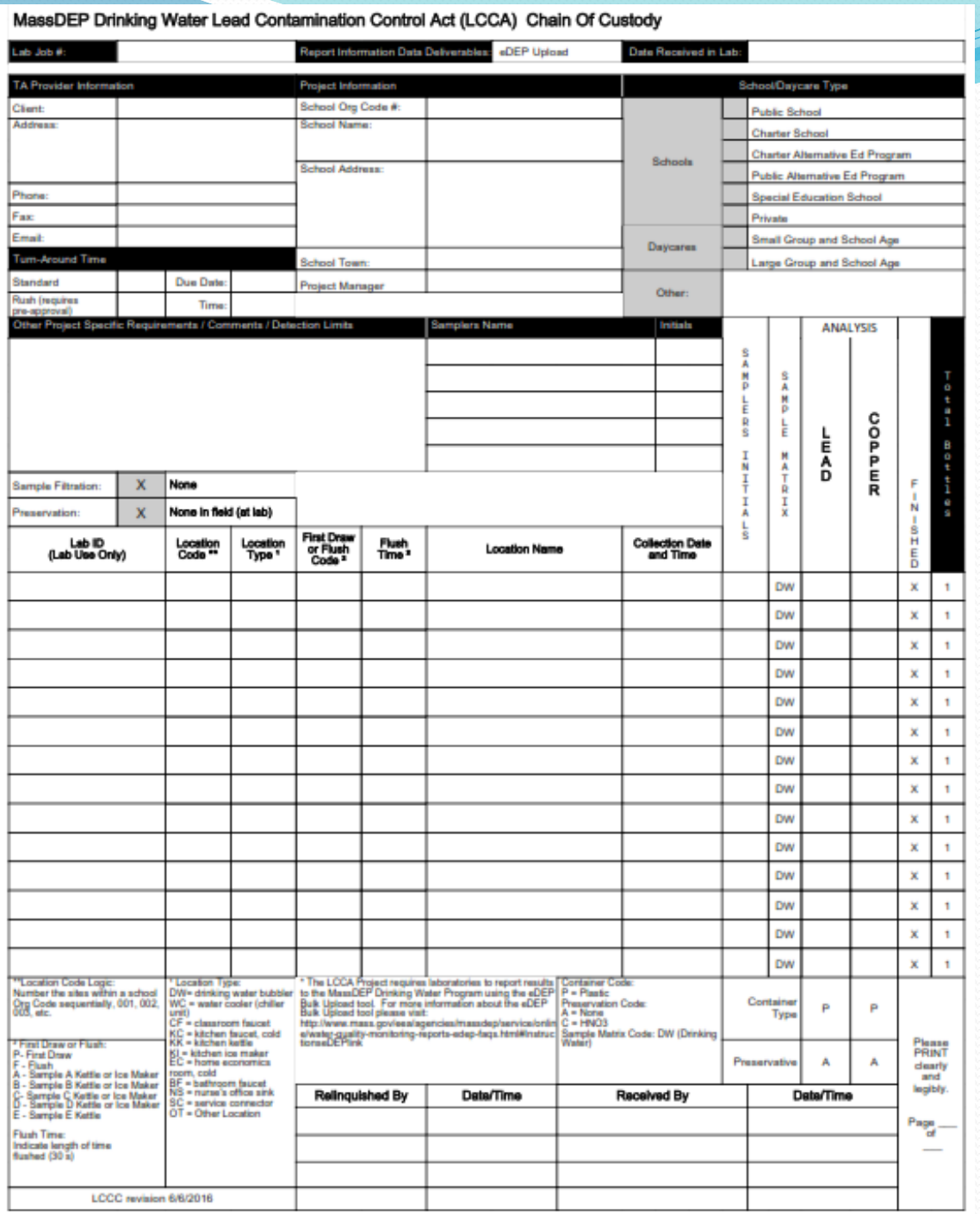
Labeling Sample Bottles



Chain of Custody

- Tracks sample from collection through sample results
- Use DESE or DEEC Organization Code
- Location Code corresponds w/ Sample Plan & Map
- Location Code includes (P) Primary or (F) Flush
- All information on the Sample Label and the Chain of Custody form must be the same.
- Scans of signed field Chain of Custody uploaded to Reporting Tool

Chain of Custody Form



MassDEP Drinking Water Lead Contamination Control Act (LCCA) Chain Of Custody

Lab Job #:		Report Information Data Deliverables:	eDEP Upload	Date Received in Lab:	

TA Provider Information		Project Information		School/Daycare Type		
Client:		School Org Code #:		Schools		Public School
Address:		School Name:				Charter School
		School Address:				Charter Alternative Ed Program
Phone:						Public Alternative Ed Program
Fax:						Special Education School
Email:						Private
Turn-Around Time		School Town:		Daycares		Small Group and School Age
Standard	Due Date:	Project Manager				Large Group and School Age
Rush (requires pre-approval)	Time:			Other:		

Other Project Specific Requirements / Comments / Detection Limits	Samplers Name	Initials

Sample Filtration:	X	None
Preservation:	X	None in field (at lab)

Lab ID (Lab Use Only)	Location Code **	Location Type *	First Draw or Flush Code *	Flush Time *	Location Name	Collection Date and Time	SAMPLERS INITIALS	SAMPLE MATRIX	ANALYSIS: LEAD	ANALYSIS: COPPER	FINISHED	Total Bottles
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1
								DW			X	1

Container Type		P	P	
Preservative		A	A	

Location Code Logic:
Number the sites within a school Org Code sequentially, 001, 002, 003, etc.

*** First Draw or Flush:**
P- First Draw
F - Flush
A - Sample A Kettle or Ice Maker
B - Sample B Kettle or Ice Maker
C- Sample C Kettle or Ice Maker
D - Sample D Kettle or Ice Maker
E - Sample E Kettle

Flush Time:
Indicate length of time flushed (30 s)

*** Location Type:**
DW= drinking water bubbler
WC = water cooler (chiller unit)
CF = classroom faucet
KC = kitchen faucet, cold
KK = kitchen kettle
KI = kitchen ice maker
EC = home economics room, cold
BF = bathroom faucet
NS = nurse's office sink
SC = service connector
OT = Other Location

* The LCCA Project requires laboratories to report results to the MassDEP Drinking Water Program using the eDEP Bulk Upload tool. For more information about the eDEP Bulk Upload tool please visit:
http://www.mass.gov/eea/agencies/massdep/service/online/water-quality-monitoring-reports-edep-faqs.html#InstructionseDEPlink

Container Code:
P = Plastic
Preservation Code:
A = None
C = HNO3
Sample Matrix Code: DW (Drinking Water)

Relinquished By	Date/Time	Received By	Date/Time

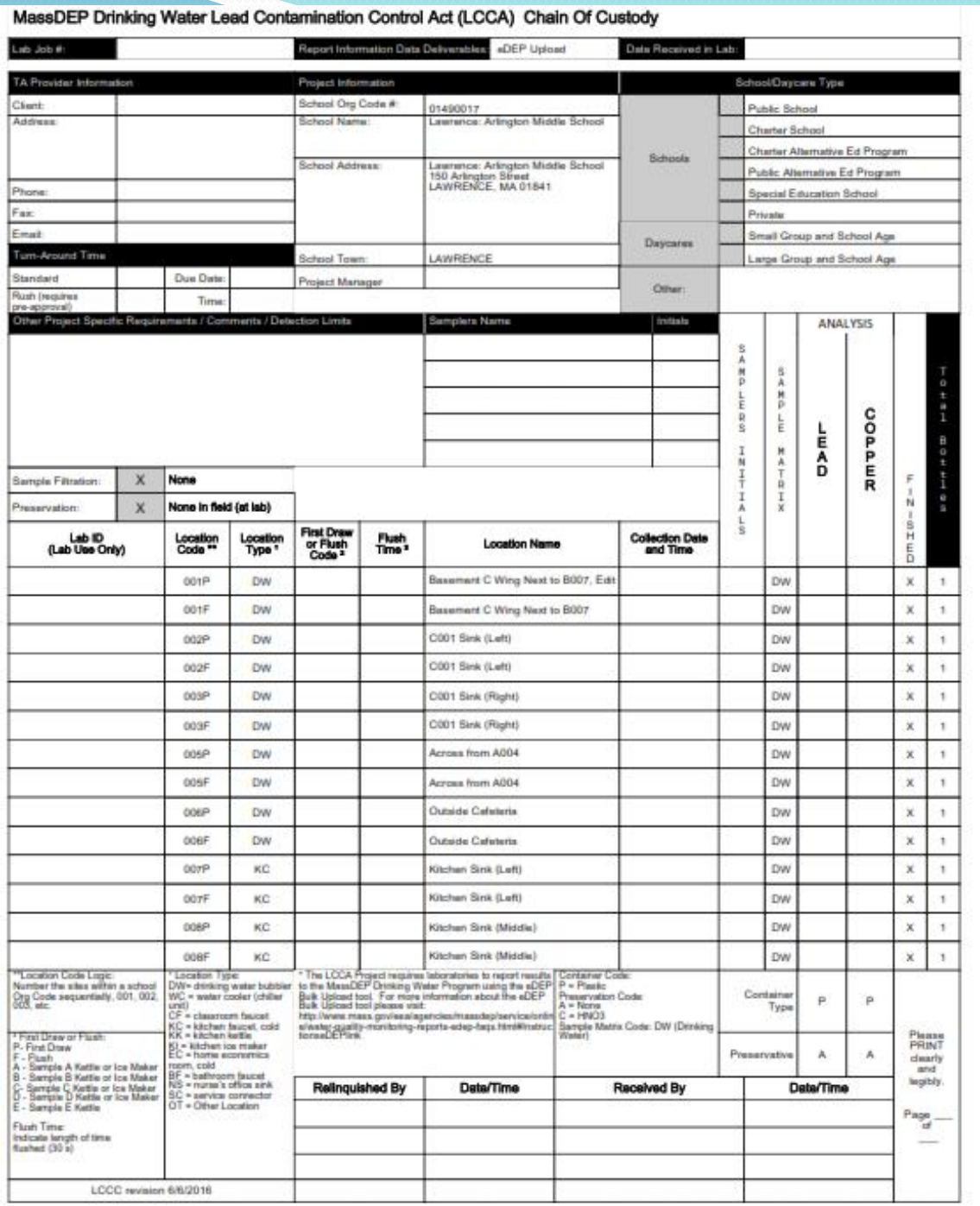
Please PRINT clearly and legibly.

Page ___ of ___

LCCC revision 6/6/2016

Chain of Custody (Example)

- printed from Reporting Tool prior to sampling



MassDEP Drinking Water Lead Contamination Control Act (LCCA) Chain Of Custody

Lab Job #: | Report Information Data Deliverables: eDEP Upload | Date Received in Lab:

TA Provider Information		Project Information		School/Daycare Type	
Client:		School Org Code #:	01490017	Schools	Public School
Address:		School Name:	Lawrence: Arlington Middle School		Charter School
		School Address:	Lawrence: Arlington Middle School 150 Arlington Street LAWRENCE, MA 01841		Charter Alternative Ed Program
					Public Alternative Ed Program
Phone:					Special Education School
Fax:					Private
Email:				Daycares	Small Group and School Age
Turn-Around Time		School Town:	LAWRENCE		Large Group and School Age
Standard	Due Date:	Project Manager		Other:	
Rush (requires pre-approval)	Time:				

Other Project Specific Requirements / Comments / Detection Limits	Samplers Name	Initials

Sample Filtration:	X	None
Preservation:	X	None in field (at lab)

Lab ID (Lab Use Only)	Location Code **	Location Type *	First Draw or Flush Code ²	Flush Time ³	Location Name	Collection Date and Time	SAMPLERS INITIALS	SAMPLE MATRIX	ANALYSIS: LEAD	ANALYSIS: COPPER	FINISHED	Total Bottles
	001P	DW			Basement C Wing Next to B007, Edit			DW			X	1
	001F	DW			Basement C Wing Next to B007			DW			X	1
	002P	DW			C001 Sink (Left)			DW			X	1
	002F	DW			C001 Sink (Left)			DW			X	1
	003P	DW			C001 Sink (Right)			DW			X	1
	003F	DW			C001 Sink (Right)			DW			X	1
	005P	DW			Across from A004			DW			X	1
	005F	DW			Across from A004			DW			X	1
	006P	DW			Outside Cafeteria			DW			X	1
	006F	DW			Outside Cafeteria			DW			X	1
	007P	KC			Kitchen Sink (Left)			DW			X	1
	007F	KC			Kitchen Sink (Left)			DW			X	1
	008P	KC			Kitchen Sink (Middle)			DW			X	1
	008F	KC			Kitchen Sink (Middle)			DW			X	1

**Location Code Logic:
Number the sites within a school Org Code sequentially, 001, 002, 003, etc.

* First Draw or Flush:
P - First Draw
F - Flush
A - Sample A Kettle or Ice Maker
B - Sample B Kettle or Ice Maker
C - Sample C Kettle or Ice Maker
D - Sample D Kettle or Ice Maker
E - Sample E Kettle

Flush Time:
Indicate length of time flushed (30 s)

* Location Type:
DW = drinking water bubbler
WC = water cooler (chiller unit)
CF = classroom faucet
KC = kitchen faucet, cold
KK = kitchen kettle
KI = kitchen ice maker
EC = home economics room, cold
BF = bathroom faucet
NS = nurse's office sink
SC = service connector
OT = Other Location

* The LCCA Project requires laboratories to report results to the MassDEP Drinking Water Program using the eDEP Bulk Upload tool. For more information about the eDEP Bulk Upload tool please visit: http://www.mass.gov/eea/agencies/massdep/service/online/water-quality-monitoring-reports-edep-faqs.html#instructionseDEPlink

Container Code:
P = Plastic
Preservation Code:
A = None
C = HNO3
Sample Matrix Code: DW (Drinking Water)

Container Type	P	P
Preservative	A	A

Relinquished By	Date/Time	Received By	Date/Time

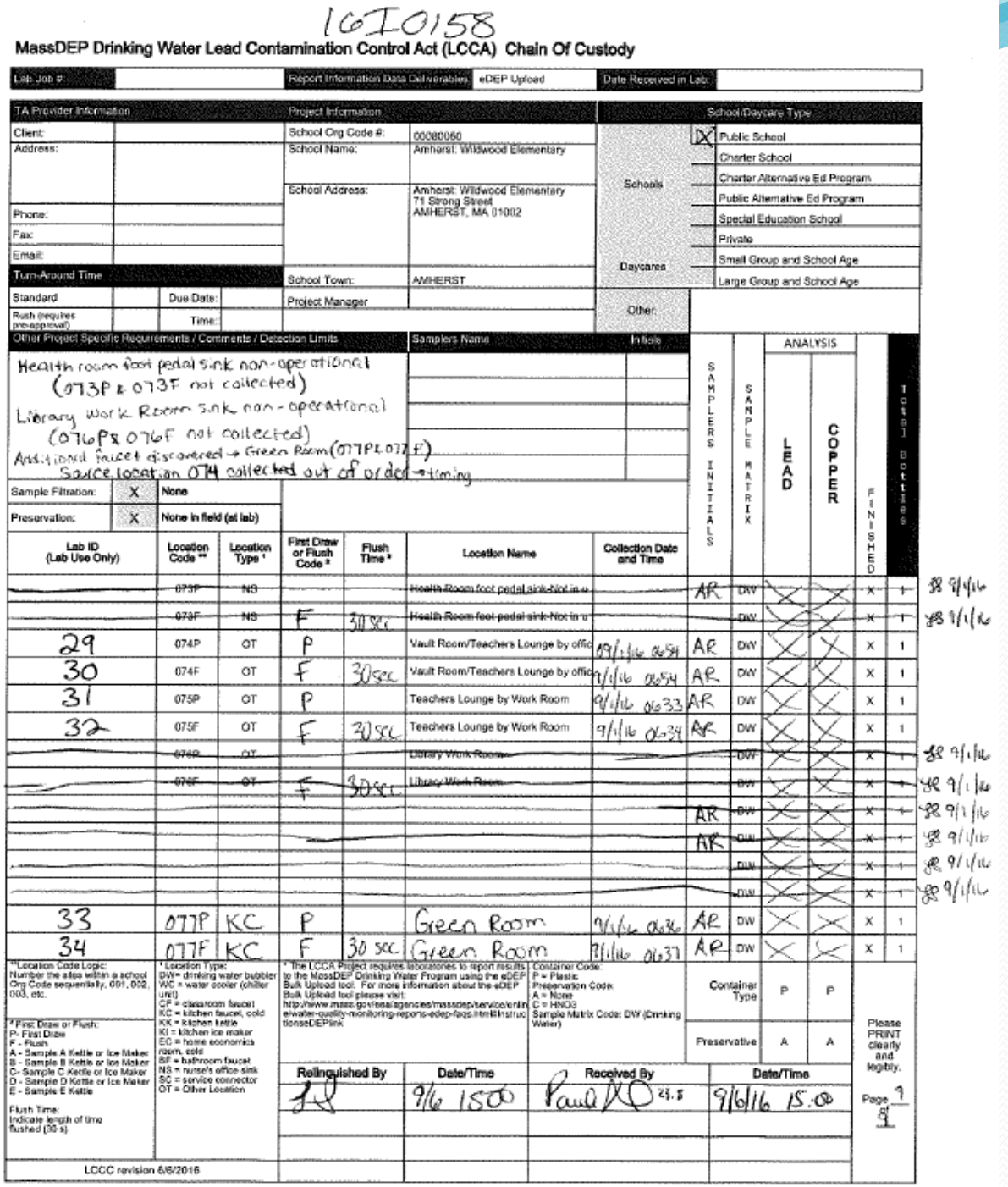
Please PRINT clearly and legibly.

Page ___ of ___

LCCC revision 6/6/2016

Chain of Custody (Example)

- Field CoC including lab notations



1GI0158

MassDEP Drinking Water Lead Contamination Control Act (LCCA) Chain Of Custody

Lab Job #: | Report Information Data Deliverables: eDEP Upload | Date Received in Lab:

TA Provider Information

Client:
Address:
Phone:
Fax:
Email:

Project Information

School Org Code #: 00080060
School Name: Amherst: Wildwood Elementary
School Address: Amherst: Wildwood Elementary, 71 Strong Street, AMHERST, MA 01002
School Town: AMHERST
Project Manager

School/Daycare Type

Schools: [X] Public School; [ ] Charter School; [ ] Charter Alternative Ed Program; [ ] Public Alternative Ed Program; [ ] Special Education School; [ ] Private
Daycares: [ ] Small Group and School Age; [ ] Large Group and School Age
Other:

Turn-Around Time

Standard | Due Date:
Rush (requires pre-approval) | Time:

Other Project Specific Requirements / Comments / Detection Limits

Health room foot pedal sink non-operational (073P & 073F not collected)
Library Work Room sink non-operational (076P & 076F not collected)
Additional faucet discovered → Green Room (077P, 077F)
Source location 074 collected out of order → timing

Sample Filtration: X None
Preservation: X None in field (at lab)

Samplers Name / Initials

Lab ID (Lab Use Only)	Location Code **	Location Type *	First Draw or Flush Code #	Flush Time *	Location Name	Collection Date and Time	Samplers Initials	Sample Matrix	ANALYSIS: Lead	ANALYSIS: Copper	Finished	Total Bottles
	~~073P~~	~~NS~~			~~Health Room foot pedal sink-Not in o~~		AR	DW	X	X	X	1
	~~073F~~	~~NS~~	~~F~~	~~30 sec~~	~~Health Room foot pedal sink-Not in o~~			DW	X	X	X	1
29	074P	OT	P		Vault Room/Teachers Lounge by offic	9/1/16 0654	AR	DW	X	X	X	1
30	074F	OT	F	30 sec	Vault Room/Teachers Lounge by offic	9/1/16 0654	AR	DW	X	X	X	1
31	075P	OT	P		Teachers Lounge by Work Room	9/1/16 0633	AR	DW	X	X	X	1
32	075F	OT	F	30 sec	Teachers Lounge by Work Room	9/1/16 0634	AR	DW	X	X	X	1
	~~076P~~	~~OT~~			~~Library Work Room~~			DW	X	X	X	1
	~~076F~~	~~OT~~	~~F~~	~~30 sec~~	~~Library Work Room~~			DW	X	X	X	1
							AR	DW	X	X	X	1
							AR	DW	X	X	X	1
								DW	X	X	X	1
								DW	X	X	X	1
33	077P	KC	P		Green Room	9/1/16 0636	AR	DW	X	X	X	1
34	077F	KC	F	30 sec	Green Room	9/1/16 0637	AR	DW	X	X	X	1

~~9/1/16~~ ~~9/1/16~~ ~~9/1/16~~ ~~9/1/16~~ ~~9/1/16~~ ~~9/1/16~~ ~~9/1/16~~

**Location Code Logic: Number the area within a school Org Code sequentially, 001, 002, 003, etc.

* Location Type: DW = drinking water bubbler; WC = water cooler (chiller unit); CF = classroom faucet; KC = kitchen faucet, cold; KK = kitchen kettle; KI = kitchen ice maker; EC = home economics room, cold; BF = bathroom faucet; NS = nurse's office sink; SC = service connector; OT = Other Location

First Draw or Flush: P- First Draw; F - Flush; A - Sample A Kettle or Ice Maker; B - Sample B Kettle or Ice Maker; C- Sample C Kettle or Ice Maker; D - Sample D Kettle or Ice Maker; E - Sample E Kettle

Flush Time: Indicate length of time flushed (30 s)

* The LCCA Project requires laboratories to report results to the MassDEP Drinking Water Program using the eDEP Bulk Upload tool. For more information about the eDEP Bulk Upload tool please visit: http://www.mass.gov/eea/agencies/massdep/service/online/water-quality-monitoring-reports-edep-faqs.html#Instructionse DEPlink

Container Code: P = Plastic; Preservation Code: A = None; C = HNO3; Sample Matrix Code: DW (Drinking Water)

	Container Type	P	P
	Preservative	A	A

Relinquished By	Date/Time	Received By	Date/Time
[illegible]	9/6 1500	Paul [illegible]	9/6/16 15:00

Please PRINT clearly and legibly.

Page 1 of 1

LCCC revision 6/6/2016

What to Sample

(From DEP UMass Sampling Training Document)

- Drinking Water Sites & Food Preparation Sites sometimes share a main or direct water pipe and only split just before the fixtures.

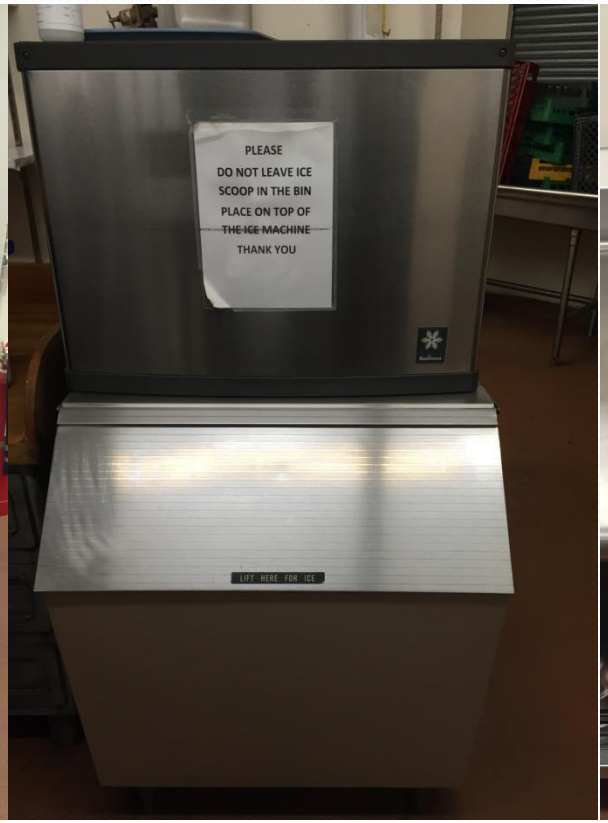
Paired drinking water bubblers and some classroom sinks share a main water pipe that splits to provide water to two or three fixtures. A Primary sample is taken from all fixtures (each fixture has its own location code) but only one flush sample is taken.

P-P-F

(From DEP UMass Sampling Training Document)

What to Sample continued

Kitchen Kettle
(Cold only)



Ice Machine

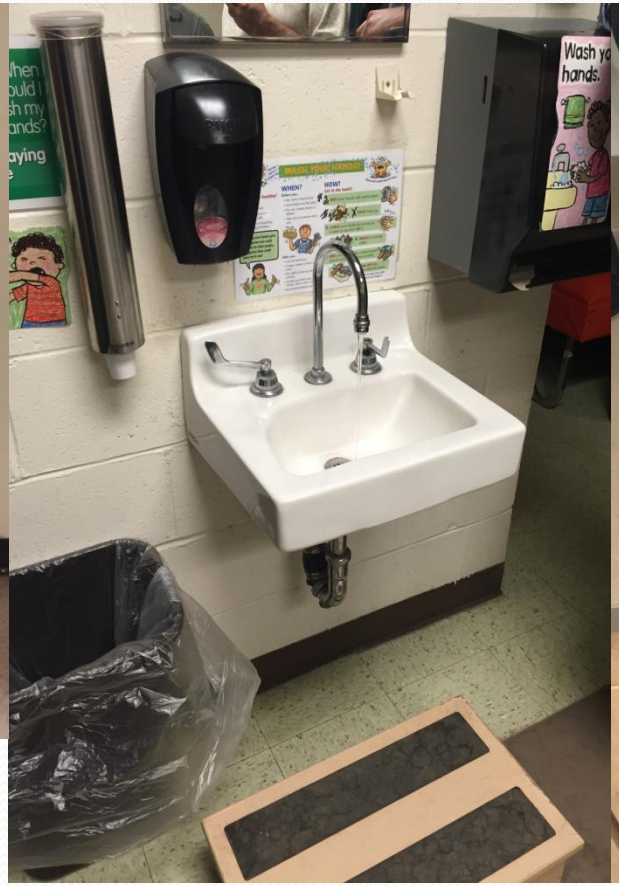
Food Preparation
Sink

These have one main water line. The sequence for sampling is **P-F**

(From DEP UMass Sampling Training Document)

What to Sample continued

Hallway Water Cooler (sometimes two water coolers side-by-side, each gets Primary and Flush samples)



Nurse's Office Sink (cold only)

Teacher's Lounge Sink (cold only)

P-F

(From DEP UMass Sampling Training Document)

What **Not** to Sample

Custodial Washing Sinks

Bathroom Sinks (If posted, "For Hand Washing Only")

Laboratory Analysis Result Reporting

- **Laboratories reported all analytical results electronically to MassDEP (eDEP system)**
  - **Performed only by Massachusetts DEP-certified laboratories that were e-DEP compliant**
- **MassDEP emailed the analytical results (attached Excel file) to school system (1 to several schools at a time) along with DEP contacts, information links, and template letters for parents**
- **DEP transferred the Sampling Results to the Reporting Tool**
- **DEP posted results on website ~ 2 weeks after sending to schools**
- **MassDPH followed-up with an email with information about Pb and Cu and health and additional guidance**

Communication Strategy on Action Level Exceedences

- Notify consumers (public) immediately
  - Include results and short-term and long-term next steps
  - Utilize letters and other outreach mechanisms (website, Twitter, etc.)
  - Explore engagement from local health officials
- Tools to assist schools
  - Template outreach letters from MassDEP
  - Fact Sheet(s) on Lead and Copper in Schools from Mass Department of Public Health (DPH)

School Remediation Actions

- Contact Local Public Water System and MassDEP Drinking Water Program for assistance
- Immediate Measures
  - Shut Off Problem Fixtures
  - Implement a Flushing Program (track via Manual Flushing Log)
- Conduct Outreach to Staff and Parents

  - Transparency is critical
- Determine if the source of the contamination is the fixture or the plumbing
  - Check Plumbing Profile
  - Possibly replace plumbing
  - Follow-up Sampling
- Develop Plan of Permanent Measures
- Report remedial actions taken on the MassDEP online Reporting Tool

Summary of Findings

- **Final report on Assistance Program issued 2 May 2017**

  http://www.mass.gov/eea/agencies/massdep/water/drinking/testing-assistance-for-lead-in-school-drinking-water.html

- **Sampled 818 school building in 153 municipalities**

- **Range of 1 to 76 buildings per school system**

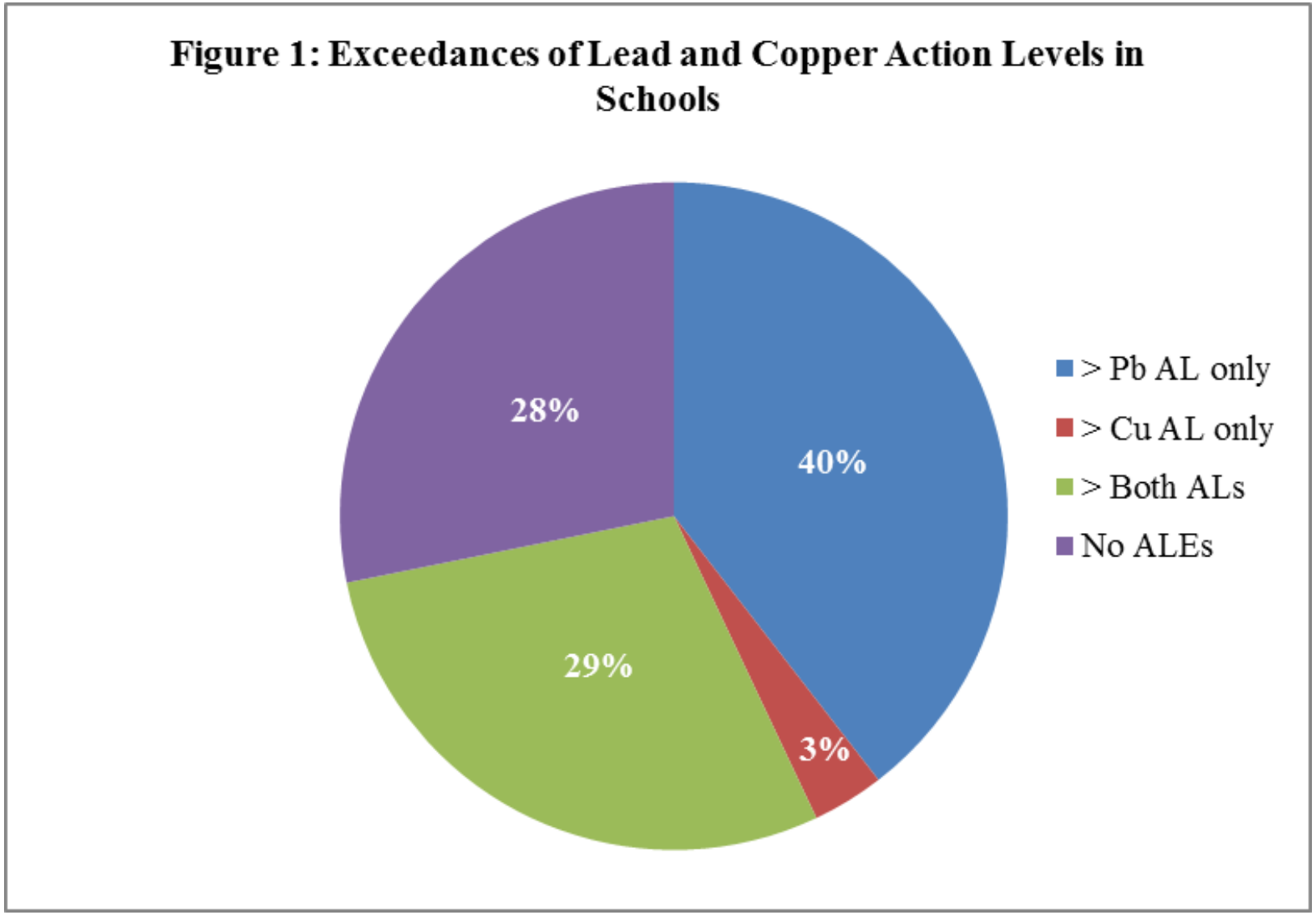
- **Average of 39 sample locations and 69 samples per building**

- **56,000 samples collected (50,000 analyzed by commercial labs, cost of $1.4 M)**

MassDEP 2016 LCCA Program Results

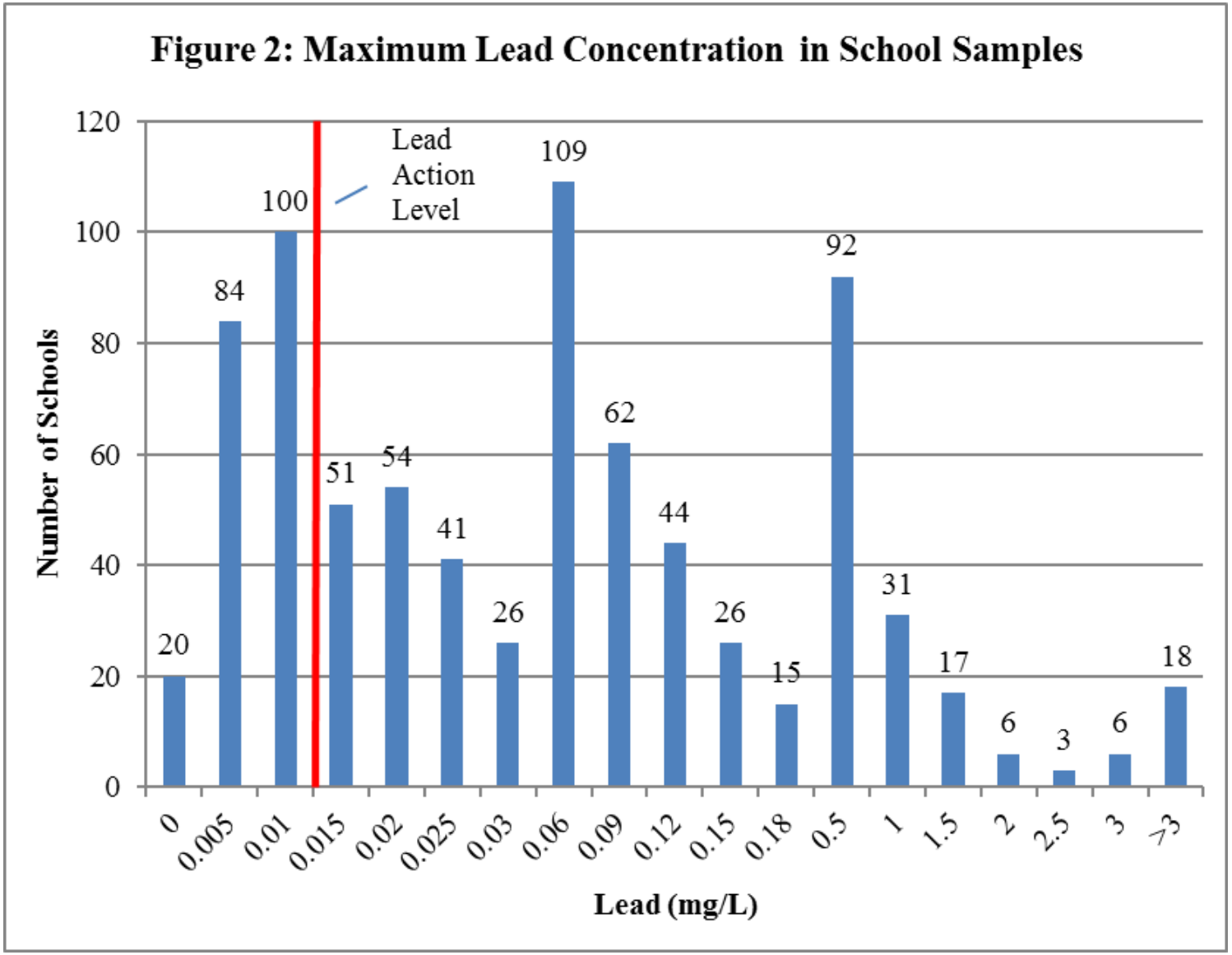
- **It is common (69%) for a school building to have at least one sample that has lead > 15 ppb AL, sometimes many.**
- **A number of schools (28%) had no samples with Pb or Cu levels that exceed the AL. including many with lead levels below the method reporting limit**
- **Most of the sample AL exceedance results for Pb are for the primary or first draw sample (12%) versus flush sample (2.5%), highlighting the benefits of flushing.**
- **Exceedances of the copper Al of 1.3 mg/L are infrequent (~ 2%), and similar for first draw and flush samples. Copper AL exceedances are more systemic, and could possibly be controlled by optimum corrosion control.**
- **Often, the fixtures with the highest Pb or Cu levels are known to be used much less frequently than most other fixtures, highlighting the importance of flushing taps prior to consumption.**

Action Level Exceedance, Number of Schools



Source: MassDEP Assistance Program Final Report, May 2017

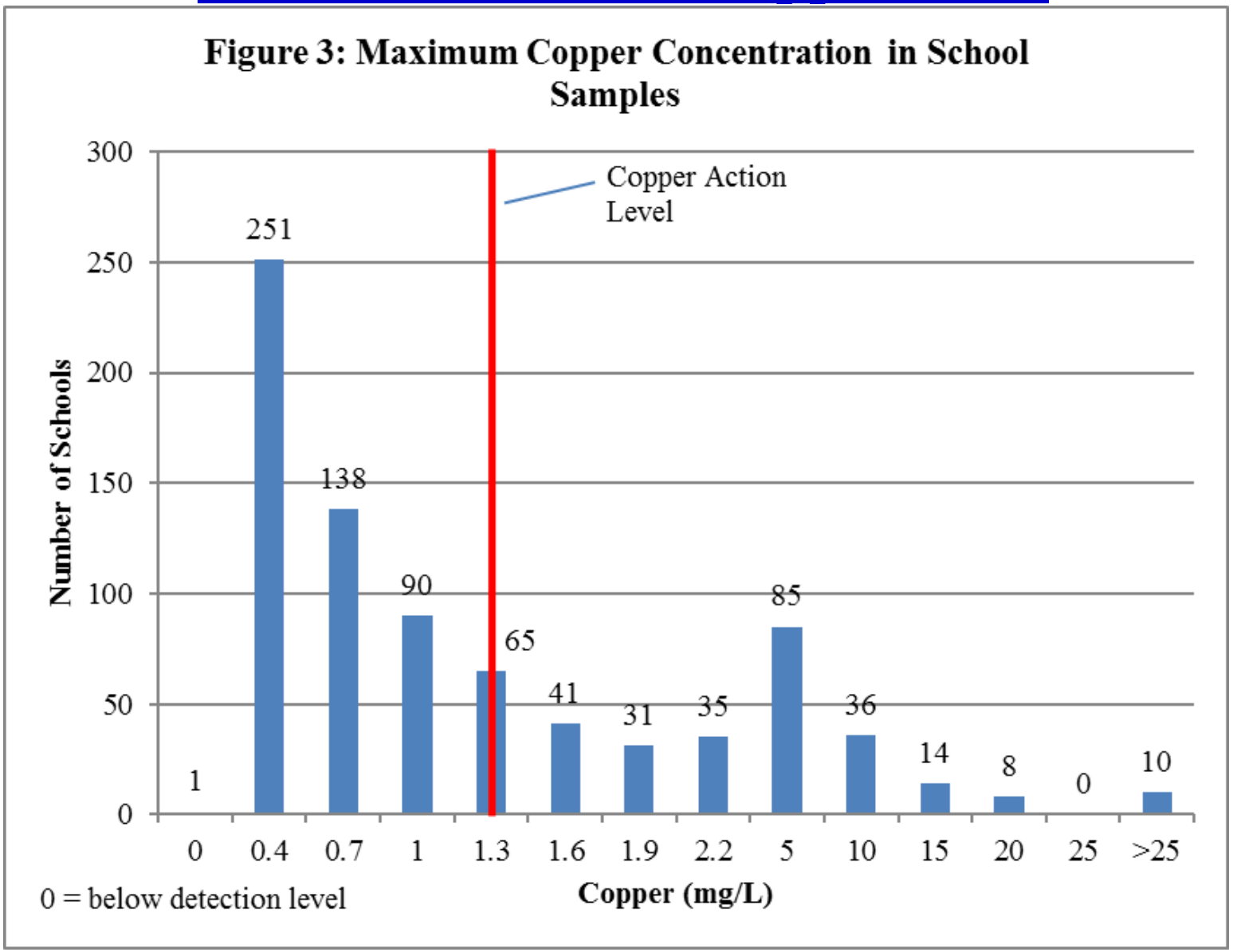
Schools: Maximum Lead Level



Source: MassDEP Assistance Program Final Report, May 2017

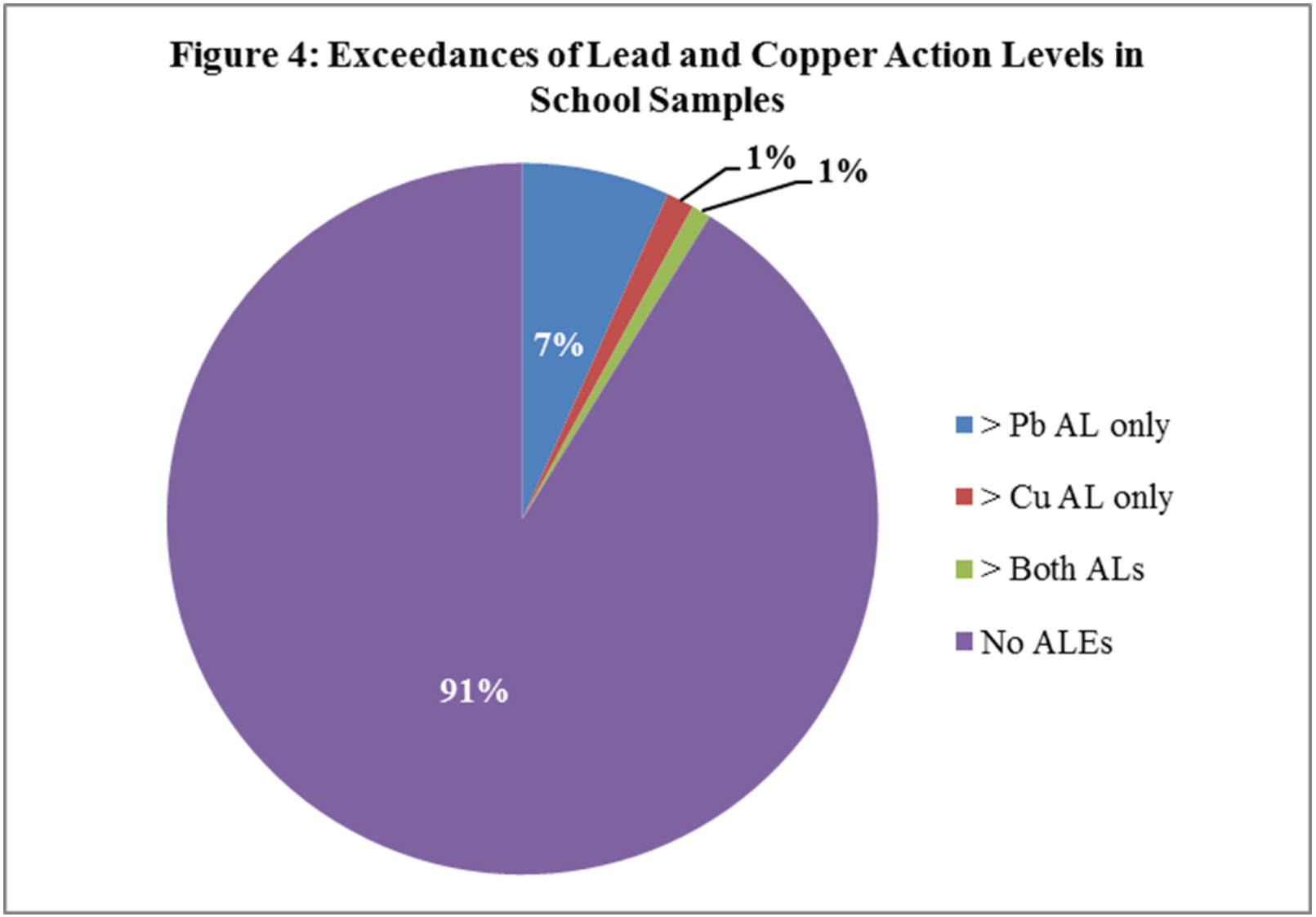
J.E. Tobiason, Lead in School Drinking Water, NEWWA May 2017

Schools: Maximum Copper Level



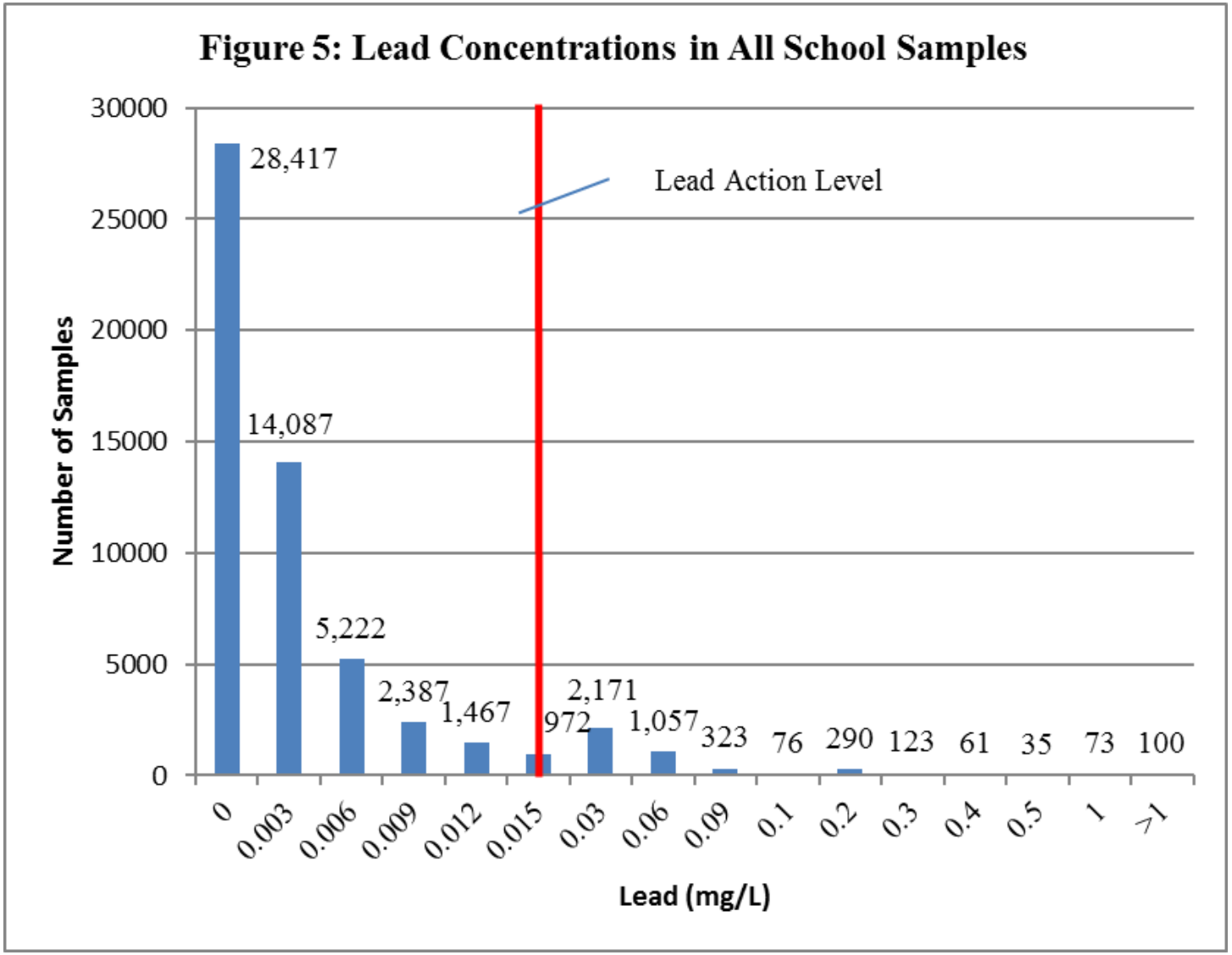
Source: MassDEP Assistance Program Final Report, May 2017

All Samples: AL Exceedances



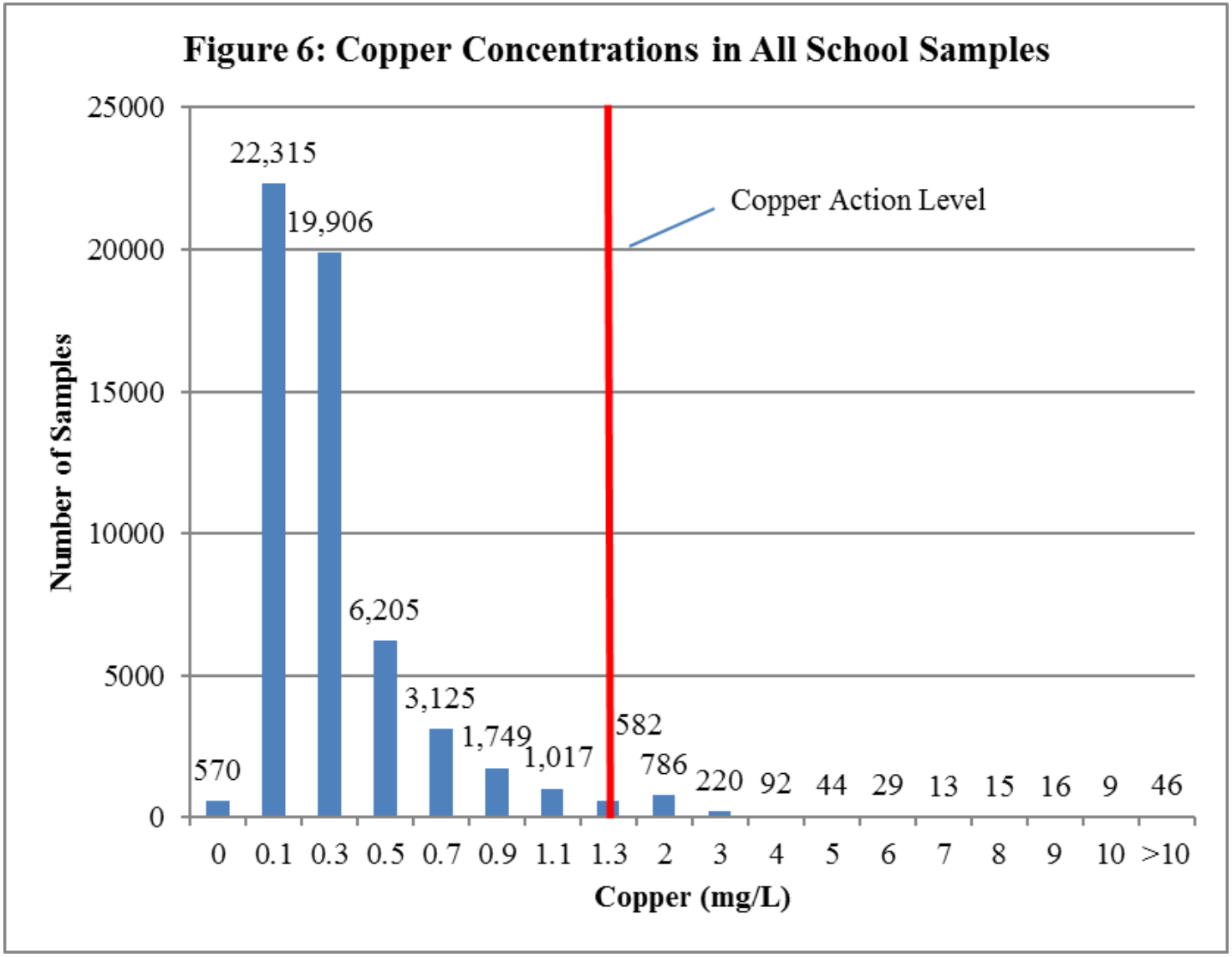
Source: MassDEP Assistance Program Final Report, May 2017

All Samples: Lead Concentration Distribution



Source: MassDEP Assistance Program Final Report, May 2017

All Samples: Copper Concentration Distribution



Source: MassDEP Assistance Program Final Report, May 2017

Fixture Type and Number of Samples

Table 1: Fixture Types Sampled in the Program

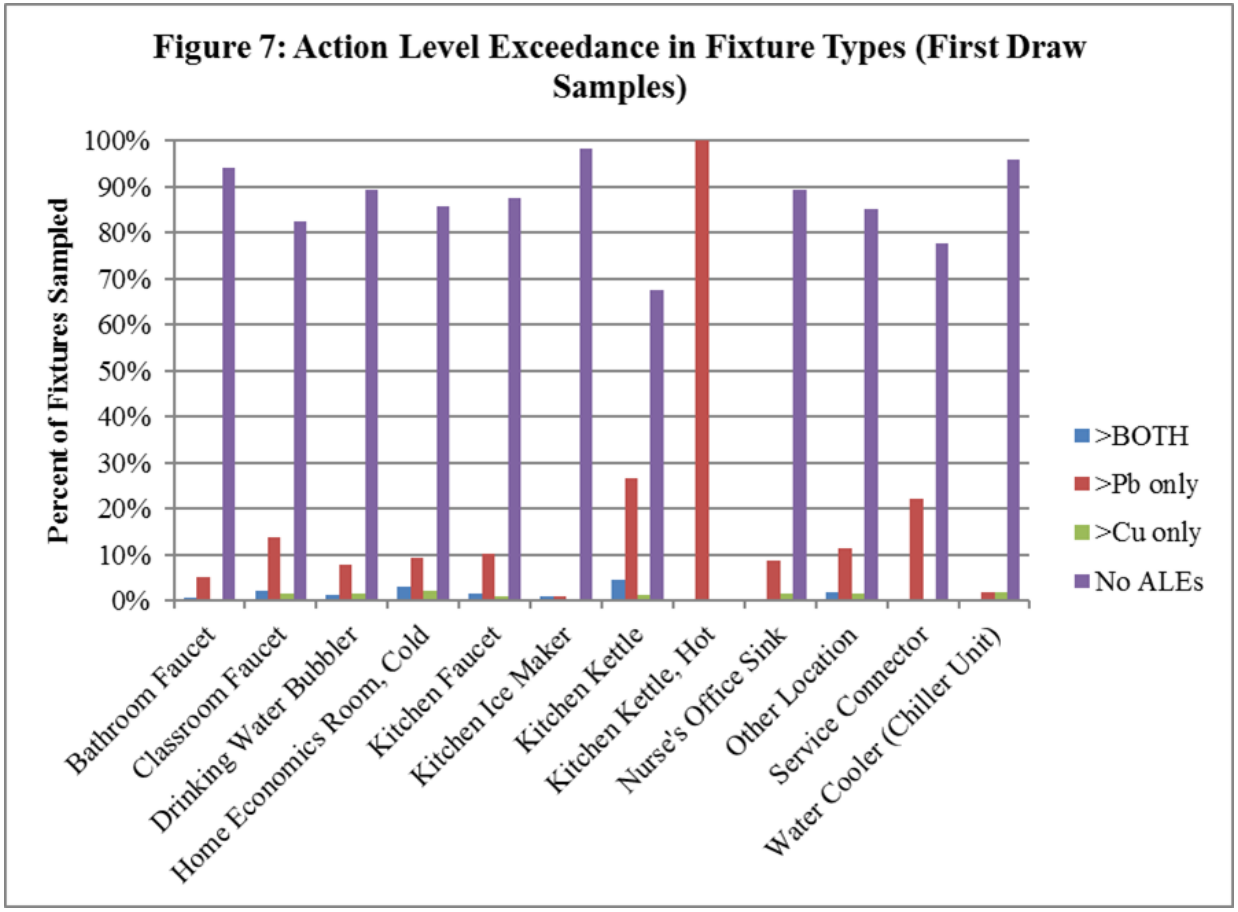
Fixture Type	Number of Samples
Classroom Faucet	21,385
Drinking Water Fountain	14,556
Water Cooler (Chiller Unit)	6,863
Kitchen Faucet	4,201
Other Location	2,101
Nurse's Office Sink	1,791
Bathroom Faucet	1,196
Kitchen Kettle (cold water line)	1,079
Kitchen Kettle (hot water line)	4
Home Economics Room, Cold	527
Kitchen Ice Maker	138
Service Connector[1]	16

Source: MassDEP Assistance Program Final Report, May 2017

AL Exceedance by Fixture Type, First Draw Samples

For all First Draw Samples

- **Pb: 88% < AL**
- **Cu: 97% < AL**

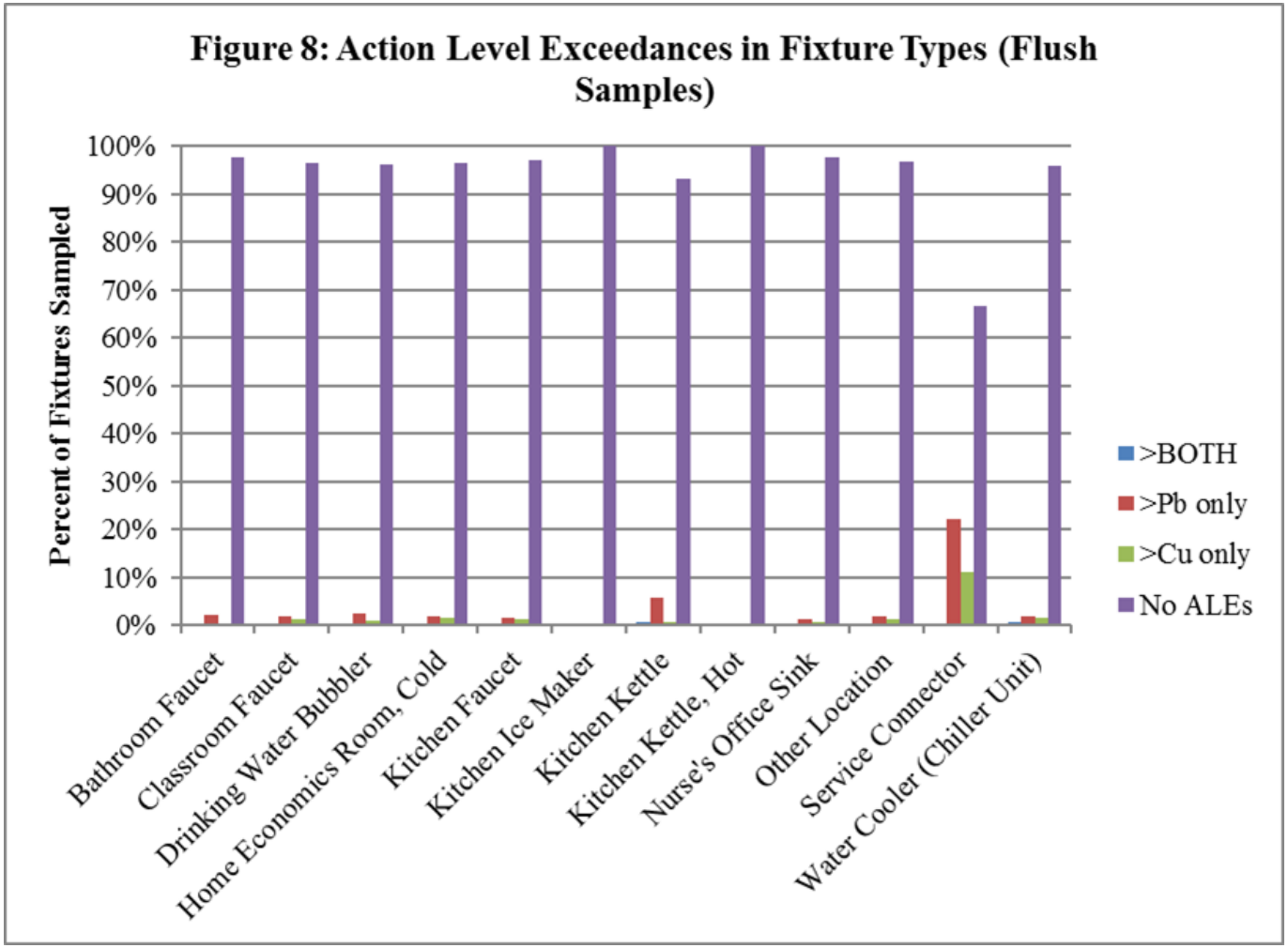


Source: MassDEP Assistance Program Final Report, May 2017

AL Exceedance by Fixture Type, Flush Samples

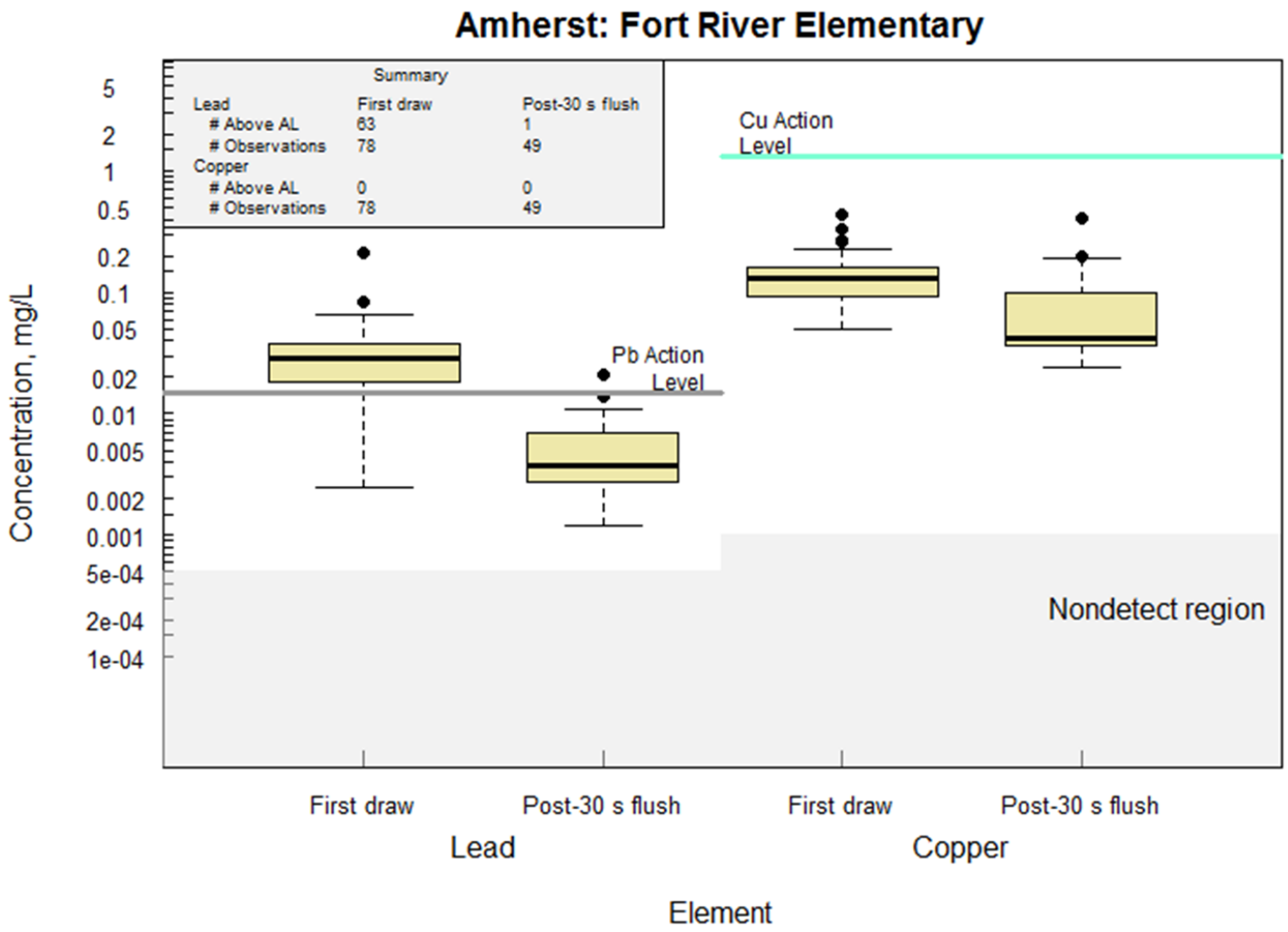
For all Flush Samples

- **Pb: 98% < AL**
- **Cu: 99% < AL**



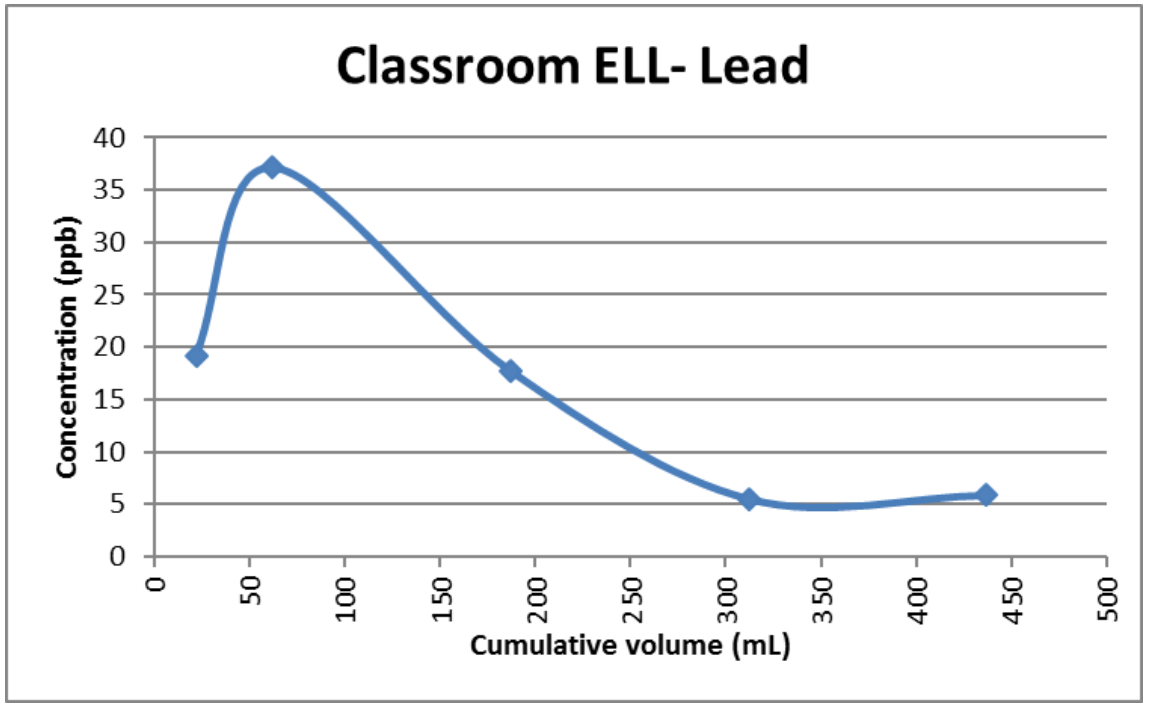
Source: MassDEP Assistance Program Final Report, May 2017

A method to analyse/present data for a school (courtesy Dr. David Stevens)

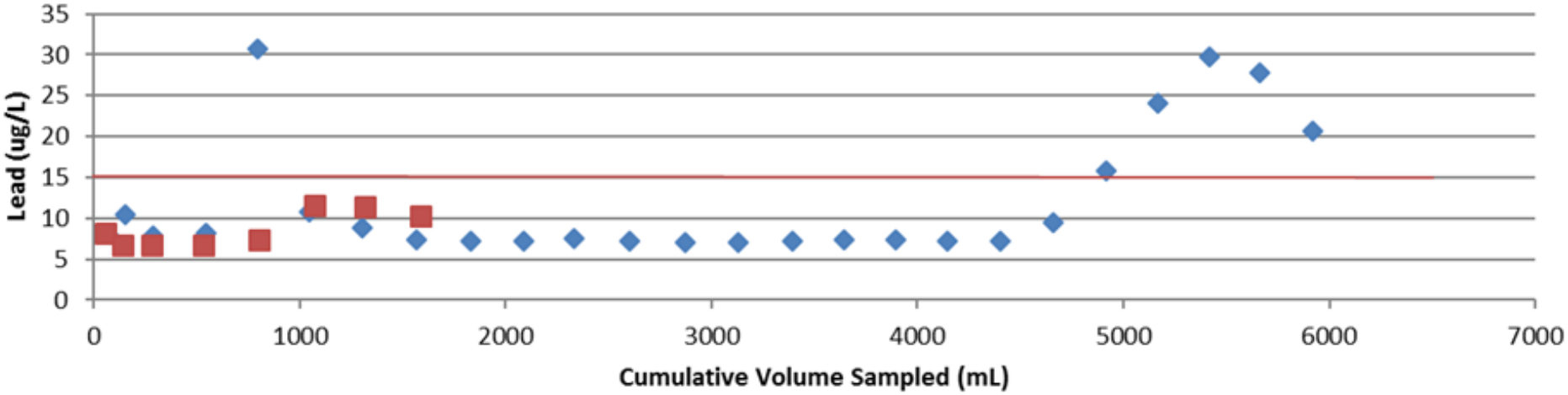


Building plumbing Pb: it's all in the details

- **Need to determine volume associated with components, sample accordingly, detect contributing components in order to direct replacement work**
  - **Goose-neck faucet (185 nL) versus bubbler (10 mL), flexible line to valve (25 mL), valve, piping, etc.**



- **Pb profile showing a faucet contribution and possibly a lead gooseneck (volume calculated to be associated with water near service connection to water main). Not from a school.**



Some Lessons Learned

- **Community personnel involvement is critical, best when school, PWS and Public Health all involved**
  - **PWS involvement varied, very beneficial when included**
  - **School facility manager (custodian) was key**
- **Sampling protocols need to be clearly communicated**
- **School calendar year should be considered when providing such a program**
  - **Summer not suitable for sampling, start of school year challenging**
- **Schools need technical assistance and support in the follow-up stage for interpreting and responding to sampling results.**
- **Schools need to be prepared with communications tools prior to beginning a sampling program.**

After the Assistance Program:

- Complete All Remediation Measures (as applicable)
- Follow the MassDEP Lead and Copper in School Drinking Water Program
- Sample All School Fixtures at Least Once Every Three Years (e.g. One-Third Each Year)
- Keep Plumbing Profile and Sampling Plan Up-To-Date
- Update the MassDEP LCCA Maintenance Checklist after any Sampling or Programmatic Change

For More Information

MassDEP Drinking Water Program:

Program.Director-DWP@state.ma.us

DEP LCCA Program Contact:

Kenneth.Pelletier@state.ma.us

978-242-1329

MassDEP Website:

http://www.mass.gov/eea/agencies/massdep/water/drinking/testing-assistance-for-lead-in-school-drinking-water.html

Acknowledgements (1): who did the work!

- **UMass Amherst based Project Team**
  - **John Tobiason, David Reckhow, *co-Principal Investigators***
  - **Rick Larson, Bob Hoyt, *co-Program Managers***
  - **Tom Bienkiewicz (MRWA), Gene Brunelle, Harrison Corbett, Jim Dillon, Kate Gallagher, Mark Griffin, Marie Iken, Ted Kenney, Lynda Laine (MRWA), Thom Martens, Heather Minott, Wayne Southworth, Anita Wolovick, *Technical Assistance Providers***
  - **Donna Asher, Marie-Francoise Hatte, Kelley, Ives, *Administrative***
  - **Kaavya Ram, Graduate Student, many undergraduate students**
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  - **Jeffrey Mickelson, Michael Maynard**
  - **Yvette Depeiza, Damon Gutterman, Andrew Durham, Margaret Finn, Marc LaPlante, Ken Pelletier, Tio Yano**
- **All the school, PWS, and other municipal employees**

Acknowledgements (2): who did the work!

- **Massachsuetts Water Resources Authority**
  - **Sample bottles, sample analyses (6000 for this Program)**
  - **MWRA has conducted many more analyses for member communities outside of this program, at no charge to those communities**
- **Commercial Laboratories**
  - **12 different laboratories**
  - **provided important communication, sample bottles, analysis**
  - **Large workload, short time period**

Questions?

Thank you for your attention!